Folio of Compositions

Commentary

by

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The University of York
Department of Music

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Acknowledgements

Before continuing to the commentary of this folio, I would like to thank:

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- Recordings. One Audio CD containing the performances of the following works:

1) Aoide for Chamber Ensemble
2) Eteromorphia for Violoncello & Piano
3) Tu Solus III for Flute

2. Introduction

Composition has always been more than a creative process for me. I always used to consider it as sculpting and morphing parts of time, according to personal character and logic. Having been born in a country with a strong Eastern music tradition and at the same time decisively influenced by Western elements, it would be almost impossible for Hellenic culture not to have contributed to the development of my musical language. Therefore, the majority of this folio's works focus on two different categories of musical material: the modal (reflecting the eastern traditional music element) and the spectral (reflecting western contemporary music).

This PhD folio is a development of my previous compositional background, especially of works composed during the years 2005-2008 including specific works from my Masters degree years. That period is characterised by compositional research on folk modes, used as prime pitch material to develop various kinds of structures through works such as 'Lux Perpetua' for flute solo (2005) and 'Talus' (2006) for piccolo and tam-tam. However, spectral musical elements were gradually introduced to my language in works such as 'Elsewhere' for piano (2007).

My main influences have been the sounds of George Crumb, Salvatore Sciarrino and Helmut Lachenmann, where I firstly discovered sophisticated timbres on acoustic musical instruments through imaginative extended playing techniques. From my first years of composition, works such as Crumb's *'Vox balenae'*, Sciarrino's *'L'Opera per flauto'* and Lachenmann's *'Gran Torso'* contributed significantly, developing my personal use of timbral exploration and manipulation. On the other hand, spectral works such as Gerard Grisey's 'Les espaces acoustiques', Tristan Murail's *'Treize couleurs du soleil couchant'* and Kaja Saariaho's *'Verblendungen'* taught me the beauty of the microcosm of sound, leading me to expand my compositional thought in a more logical and formalised way.

Emerging from this background, all of the above primary ideas lead to the creation of a PhD folio, focused on the exploration and the invention of artistic ways that modal aspects can be extracted from spectrality and vice versa. My research explores the combination of these two completely distinct sound-worlds and the interaction between them. One harmonic (or non-harmonic) spectrum can be used to extract various kinds of modes contained within it, in several ways. In addition, a mode can be used for generating various kinds of spectral material through simple algorithmic processes. The combination of these two completely different sonic environments forms a dual musical language, which includes both logical and an free elements.

The target of my research is to extend these two different sound worlds and find or invent methods by which modality can be extracted from spectrality and vice versa in an artistic framework. This methodology has been developed on several levels and applied to various instrumentations including solo instruments, chamber ensembles and orchestra. The manipulation of the musical material aims to create multiple contrasting layers which form various kinds of symmetrical or non symmetrical structures.

Studying at the University of York was an important opportunity for me not only to experiment comprehensively with sound, but also to exchange thoughts with other composers, both students and professionals. This compositional community helped me to expand my musical notion and enrich my language by adding new methods and techniques. Getting familiar with IRCAM's OpenMusic software was a landmark in the development of my personal style and aesthetic direction. Although my music cannot be characterised as purely 'algorithmic', simple algorithms have been used in order to organise, develop and transform the musical material. In most works OpenMusic was used as a calculator for the extraction of various harmonic or non harmonic spectra and for the transcription of several spectral techniques or acoustic phenomena into standard music notation. Many kinds of musical experiments were performed in OpenMusic to set the main principles and to achieve the desirable harmonic or rhythmic result for each work.

My research focuses on spectral harmony organisation, texture manipulation, melodic shaping, and timbre exploration. Regarding the harmony organisation, various mathematical models are usually used to produce primary chordal material based on harmonic and non harmonic spectra or on other chord sequences constructed using spectral techniques such as Frequency Interpolation, Frequency Modulation, Frequency Distortion and others. Texture plays a significant role for almost all of my compositions. This parameter is usually manipulated to modulate the intensity of the various music events and to crystallise the framework of the algorithmic approach of harmony through development of contrasting parts to each work. The melodic shaping is based either on folk modes (e. g. works *'Aoide'* and *'Tu Solus III'*) or on pitch sequences generated from the above spectral techniques (e. g. works *'Eteromorphia'* and *'α4')*. Both methods are used to create a primary 'skeleton' which is elaborated, developed and finally shaped according to personal taste and imagination. Timbre organisation using several extended techniques is another element of my compositional research. The timbre is mostly organised by continuous experiments on the instruments and often works more as original part of a melodic line rather than an additive coloristic effect.

My initial research plan was to develop my artistic voice following a trajectory which included various instrumental levels. My main target was to explore how my compositional propositions work on solo instruments, duets, ensembles of four, six, eight and eleven instruments respectively, and finally symphony orchestra, creating a bridge between two different traditions and exploring possible combinations in order to produce new works.

4. Commentary on the compositions submitted

4.1 Aoide (2007) Duration: approximately 10 minutes

Instrumentation: Flute, Clarinet in B Flat, Trumpet in C, Trombone, Percussion I, Percussion II, Piano, Violin I, Violin II, Viola, Violoncello

The title of this work derives from the ancient Greek mythology, where *'Aoide'* (in Greek '*Αοιδή*') was one of the three (later nine) original muses, daughter of Zeus and muse of song. This title was chosen to represent the melodic character of the first and last section of the work which is performed by the flute and the clarinet respectively. This particular instrumentation which includes two woodwinds, two brasses, percussion and string quartet, was chosen as a reduced form of a chamber orchestra to achieve the timbre and volume balance. A supporting-coloristic role has been given to the piano to enrich the various textures and timbres. This work can be characterised both aesthetically and technically as a transition between my recent compositional past and the extension of my language during my PhD studies, after the introduction of OpenMusic software.

There are three different initial musical ideas which were used to form the textural plan:

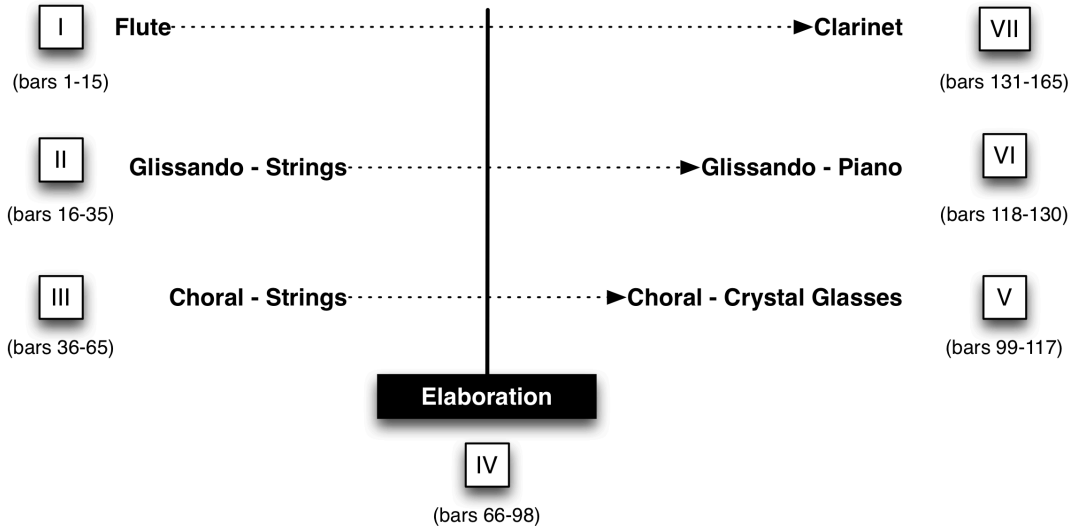
1) A melodic line (performed by the Flute in bars 1- 15)

2) A glissando passage (performed by the violins and the viola in bars 16-35)

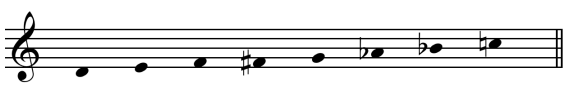
3) A homophonic (chorale-style) passage (performed by the strings in bars 36-65)

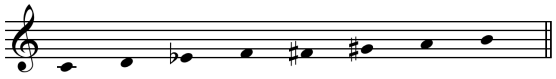
The development of the above ideas is based on the reconstruction of timbres, exporting the same aesthetic direction from an alternative perspective thus creating a palindromic structure. In the second half of the work, each of the three initial ideas is substituted by a new one, based on the

same technique but performed by different instruments. The melodic idea passes from the flute to the clarinet (bars 131-165) and the glissando idea is given to the piano, where the performer plays on the string using a guitar glass-slide (bars 118-130). Finally, the 'chorale' is arranged for a pair of crystal glasses rubbed with wet fingers by the two percussionists (bars 99-117). These two mirrored sections are divided and linked at the same time with an elaboration (bars 66-98), which is used as an axis of symmetry. Here, elements and ideas from the first half of the work are expanded and developed leading to a peak in the density of the texture. The figure below gives a structural overview of the work which is divided into seven successive sections according to different musical ideas, timbres and textural densities:

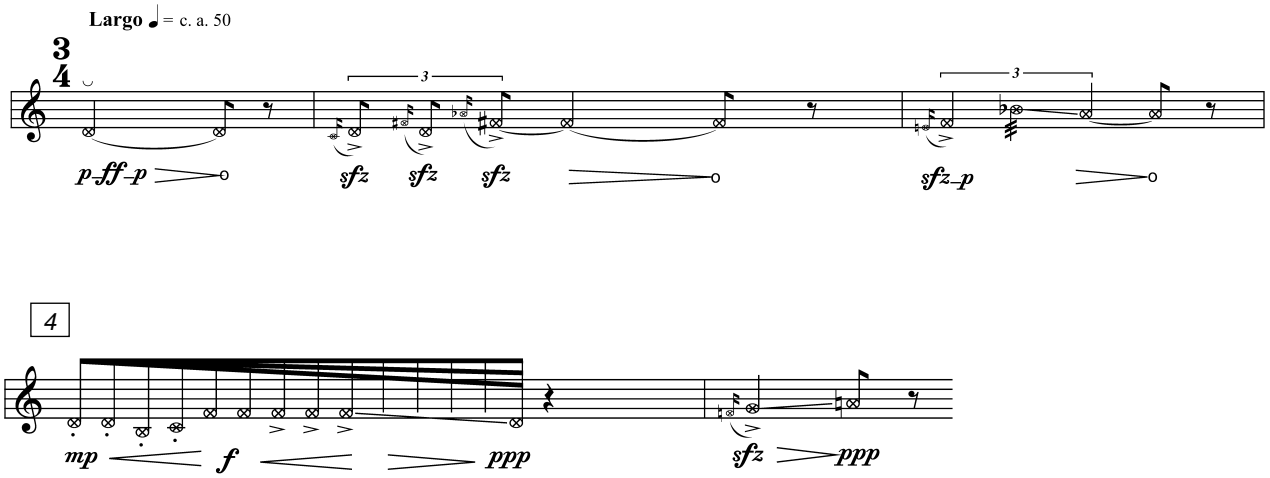


The fundamental pitch material of Aoide is based on two different eight-note modes. The first is constructed from one tone, four semitones and two tones respectively (bars 1-15) and the second is an octatonic scale which rises by tone-semitone-tone etc. (bars 75-98):

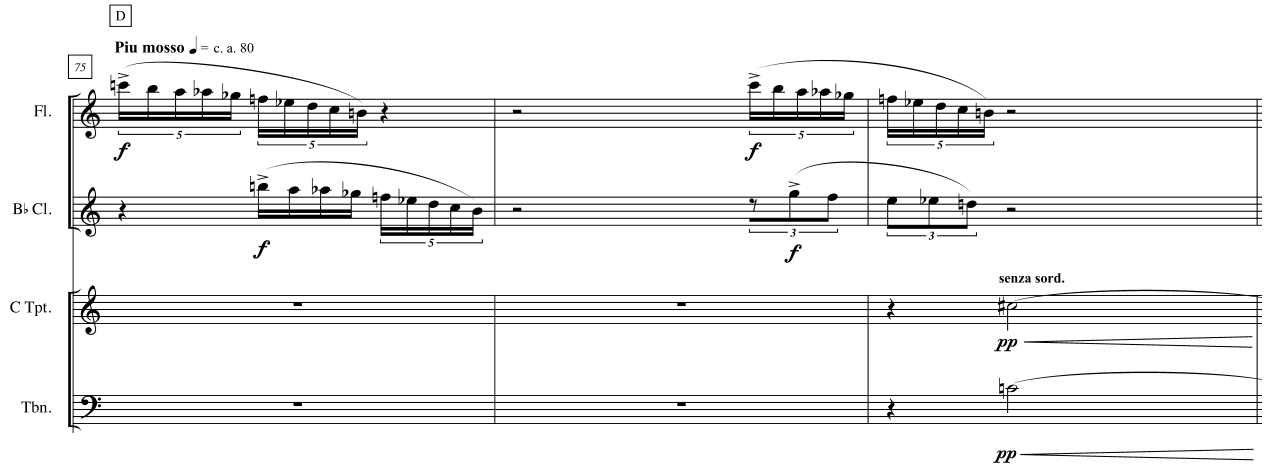
1. 

2. 

I used mostly the pitches of the first mode as main points to shape the melodic line of the first and the last section (bars 1-15 and 99-117 respectively). In addition, complementary pitches of the chromatic scale were inserted either for timbral or harmonic reasons, to modulate the harmonic intensity and create some additional dissonances:



The second mode was mostly used in bars 75-117 (rehearsal letter D) to construct scale gestures, expanding the second section's glissando idea:



Although the glissando idea is established in the second section by the strings (bars 16-35), from a macro-structure perspective, it underlies during almost the whole work as a continuum, transformed into various forms. The table below illustrates the development of the glissando idea along Aoide's timeline:

Section	Instruments	Form	Bars
I	Flute	Pitch bending	1-15
II	Strings	Trilling glissandi (initial idea)	16-35
III	-	-	-
IV	Strings	Trilling glissandi Col legno battuto glissandi (first granular form of glissando)	66-117
	Tutti	Rapid upwards/downwards scale gestures (expansion of glissando to modal pitch sequences)	
	Chimes	Rapid glissando producing a large and loud amount of harmonics (Glissando is compressed to a spectrum)	
V	-	-	-
VI	Piano	Glass slide glissando on strings	118-130
VII	Strings	Bouncing bow glissando (second granular form of glissando)	157-164

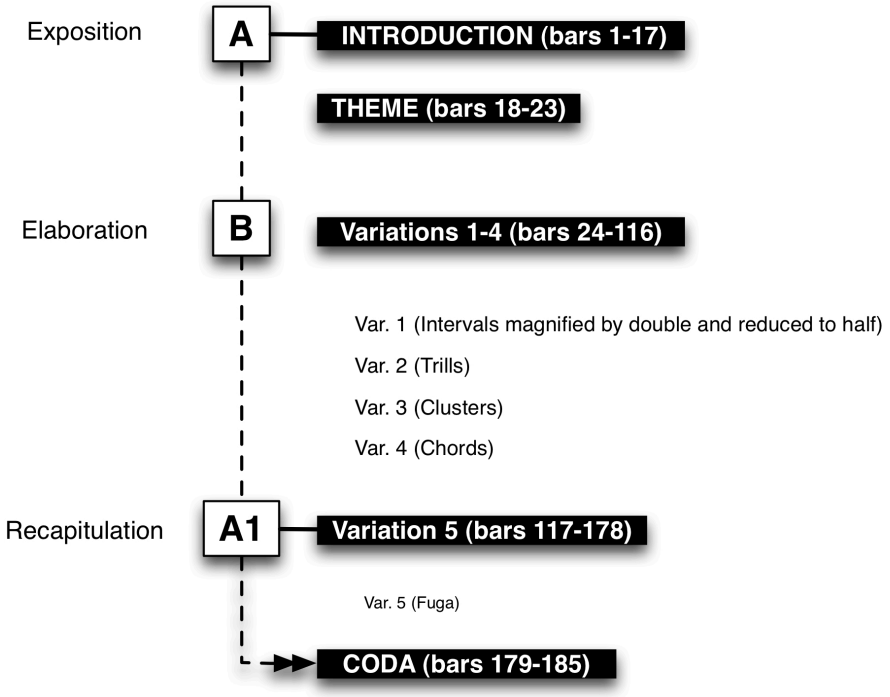
In summary, Aoide is characterised by a palindromic structure, based on the timbral reconstruction of three initial ideas where the second (glissando) underlies during the whole work as a continuum, transformed into various forms. Several instrumental techniques are developed by substitution, while later techniques and musical ideas are often expanded to form larger phrases or compressed into short motives. Finally, specific elements of these developed forms intervene as links between the distinct sections of the work, contributing to the overall flow of this structure.

4.2 Eteromorphia (2008) Duration: approximately 12 minutes

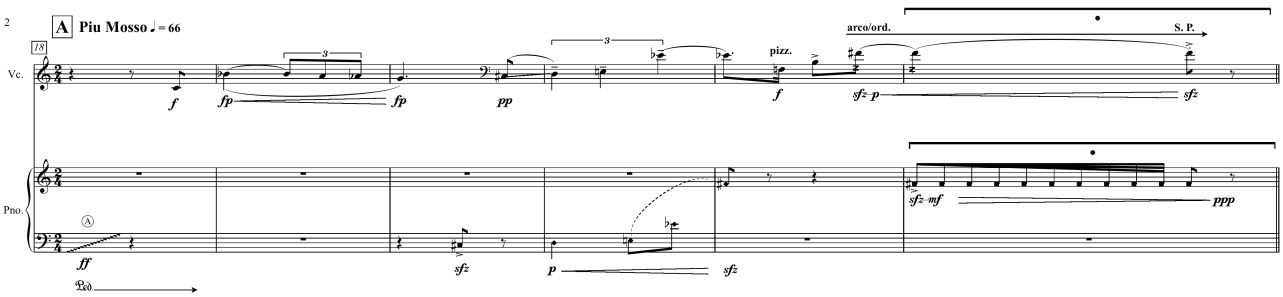
Instrumentation: Violoncello, Piano

Eteromorphia is my first work where spectral methods were applied, calculated by the OpenMusic software. The Greek complex word *'ετερομορφία'* (*έτερος*=different + *μορφή*=form) means the property of an object having different forms and corresponds both to the compositional methodology applied and the structure. The structure of Eteromorphia can be characterised as 'Theme and Variations'. This work examines the interaction between a twelve-note row and a spectrally elaborated environment and how this row behaves through some simple spectral techniques developed on several levels.

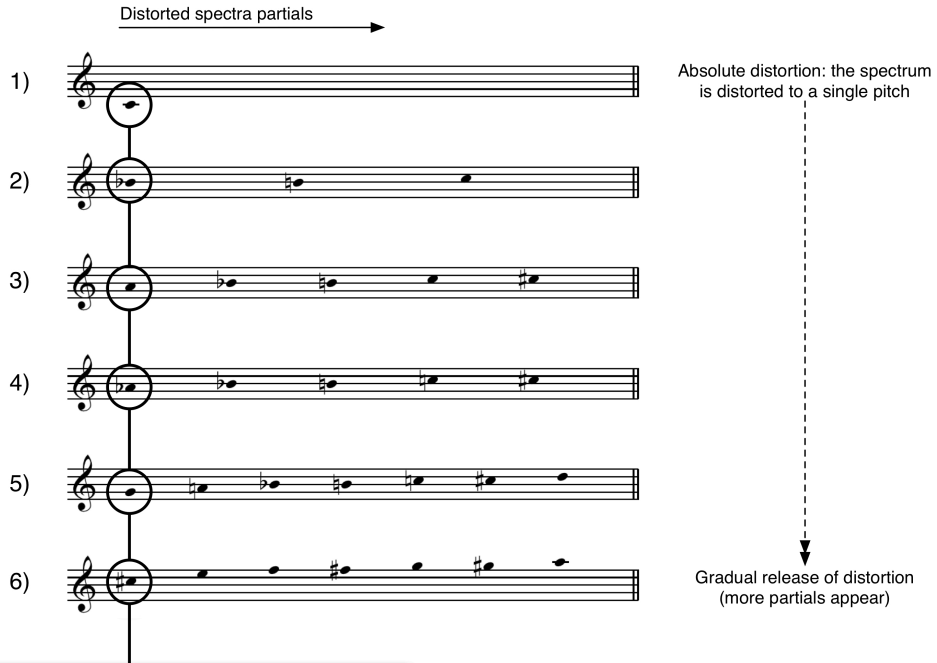
Although this composition can micro-structurally be divided into eight sections plus a short coda, from a macro-structural point of view it could be considered a three-part form, based on the three basic steps of the compositional process (exposition of the primary pitch and rhythmical material, elaboration and recapitulation respectively). The figure below illustrates the micro and macro structure of Eteromorphia:



Unlike the other works in this folio, Eteromorphia is based on a theme constructed from a twelve-note row performed by the violoncello in bars 18-23:



Frequency distortion technique was used to construct the introduction (bars 1-17) and develop the variations 1, 4, and 5. Regarding the introduction, the first six partials of the twelve-note row were used as fundamentals to produce six distorted harmonic spectra. The same technique was used to compose the fifth variation (Fuga) as well. Frequency distortion was also used to extract the pitch material of variations 1 (bars 24-36) where the theme has been transformed both by reducing the melodic intervals to half and magnifying to double. Because of the equal temperament, no microtones were used and the frequencies were rationalised to the nearest semitone:



Partials 1-6 from the 12-note series - Fundamentals for each distorted harmonic spectrum

Variations 2, 3 and the piano part of variation 4 were based on several pitch sequences which were extracted from the twelve-note series 'row-box', a matrix which contains the four forms of the row (prime, inversion, retrograde and retrograde inversion) and their transpositions:

Prime → ← Retrograde

Inversion ↓

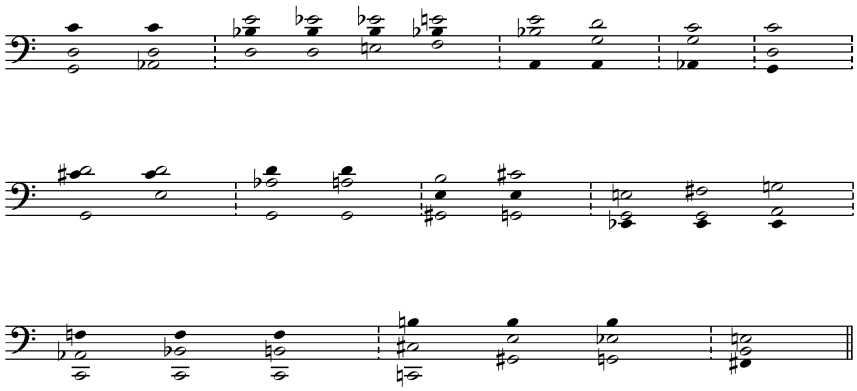
C	Bb	A	Ab	G	C#	D	E	Eb	F	B	F#
D	C	B	Bb	A	Eb	E	F#	F	G	C#	Ab
Eb	C#	C	B	Bb	E	F	G	F#	Ab	D	A
E	D	C#	C	B	F	F#	Ab	G	A	Eb	Bb
F	Eb	D	C#	C	F#	G	A	Ab	Bb	E	B
B	A	Ab	G	F#	C	C#	Eb	D	E	Bb	F
Bb	Ab	G	F#	F	B	C	D	C#	Eb	A	E
Ab	F#	F	E	Eb	A	Bb	C	B	C#	G	D
A	G	F#	F	E	Bb	B	C#	C	D	Ab	Eb
G	F	E	Eb	D	Ab	A	B	Bb	C	F#	C#
C#	B	Bb	A	Ab	D	Eb	F	E	F#	C	G
F#	E	Eb	D	C#	G	Ab	Bb	A	B	F	C

↑ Inversion Retrograde

Aesthetically, the elaboration (bars 24-116) consists of contrasting textures which gradually lead to a dematerialisation of the theme. The twelve note series was used as a flexible material to form five different musical objects representing one musical idea expressed from five different perspectives. The table below shows the steps of the elaboration of the theme:

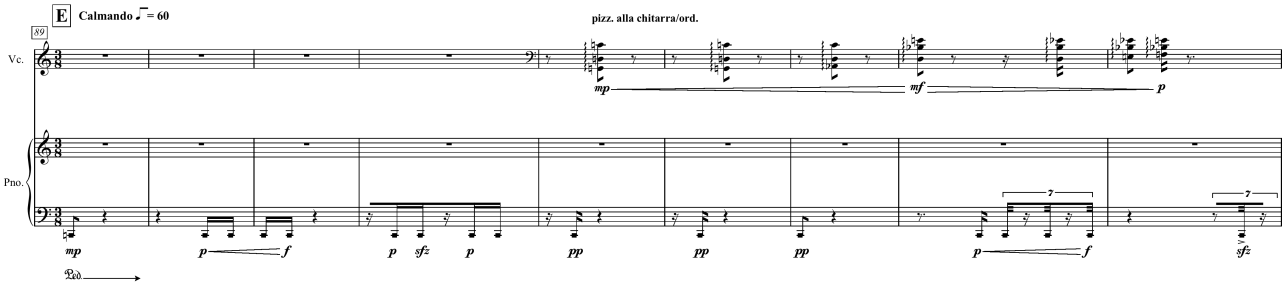
Variation	Bars	Theme form
1	24-36	original with distorted melodic intervals (both instruments)
2	37-53	trilling passage (violoncello)
3	54-88	top pitches of clusters (piano)
4	89-116	three-part chords (piano)
5	117-178	original (both instruments)

After the theme is exposed (in bars 18-23) it gradually becomes distant from its original form. It appears hidden inside a loud and fast trills passage. During variation 3 (bars 54-88) it appears as top pitches of clusters with different harmonic densities. On the one hand, the clusters are performed on the white keys of the Piano (diatonic density) whilst on the other, they are performed on the black keys (pentatonic density). During variation 4 (bars 89-116), the theme is transformed into the most distant form. Almost inaudible, the pitches appear as elements of three-part chords, performed by the violoncello with the '*pizzicato alla chittara*' technique:

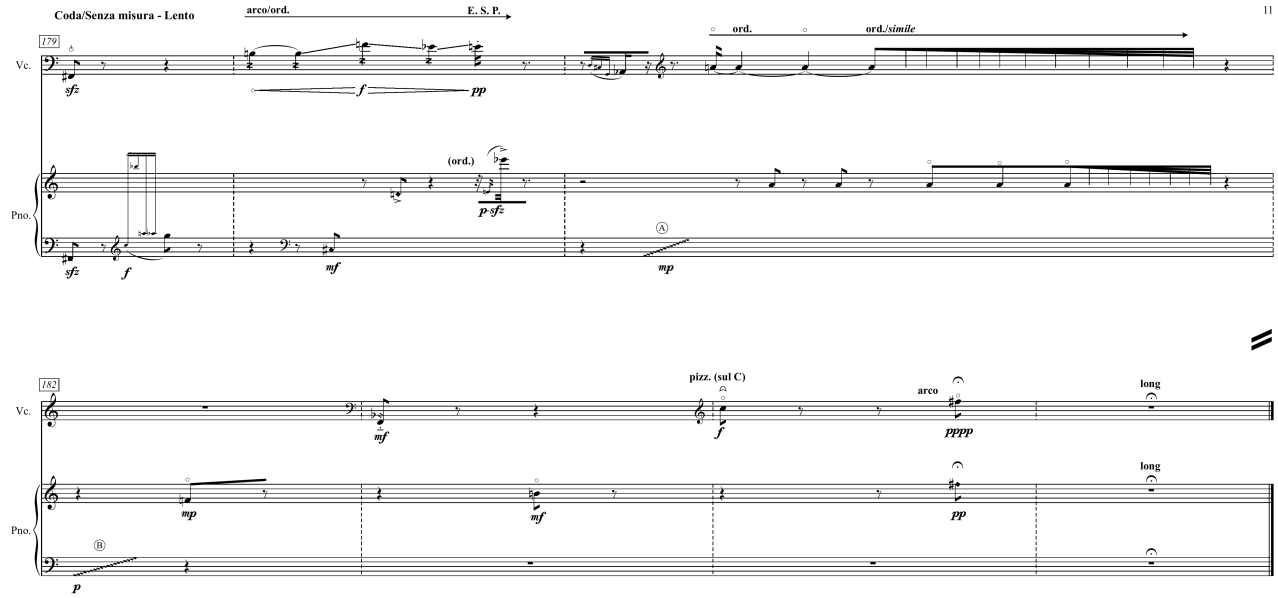


• = partials of the 12-note series

Simultaneously, the piano focuses on a rhythmic motive based on pitch C_2. Pitch C was chosen due to its importance inside the 'row-box' where it can be found as a diagonal. During this variation, the distortion technique was applied to rhythm and gradually diminishes the durations:



The final section of the work consists of Variation 5 and initiates the recapitulation of the theme in a fugue form. Beginning with the rhythmical element, the theme is gradually reconstructed through the frequency distortion technique. The organisation of the distorted harmonic spectra, the dynamics and the timbre is being developed around the rhythmical axis until the theme recovers completely its original pitch form. A second, shorter dematerialisation was applied leading the work to a coda where parts of the theme appear as a distant recapitulation:

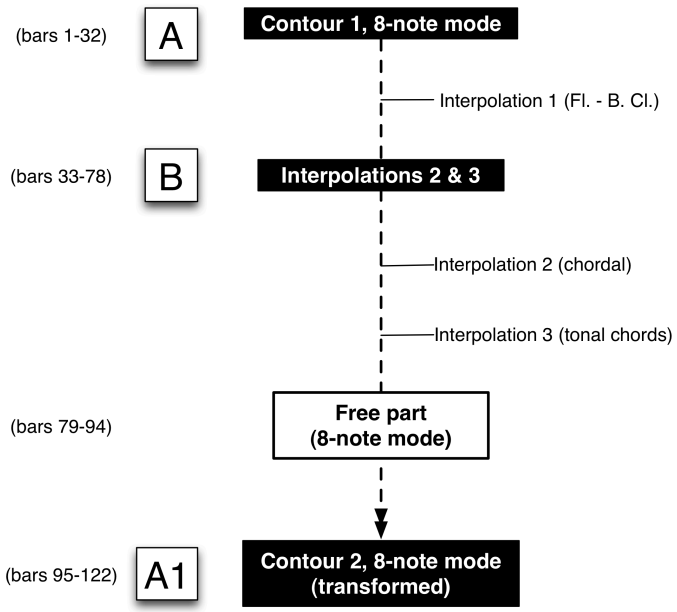


To summarise, this work examines the interaction between a twelve-note row and a spectrally elaborated environment and how this row behaves through some simple spectral techniques developed on several levels. Structurally, the five variations are characterised by contrasting textures, each one contributing to a gradual dematerialisation of the theme. The macro-structure of this work could be characterised as a three-part form (Exposition-Elaboration-Recapitulation). The basic theme is incorporated in the Introduction-Exposition part and the Elaboration part is, micro-structurally, a compilation of four variations. Finally this leads to the last Fuga-form variation which constitutes the recapitulation part.

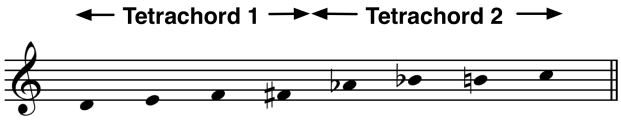
4.3 a4 (2008) Duration: approximately 11 minutes

Instrumentation: Flute (Doubling Piccolo), Bass Clarinet, Percussion, Piano

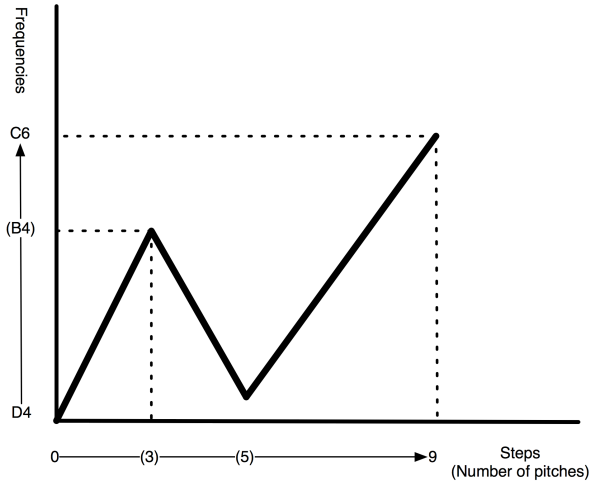
Getting deeper into the use of algorithmic spectral techniques into my artistic research, the main concern in a4 (*a quattro*) is the melody shaping and both the harmonic and the rhythmic manipulation through the interpolation technique. To begin with, the melodic and chordal material of this work is based on two different algorithms created in OpenMusic software to extract the primary pitch and rhythmic material. On the one hand I used a patch which transcribes freely chosen graphs into melodic contours using a predefined reservoir of frequencies. On the other hand I used the interpolation technique, an algorithm which interpolates a number of middle values between a starting and an ending point and transcribes the result into frequencies, rhythms or dynamics. This technique was used to extract both rhythmical patterns and chord sequences. The above techniques were used to set the basic principles and extract the primary musical material leading to the creation of two contrasting textures interacting with each other and forming a three part structure:

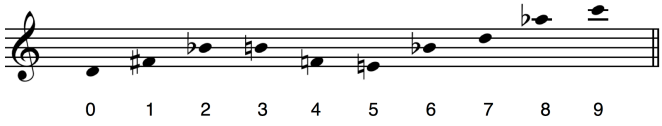


Initially, an eight-note mode that comprises two similar successive tetrachords is used as primary pitch material:



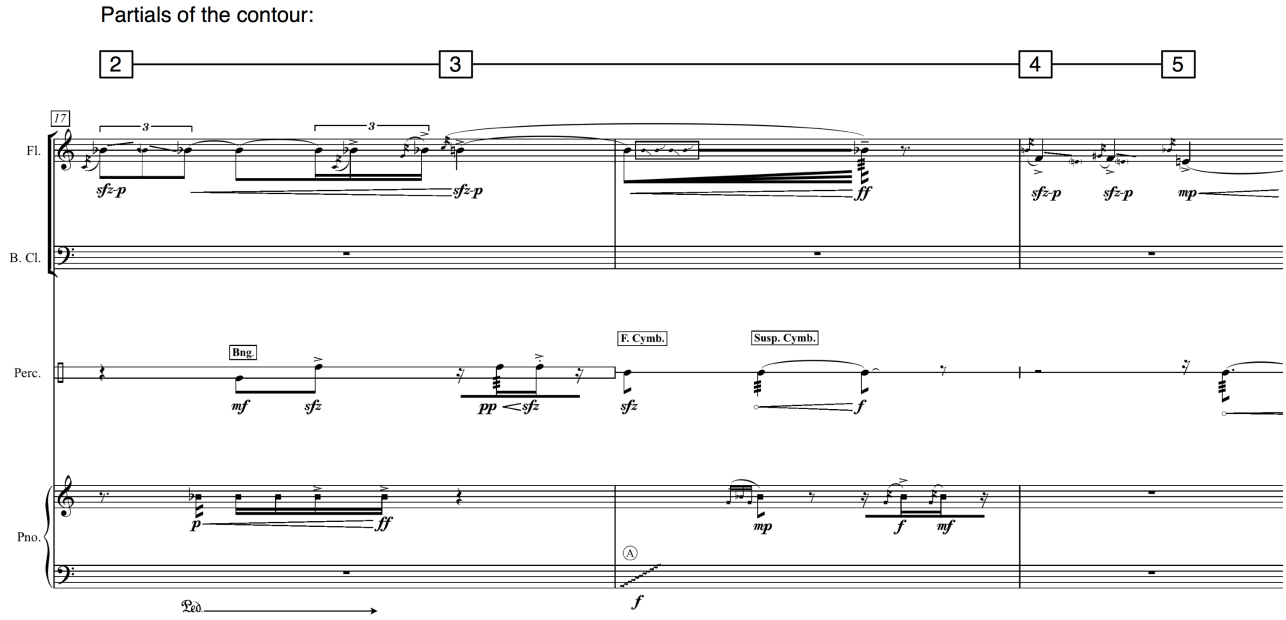
To form the first part of the work (Part A, bars 1-32), the mode above was used as a reservoir of pitches to generate a melodic contour. In particular, this particular OpenMusic patch creates a melodic representation of a graph using the predefined reservoir of frequencies:



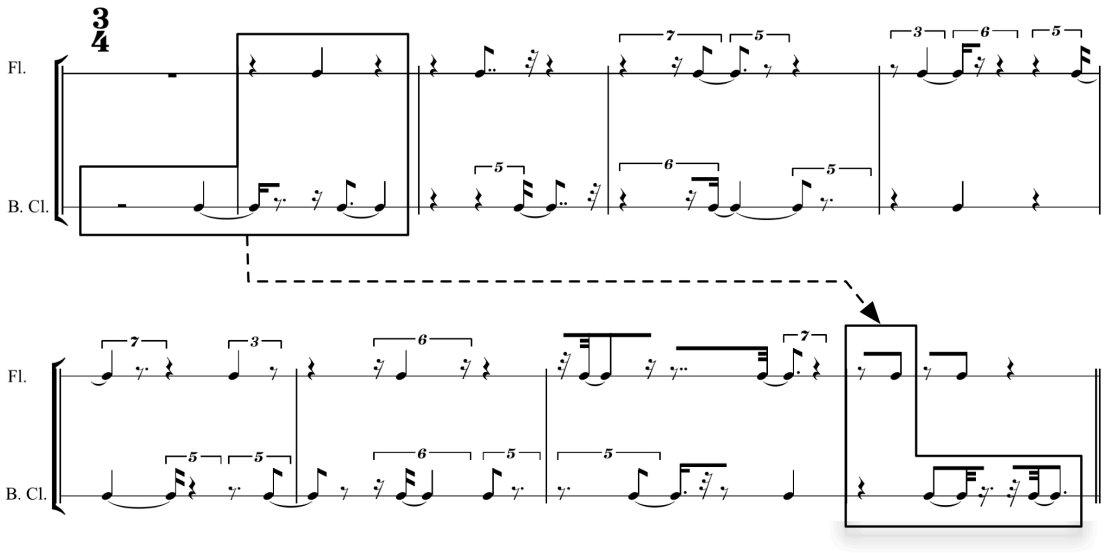


The contour extracted was used as a skeleton to construct the melodic part of the flute in bars 1-32. Various elements such as repeating pitches, glissandi and grace notes were used in combination with extended techniques to achieve an aesthetical balance between the formalised and the freely chosen and elaborated musical material. In addition, pitches C and Eb were used as 'chromatic satellites' of pitch D (first partial of the contour) to create an introduction passage in bars 1-10. Stopped notes, glissandi and palm clusters inside piano were used to create a general, atmospheric sonic canvas establishing the aesthetical direction of the work. Finally, the flute and

bass clarinet rhythmical material in bars 22-30 was based on the first, rhythmical interpolation. The rhythmic patterns extracted were use as sonic spaces against rests. I used those spaces in a free way to develop the several musical motives and shape the melodic lines of the flute and the bass clarinet, creating a smooth transition to the second part of the work.

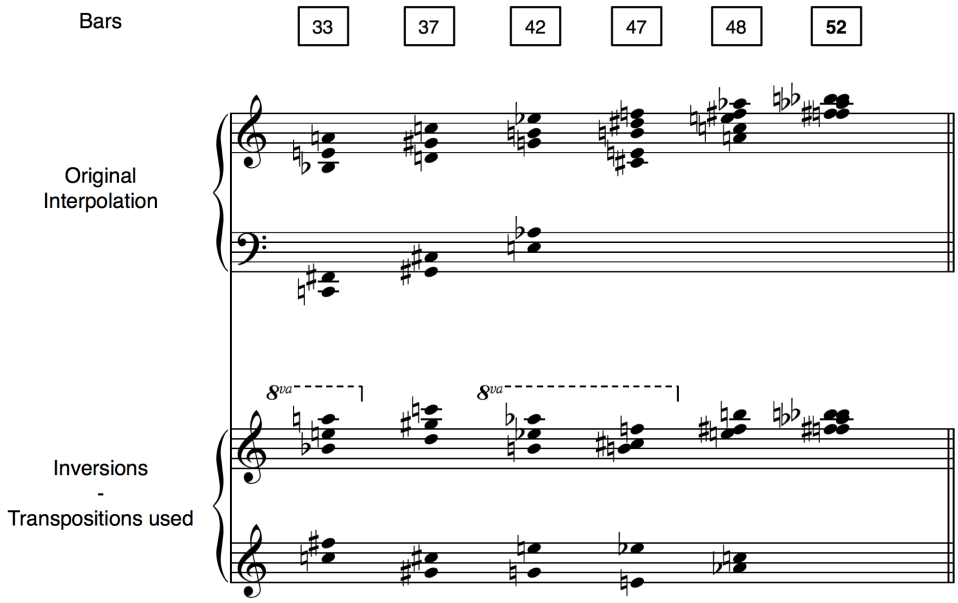


a4 - bars 17-19, melodic contour's partials 2-5

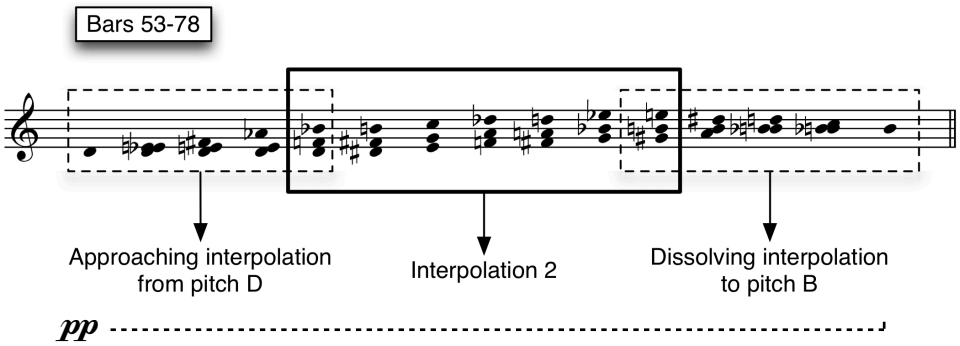


Rhythmical Interpolation by the flute and the bass clarinet in bars 22-30

In contrast to the first part, the second is focused on the chord sequences generated by interpolations two and three respectively. The first interpolation (rehearsal letter A) is based on two free chosen chords and the second (rehearsal letter B) is based on the two tonal chords included in the initial eight-note mode (Bb major and E major respectively). This interpolation coincides with the chromatic transposition of the B-flat major chord to the E major. Both the chord sequences are performed by the piano, the first one as accompaniment to the melodic line of the bass clarinet and the second one as an echo of several sforzandi performed by the flute, the bass clarinet and the percussion. As in Eteromorphia, the interpolation frequency results were rationalised to the nearest semitone.



Interpolation 2, inversions and transpositions used (bars 33-52)



Interpolation 3, tonal chords

The texture of this part was manipulated to create a gradual transformation, from contrapuntal (rehearsal letter A) to homophonic (rehearsal letter B) where the tension is totally released. The next free episode in bars 79-94 and the final part (A1, bars 95-122) bring back the contrapuntal texture of part A and create a technical recapitulation. In particular, a second contour was generated using the same graph with inverted dimensions. In addition, the pitch material occurred after inverting the intervals of the initial eight-note mode (every major second became minor second and vice versa). Apart from technical, the recapitulation of A1 can also be characterised as aesthetical. The return of ideas such as the piano's stopped notes, pizzicati and glissandi. recall the sonic atmosphere of A. Finally, the reversion to A gets more stable and substantial by the recapitulation of pitches C and Eb by the piano through stopped notes.

In summary, this work was an opportunity to explore the combination and the interaction of an eight-note folk mode with a simple spectral process (frequency and rhythm interpolation). The algorithmic techniques used were tied with compositional processes such as the melodic shaping and the harmonic manipulation, keeping a balance between the formalised and the free composed music material. The use of different algorithmic techniques lead to the creation of contrasting textures which interact with each other creating a three-part structure. Microtones were used more as a decorative material to the predominating chromatic environment of the whole work.

4.4 Concerto for Piccolo/Alto Flute and Chamber Orchestra (2008-2009)

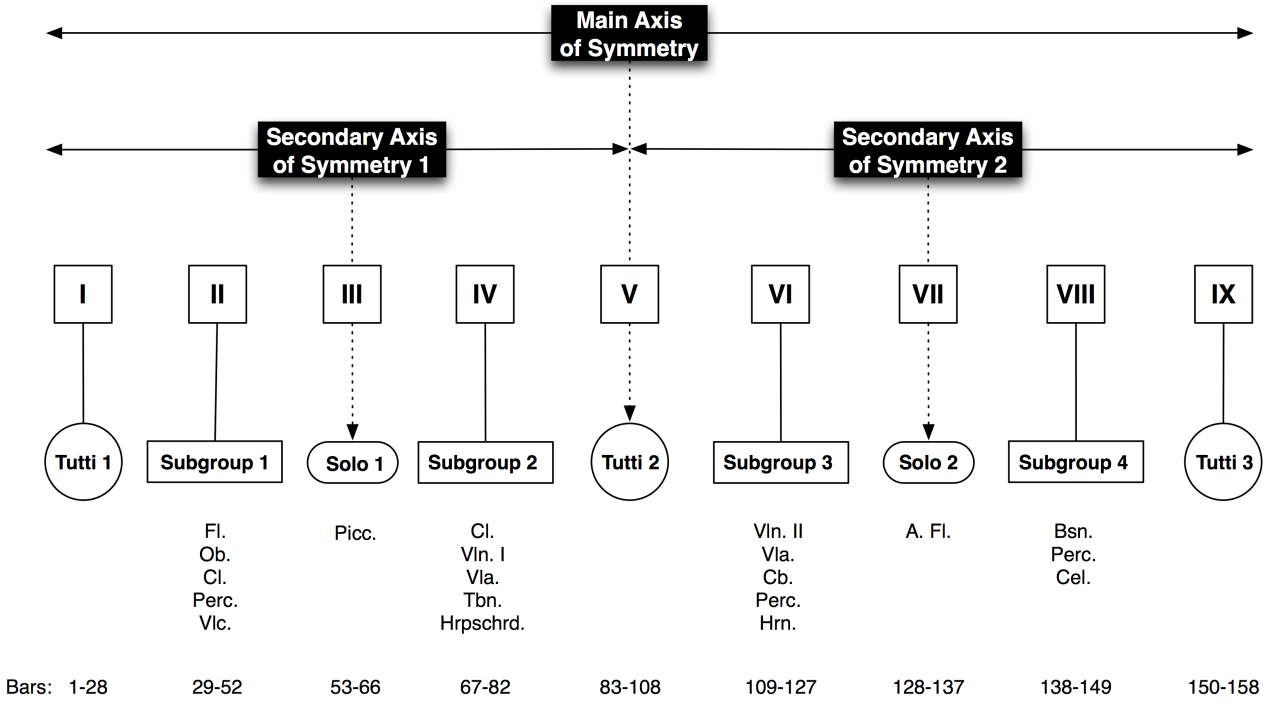
Duration: approximately 12 minutes

Instrumentation: Flute, Oboe, Clarinet in B Flat, Bassoon, Horn in F, Trumpet in C, Trombone, 2 Percussion players, Celesta (Doubling Harpsichord), Piccolo Solo (Doubling Alto Flute Solo), Violin I, Violin II, Viola, Violoncello, Contrabass.

Concerto for Piccolo/Alto Flute and chamber orchestra is a step towards deeper exploration of spectral music material and it is the first work in this folio which includes not decorative but functional microtonal pitch material. The primary idea was to create a spectral, concerto-form composition for the piccolo and the alto flute. The reason for choosing the combination of the piccolo and the alto flute was the idea of focusing on the extreme ends of the flute's range, which coincides with the middle (and most easily performable) ranges of the above instruments, creating a piece based on pure spectral material. However, although modal material is not directly introduced in this work, some sections (especially the second Cadenza) have been modally elaborated leading to the creation of a pseudo-modal environment, which also comes to the fore due to the secondary, decorative character of the various microtones.

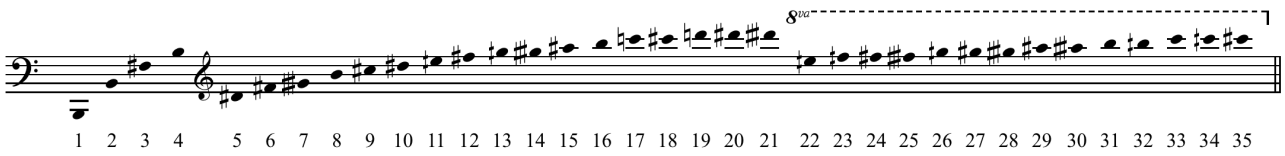
The basic compositional process comprises of a free elaboration of the spectral material to construct harmonic surfaces with multiple contrasting layers interacting with each other. The piccolo and alto flute act either as solo, dominating instruments or as equal members of the ensemble to enrich both the harmony and the timbre. Apart from the use of a solo instrument, the creation of orchestral contrast is another substantial characteristic of the Concerto. This goal was achieved by the alternation between tutti passages, solo cadenzas and smaller instrument sub-groups, leading to the creation of a structure divided into nine sections which includes various symmetries. The nine sections are placed on the timeline in a palindromic way and form a symmetrical structure, according to the orchestration and the compositional techniques applied to the basic musical ideas. The fifth section (Tutti 2) works as the main axis of the structure's

symmetry. In addition, the two cadenzas (third and seventh section respectively) work as secondary axes, forming two symmetrical smaller parts:

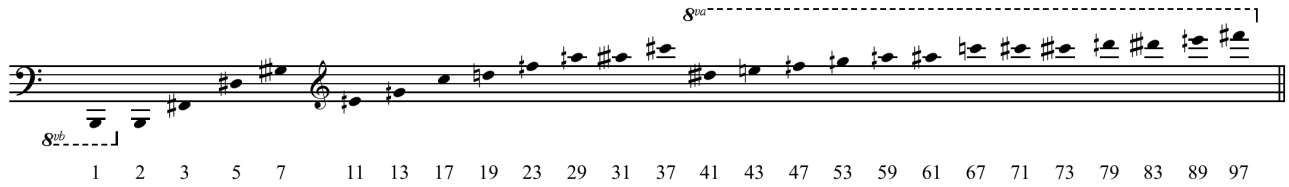


The main pitch material that this work is based on is a harmonic spectrum of the fundamental pitch B_1 and a filtered harmonic spectrum including only the prime number partials of the fundamental pitch B_0: with all the frequencies rationalised to the nearest quarter-tone.

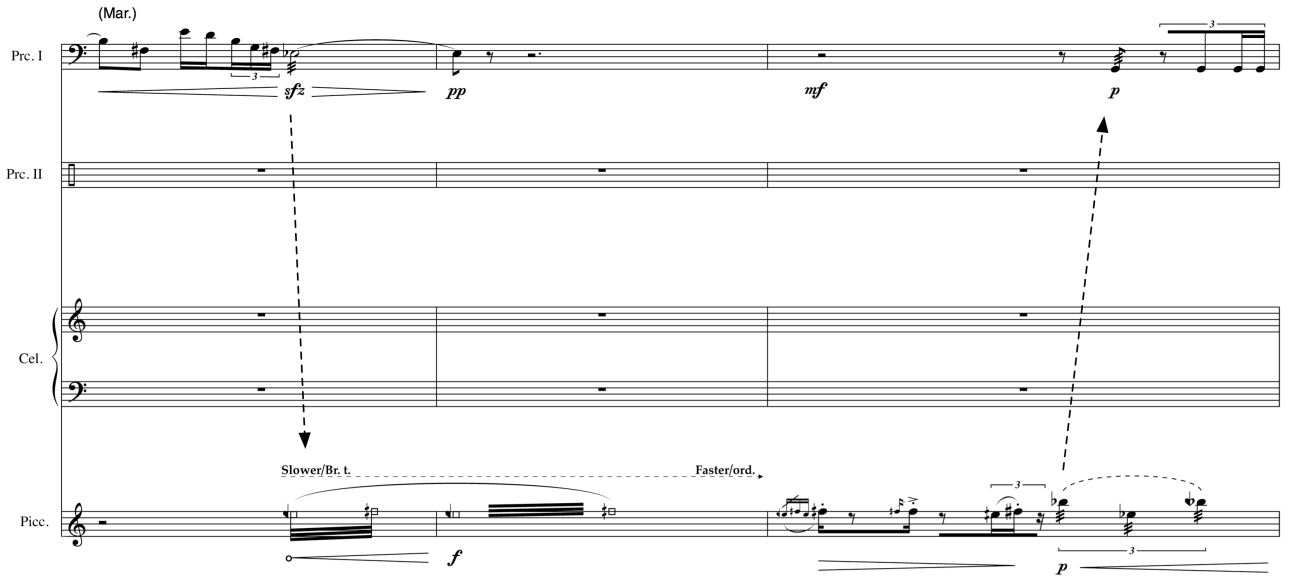
The two spectra were used either in combination or independently to form the harmonic process of the first and second sections (bars 1-52). Here, the piccolo acts as an equal member of the chamber orchestra and gradually develops a soloistic role which culminates at the first cadenza, in bars 53-66. During the second section (bars 29-52) the soloistic role of the piccolo is gradually developed through an interactive dialogue with the bass marimba.



First 37 partials of pitch B_1 harmonic spectrum

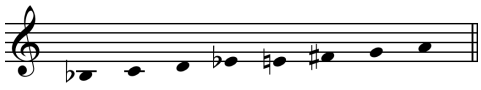


First 26 prime-number partials of pitch B_0 harmonic spectrum

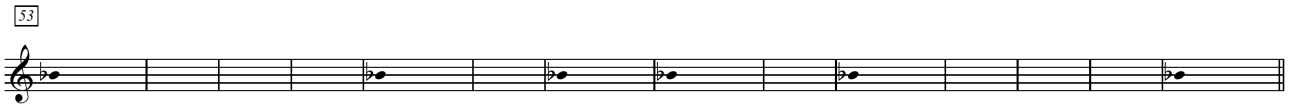


Piccolo: Gradually expanded soloistic role through dialogue with the bass marimba (bars 40-43)

The first cadenza (bars 53-66) is based on pitch Bb, which was used as a fundamental frequency for the extraction of the two primary harmonic spectra mentioned above. The pitch material is based on an eight-note mode which is enriched with complementary external pitches and microtones from the two spectra. Extended techniques such as jet tones, pitch bending and alternative ways of articulation enrich the timbral palette and underline the virtuosic character of the cadenza. Pitch Bb appears in the Cadenza in a way that forms a symmetrical melodic line.

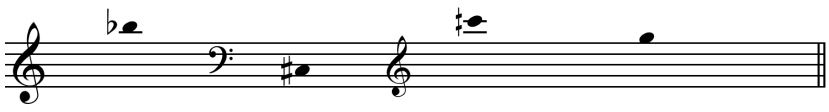


Cadenza's eight note mode

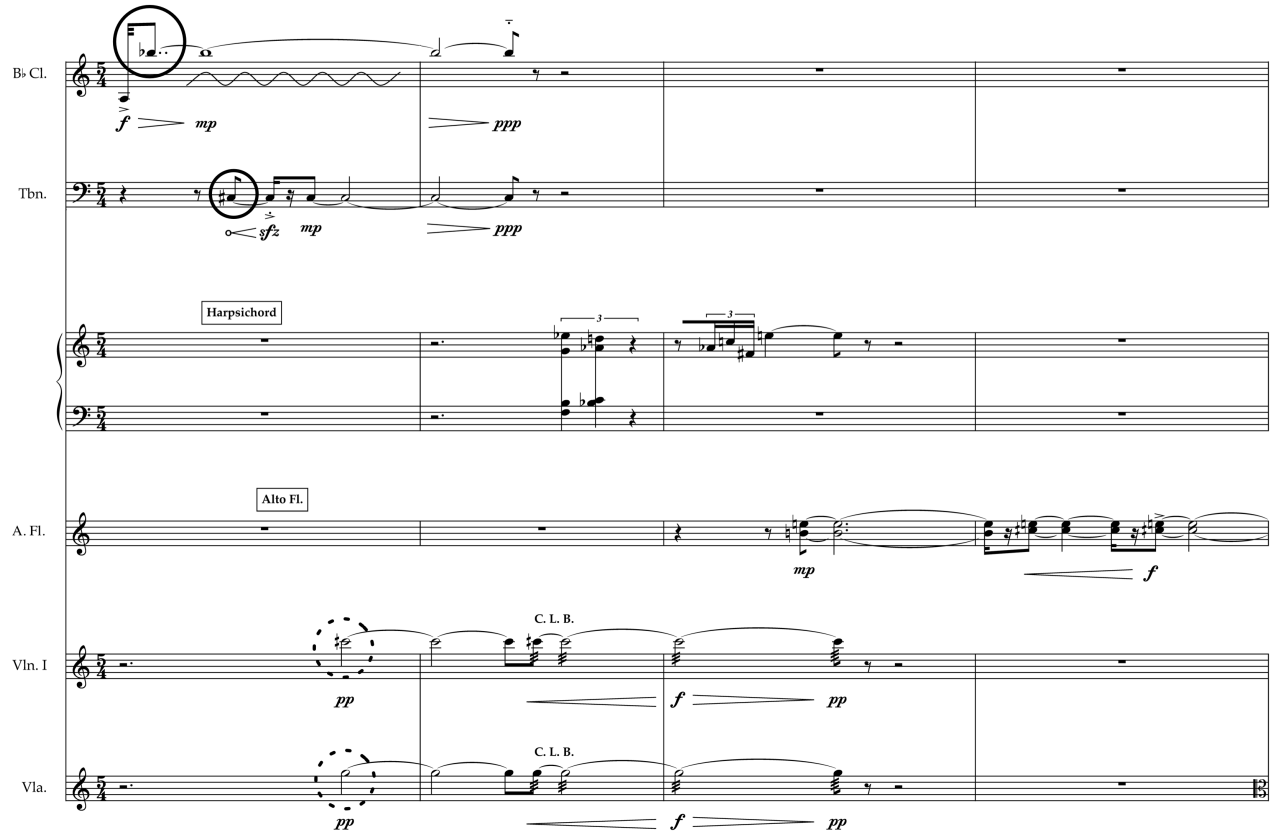


Cadenza: placement of pitch Bb

The elaboration consists of sections four, five and six (bars 67-82, 83-108 and 109-127 respectively) and includes harmonic and rhythmical development of the primary material of sections one, two and three. My main tools were the frequency modulation mathematical formula (section four), the frequency interpolation and an algorithm which transcribes arithmetic series to rhythmical patterns. The mathematical formula of frequency modulation is based on two frequencies (one fundamental and one carrier) and gives the sum and the subtraction of the two frequencies in absolute value. All of the results of the frequency modulation process have been rationalised to the nearest quarter tone. This method was applied to the fourth section to produce some four part chords based on fundamentals and carriers from the harmonic spectra which form the harmonic background for the development of several gestures and timbres. On a secondary layer, the alto flute performs a free imitation of the frequency modulation technique by several multiphonics interacting with the gestures performed by the harpsichord. The figures below illustrate the frequency modulation process in bars 67-70 and respective passage from the score, including also the interaction between the alto flute and the harpsichord:



Fundamental	Carrier	Sum	Difference
~932.33 Hz	~138.59 Hz	~1070.92 Hz	~|793.74| Hz



The second level of elaboration focuses on the rhythmical element and explores the algorithmic transcription of the position of common partials between two harmonic spectra into rhythmical values. In particular, the common partials {1, 23, 26, 29, 30, 34 36} from the first spectrum and partials {2, 14, 16, 17, 18, 19, 20, 21} from the second are used. Subtracting the second group from the first, a new arithmetic series was generated. After inserting it into an algorithm created in OpenMusic software, numbers were converted to rhythmical values and rests were randomly added, creating a rhythm tree. This experiment was carried out many times until the rhythm was satisfactorily organised. I used these rhythmical sequences to create a textural contrast to the harmonic character of the previous section and to expand the harmonic ideas of the work to a pointilistic and some times granular texture.

Part six (bars 109-127) flags the point where the harmonic texture reappears. In this particular section, I chose not to use many microtones in order to achieve a smooth transition from the spectral character to modal, leading the work to its second cadenza (bars 128-137). Here,

ideas from the first cadenza (jet tones, tremoli, bending etc) reappear performed by the alto flute at the low register.

The eighth section (bars 138-149) recapitulates the idea of section five. The same arithmetic series was used to generate another rhythmical tree. However, unlike section five, in section eight, silence instead of sound is the organised element, creating a sort of 'rhythmical negative' version of the fifth part's texture that sounds as an 'echo' of what was previously presented. The work ends with section nine returning to the textural point the concerto began from. Pitch material from both spectra is used in bars 150-158 while some timbral ideas, such as the bass drum scraping, return. The soloistic character of the piccolo is minimised, performing just short motives, such as microtonal gestures, multiphonics and breath tones and other material from several previous parts.

To summarise, this work elaborated the idea of working at extreme ends of the C Flute's range substituting that instrument with piccolo and alto flute, and building a concerto-form composition based on two harmonic series. Furthermore, the alternation between tutti, soli and grouped instruments, was the basic idea of the structure, with solo piccolo or solo alto flute either working as the dominant instrument or being an equal member of the chamber orchestra. The two harmonic series were transformed into four-part chords, rhythm-trees or were freely manipulated to create modal environments. All of these points of the compositional process of this work form a structure that incorporates various kinds of symmetries according to pitches, harmony, texture, rhythm and orchestration.

4.5 Tu Solus I-IV (2009-2010)

I - For Tenor Recorder

II - For Timpani

III - For Flute

IV - For Mandolin

Tu Solus is a cycle of works where the focus of my research moves towards a soloistic approach. The Latin title means *'You Alone'* and refers to the variety of timbres, tensions and contrasts that can be produced by a single instrument. The four works included in this folio demonstrate four different methods of spectral music material organisation and elaboration:

1) Tu Solus I (tenor recorder): Harmonic series combined with a folk mode
2) Tu Solus II (timpani): Transformation of a distorted harmonic spectrum to rhythmical values
3) Tu Solus III (flute) Modal material combined with spectral capabilities of flute
4) Tu Solus IV (mandolin) Microtonal material based on several string ratios

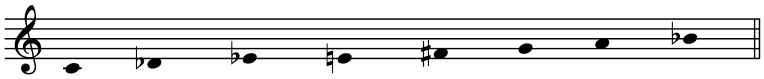
4.5.1 Tu Solus I - For Tenor Recorder Duration: approximately 6 minutes

Tu Solus I was composed during the third year of my studies. The inspiration for composing a work for solo recorder came from two different sources. The first was the techniques that Greek traditional players apply to their flute-family instruments such as *flogera*, *suravli* and *nay*. The second was a seminar by recorder player *Christopher Orton* that took place at the University of York in 2009[1], in which he discussed the aesthetic directions that composers of the 20th and 21st century followed in composing new works for the instrument. Having studied contemporary flute

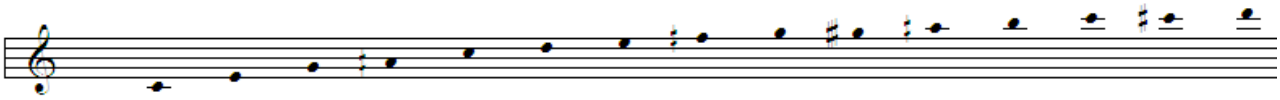
[1] March 17th, University of York Workshop/recital.

techniques for more than ten years, I was very interested in identifying timbres and techniques that are unavailable to the flute, but can be produced effectively by the recorder, making this instrument special and unique.

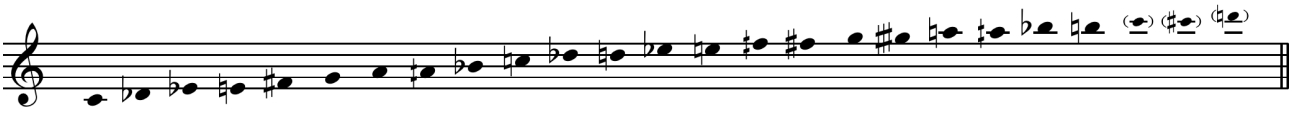
The pitch material of this work is based on the combination of an eight-note mode and part of a harmonic series. The eight-note mode notated below is combined with a part of the harmonic series of pitch C_2 (partials 4-18), resulting in a new, two octave, microtonal mode:



The eight-note mode

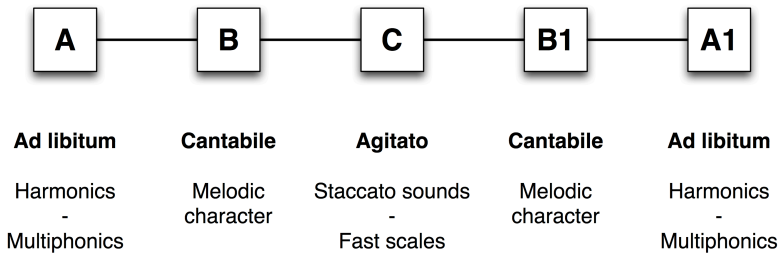


Harmonic series of pitch C2 (Partials 4-18)

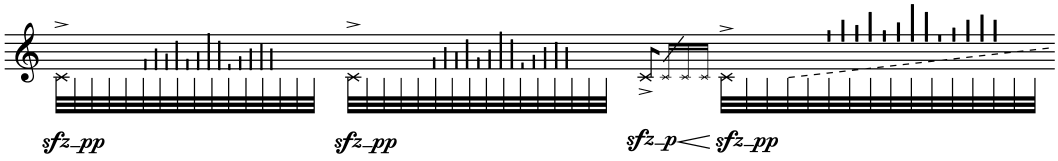


Combination of mode and harmonic series

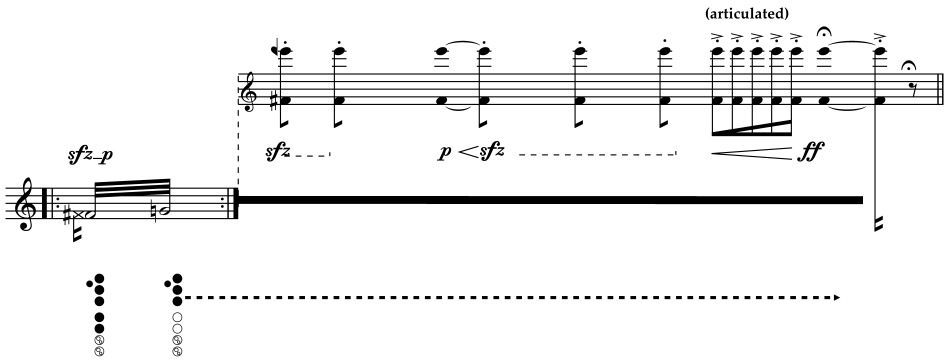
Covering almost the whole range of the instrument, the two-octave mode is used as the main pitch material for this work without any notable changes, except for some external pitches used for decorative reasons. Morphologically, the work can be considered as a circular structure A-B-C-A1 . Each section characterised by different timbre and points of tension. In particular, the two-octave mode was used as a canvas on which the four distinct sections are placed and developed creating a circular form:



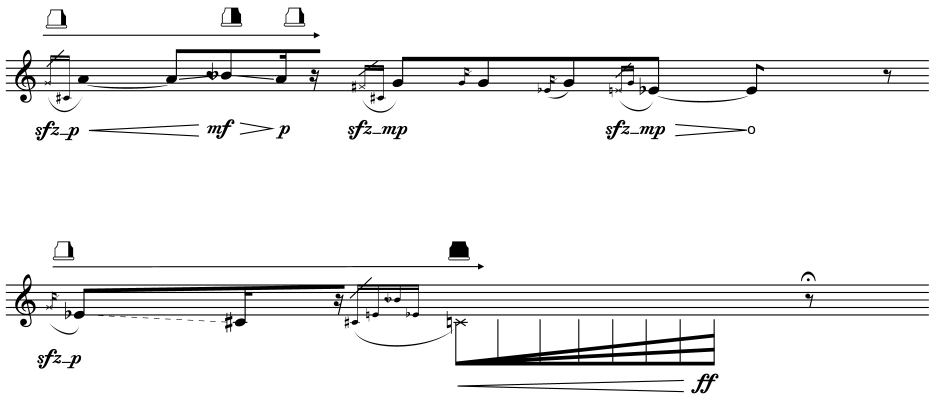
Several extended techniques were developed after continuous experimentation with the instrument, in order to construct the basic melodic and harmonic plan of the work. The various timbres were placed on multiple timbral layers to create a polyphonic texture in contrast to other monophonic cantabile sections. Such techniques include very fast articulated repeating pitches which create a suspended harmonic spectrum, as well as multiphonics, which enforce the polyphonic texture. Most of these multiphonics include pitches from the 2-octave mode and can be performed with the same quality as the other ordinary pitches. The dynamic range of this work has been timbrally enriched by using different headjoint positions. In several sections of the work the performer is asked to place only half of the headjoint in the mouth or even less, contributing to the timbral differentiation of the sound.



Fast repeated pitches creating a suspended, harmonic spectrum



Multiphonics and polyphonic texture



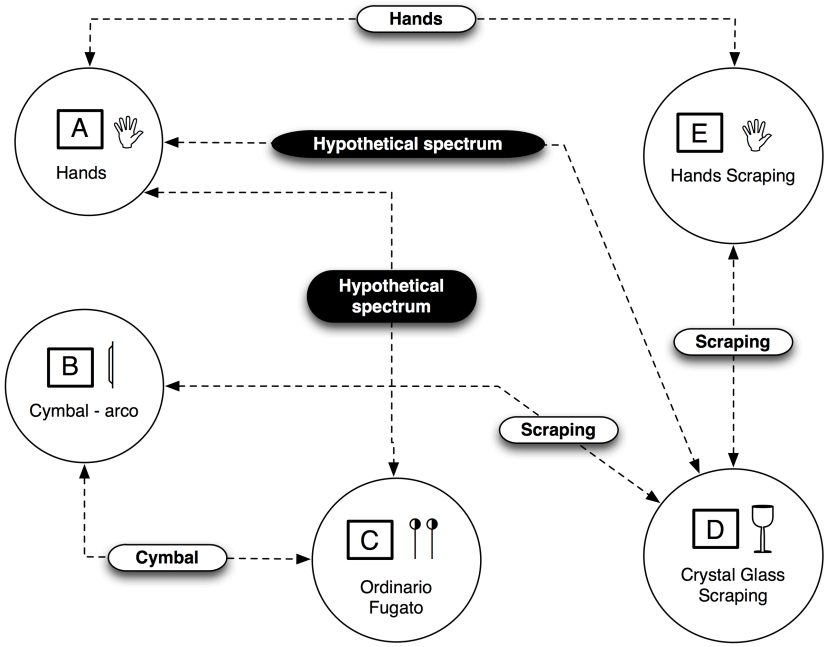
Various headjoint positions

4.5.2 Tu Solus II for Timpani Duration: approximately 5-6 minutes

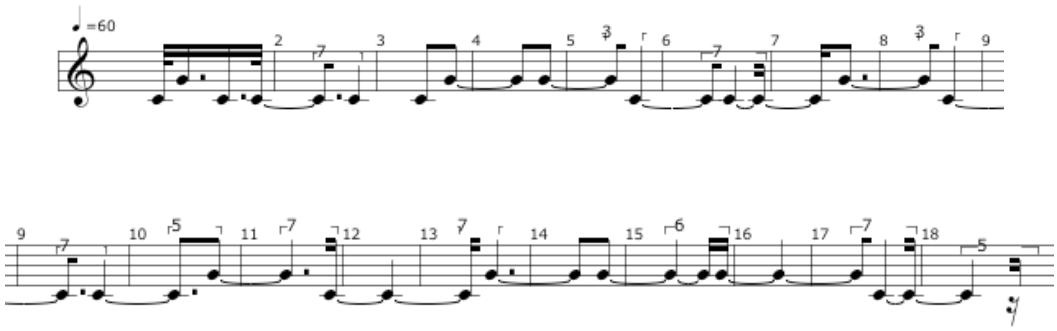
Tu Solus II was composed to a commission by percussionist *Eleni Kamvysidi* for a performance at the Ionian University of Corfu, in Greece, and is dedicated to the memory of Greek percussionist *Dimitris Papadimitriou*. The central process employed in this work was the transformation of a hypothetical distorted harmonic spectrum into rhythmical patterns. These were combined with various kinds of other spectra and groups of harmonics, produced by placing items such as a cymbal or a crystal glass on the timpani's membrane. Rhythm and timbre are the dominant music material for Tu Solus II; hence, the four timpani's pitches do not change except for small ornamentations. The structure of the work consists of five sections which are linked through relative timbres or rhythmic material. There are five timbral cores that are used, each dominating a different part of the work while the others occasionally intervene:

- playing with hands directly on Timpani both at the centre and the rims
- bowing a cymbal placed upside down on the B timpano
- ordinary playing with medium-hard mallets
- scraping the timpani's membrane with a medium size crystal glass
- scraping with hands

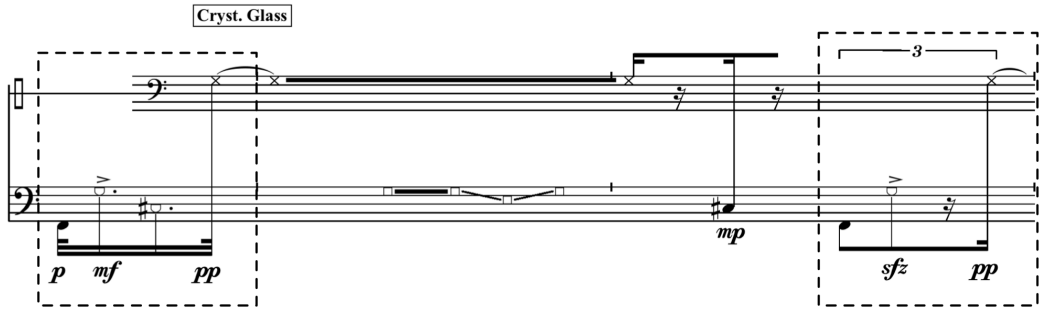
The diagram below illustrates a structural overview of Tu Solus II according to the five timbral cores and several links between them such as common musical material or playing techniques:



As mentioned above, the rhythmic values of the first section were extracted from a hypothetical distorted harmonic spectrum. In particular, the distorted partials sequence {1, 1.4, 1.7, 2...4.4} was used instead of the non distorted sequence of partials {1, 2, 3, 4...20}, and was then transcribed to rhythmic durations. The rhythmic motives were timbrally variated by playing with hands and striking either the centre or the rim of the instrument, a technique borrowed from non western membranophone instruments such as the *darabuka* and the *bedir*. This material was used to construct the first section of the work. In addition many fragments of section A were occasionally used to create contrast with other sections (for example section B) where timbre is the dominating parameter.



Hypothetical Distorted Harmonic spectrum transcribed to rhythmic durations.
Pitch C=Hits at the centre, Pitch G=Hits on the rim of each timpano



Intervening rhythmical material of the spectrum (section A) to a timbre-based section (D)

The timbre passes from hand strikes to metallic sounds (cymbal on B timpano) and reaches the ordinary timpani sound at the third section. After that timbre returns to the initial point (hands) through a section performed with a crystal glass rubbing the timpani's membrane (a distant echo of the metallic sounds of section B). This structure produces a palindromic organisation of the main timbral ideas:

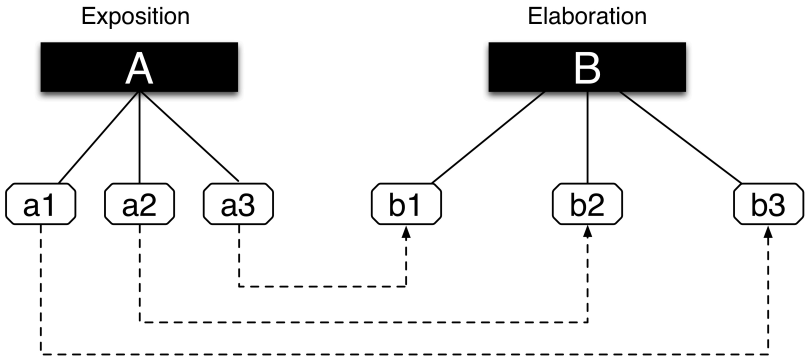
Several timbral ideas were used to construct different layers, enforcing the polyphonic texture of the work. In particular, after the first section, the polyphony is developed by additional lines, which form different layers of polyphony. My aim was to create a gradually developing polyphonic atmosphere which leads to a peak at contrapuntal section C (Fugato), where the tension of the work reaches its highest point. Finally, in sections D and E both the tension is gradually being released and the texture is dissolved first to the sound of the crystal glass rubbing the timpani's membrane and second to the sound of the membrane being scraped with hands. Section E provides a complete dematerialisation of the rhythm, gradually dissolving into the abstract sound of hand scraping.

4.5.3 Tu Solus III for Flute Duration: approximately 8 minutes

My continuous research on the contemporary flute could not allow a solo flute work to be absent from this folio. Tu Solus III was composed during the summer of 2010 for a postgraduate composition students showcase which took place at the University of York in October of the same year. The goal of this work is the exploration of the interaction between the flute's spectral capabilities and freely-organised modal material. An open tube like the flute allows a number of techniques to be applied in order to produce sounds based on harmonic and non harmonic spectra. These techniques include various kinds of multiphonics, natural harmonics, overtones and whistle-tones. The spectral atmosphere of this work was not placed in the foreground but was hidden behind the freely composed modal gestures and arises through the use of the extended techniques described above.

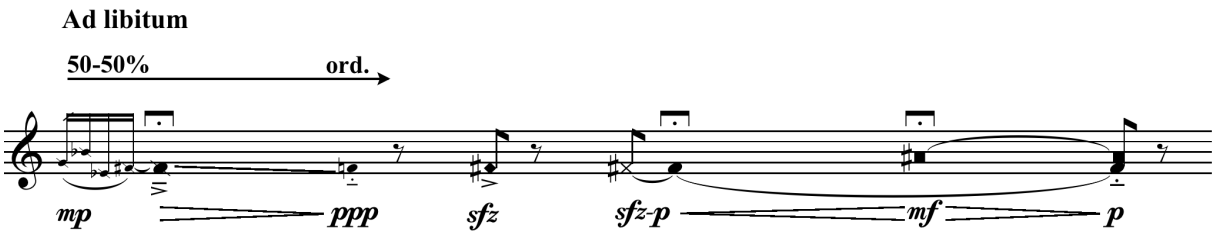
Structurally, the work is formed in two main parts, including elements of both symmetry and asymmetry at the same time. The first part (marked with letter A) is an exposition of the musical ideas that are going to be elaborated during the next part (marked with letter B). Both the

first and the second part are divided into three smaller sections (a1, a2, a3 and b1, b2, b3). Each section of part B is an elaboration of a respective section of part A, creating a symmetrical structure. The figure below shows the links between the different sections:

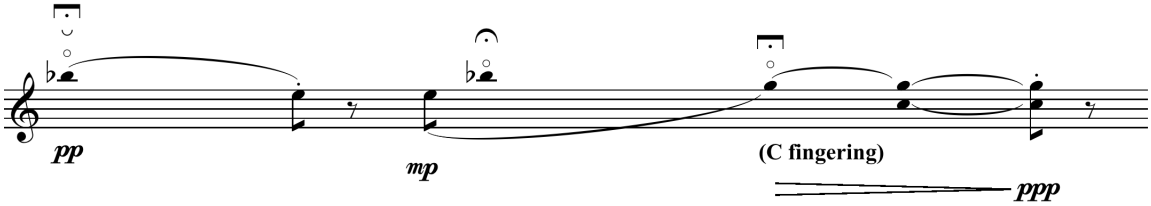


The asymmetry is due to the different durations of the two main parts. The exposition part (A) covers only the first page of the score while the elaboration part (B), consists of the remaining pages. Each of the three sections of Part A corresponds to a different timbral category, and appears in reverse order during the development of part B:

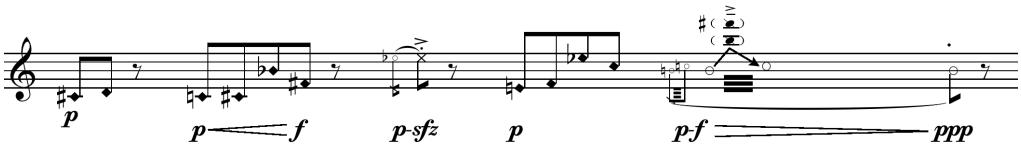
a1: Breathy - aeolian sounds



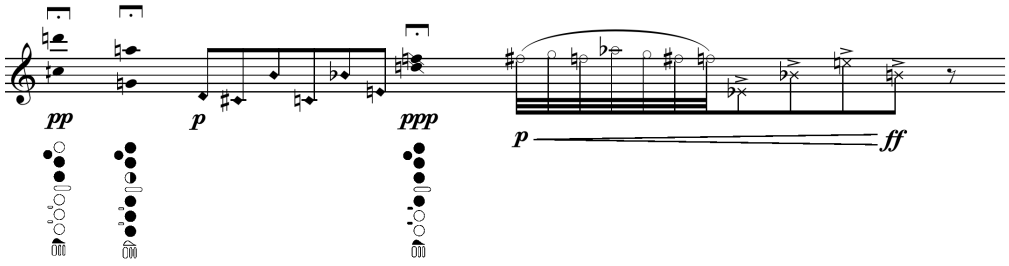
a2: Harmonics (distant sounds) together with the ordinary flute sound



a3: Percussive sounds (pizzicati - jet tones)



Timbral organisation is a vital part of Tu Solus III. The interaction of several non relative timbres such as pizzicati and breath tones often create tensive dialogues between the several registers of the flute and therefore create a polyphonic texture, which leads to various dynamic peaks. I used the colour of the various extended techniques to modulate the tension of the musical argument and create both coarse-textured and smooth-distant passages. That textural contrast produced by the interaction of the several colours was used either to bring the pitch material to the foreground or transform it to distant mysterious sounds. A characteristic example could be the harmonic development of several chord sequences constructed by multiphonics. During that development the chordal material usually interacts with percussive sounds to create a dialogue:

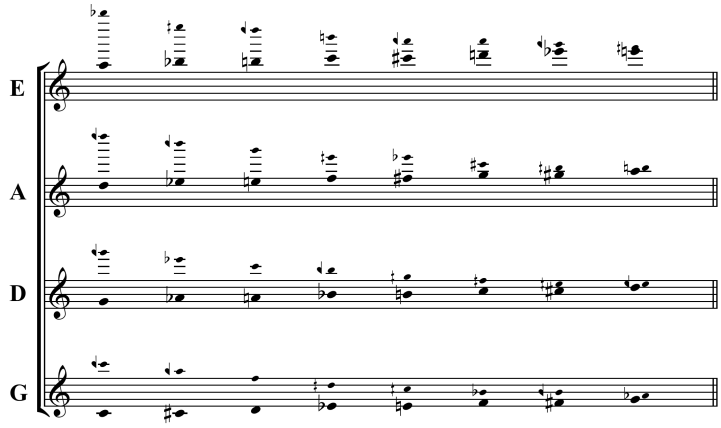


Although there is a distinct correspondence between the musical ideas and the sections of the two main parts, elements of all sections are occasionally used (in their original or variated form) throughout the work, interacting with each other and creating different layers. For example, in section b1, where the percussive material is developed, another layer of multiphonics, corresponding to the harmonic material of a2 is developed on a secondary layer. This technique is very common among the works in this folio and is used to create homogeneity within the musical structure, preventing the work from becoming fragmented.

4.5.4 Tu Solus IV for Mandolin Duration: approximately 6 minutes

The idea of composing a work for mandolin arose from the position that this instrument has within Greek folk music. During the Venetian Rule (1207-1580) the mandolin was introduced and incorporated into the traditional music of Crete and the Ionian islands along with appropriate changes of playing techniques in order to better adapt to the Greek culture. The Cretan mandolin technique is characterised by gestures formed more by separate, detached pitches, rather than tremolo which appears to be the usual technique for the instrument. This is the main aesthetic direction which this work follows, in combination with several extended playing techniques.

Tu Solus IV explores the elaboration of the chromatic scale according to the physical properties of the strings on which each pitch is performed. In particular, every fret of the instrument can produce two different pitches; the ordinary and an additional one plucked behind the left finger. Consequently, another group of pitches is produced. This idea was based on Pythagoras' monochord (300 BC), the instrument which explores the various pitch ratios of a single string. The figure below shows approximately which pitches are produced on each string (both the ordinary and the additional), beginning from the mandolin's fifth fret:



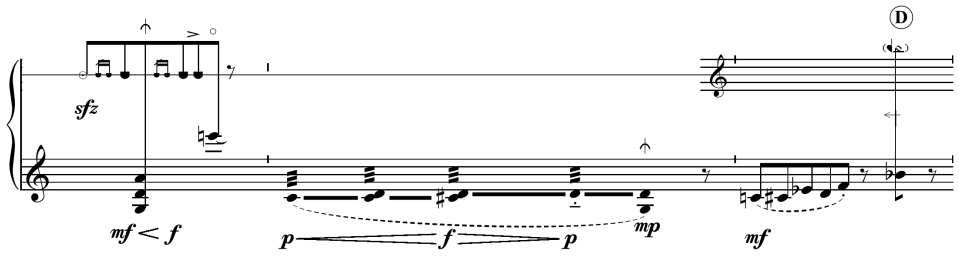
As the work is being developed, these two different pitch groups interact with each other creating two contrasting lines: one chromatic/pseudo-modal and the other distant/microtonal. In several bars of the work the microtonal line functions as a distant echo of the modal motives.

The timbral material used for this work can also be categorised into four groups. Each group constitutes a different layer forming the sound palette of this work. The several contrasting layers interact with each other and create a single structure without any additional subdivisions.

Short sounds	Suspended sounds	Microtonal material	Percussive sounds
ordinary plucking	tremolo	pitches behind left hand	striking the body of the instrument
	scraping on strings with fingers	pitches behind bottom bridge	tail-piece pizzicato
		high pitches between the tuning keys and the first fret	

Tu Solus IV - Timbral categories and extended techniques used.

The elaboration of these ideas infuses the work with a narrative character which includes several developing sound events, such as mysterious suspended sounds, modal cantabile gestures, percussive sounds, energetic chords and distant echoes. The figure below presents a typical passage where different layers appear, forming a developing narration:

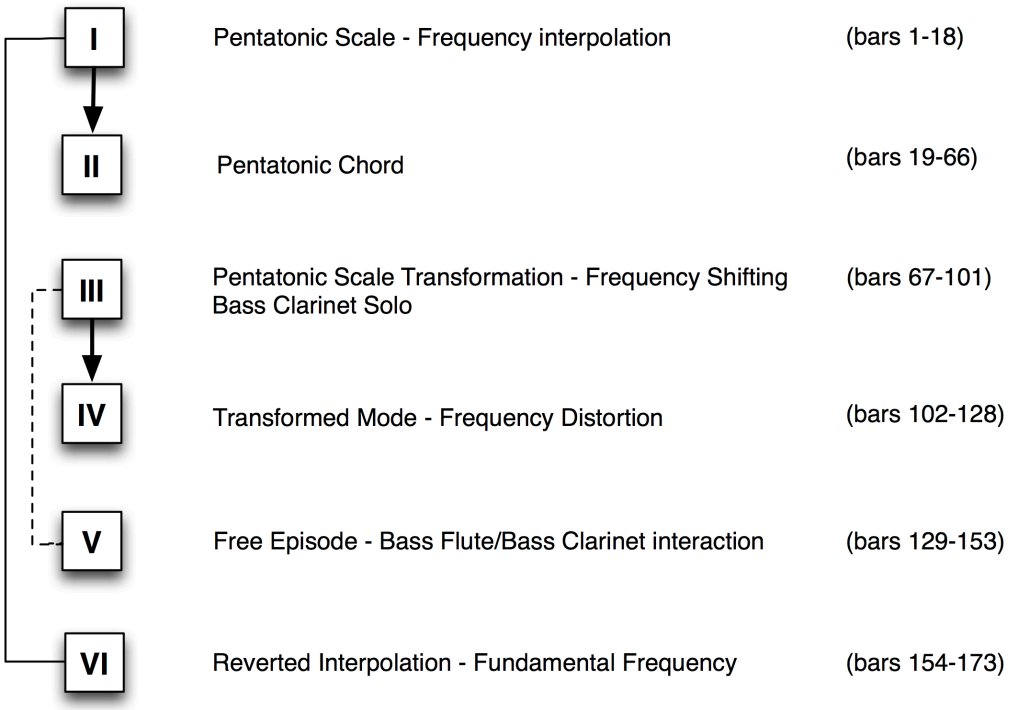


In summary, Tu Solus is an open cycle of Solo works which explores the spectral capabilities of instruments combined with extended techniques. It is a continuous research project, focused on extending the potential of a solo instrument through several kinds of modal and spectral ideas, such as the combination of modes and harmonic series, groups of harmonics arising from extended playing techniques, or the physical properties and pitch ratios of strings.

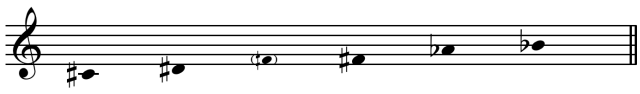
4.6 Octaphonia (2009) Duration: approximately 10 minutes

Instrumentation: Flute (Doubling Piccolo and Bass Flute), Clarinet in B Flat (Doubling Bass Clarinet), Piano, VIolin I, Violin II, Viola, VIoloncello, Contrabass

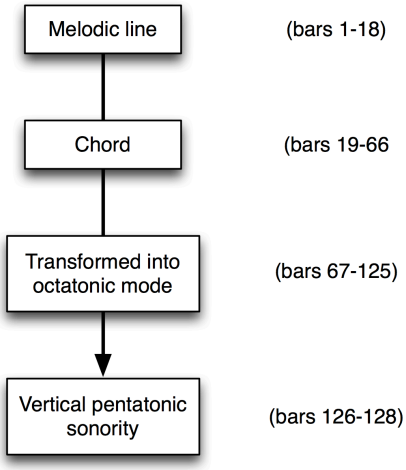
Octaphonia was composed during the third year of my studies to a commission from the *Greek Composers Union*, and is dedicated to the memory of *Lukas Foss*. The work, after its first performance in Athens in December 2010, was partly revised during the summer of the same year. The tittle comes from the Greek word '*Οκταφωνία'* (eight voices) and refers to the instrumentation of the work. The basic musical idea is a parallel and equivalent elaboration of both a modal and a spectral sonic environment. This goal was achieved through a developing structure, divided into six sections. During each section, the elaboration and development of music material is almost simultaneous for the two different sonic categories. The individual sections are linked together either by common material (sections I-VI and III-V) or by the fact that one section aesthetically derives from another (section I-II and III-IV).



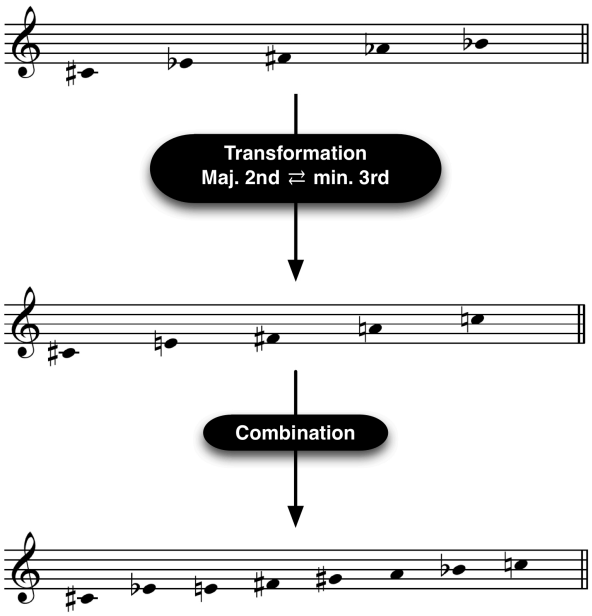
Initially, the primary pitch material is a five-note mode which can be found within various musical traditions worldwide, including the Greek traditional music of Epirus. Another point of inspiration was the occasional approximate quarter-tone lowering of the pitch F#, which usually appears in downwards gestures:



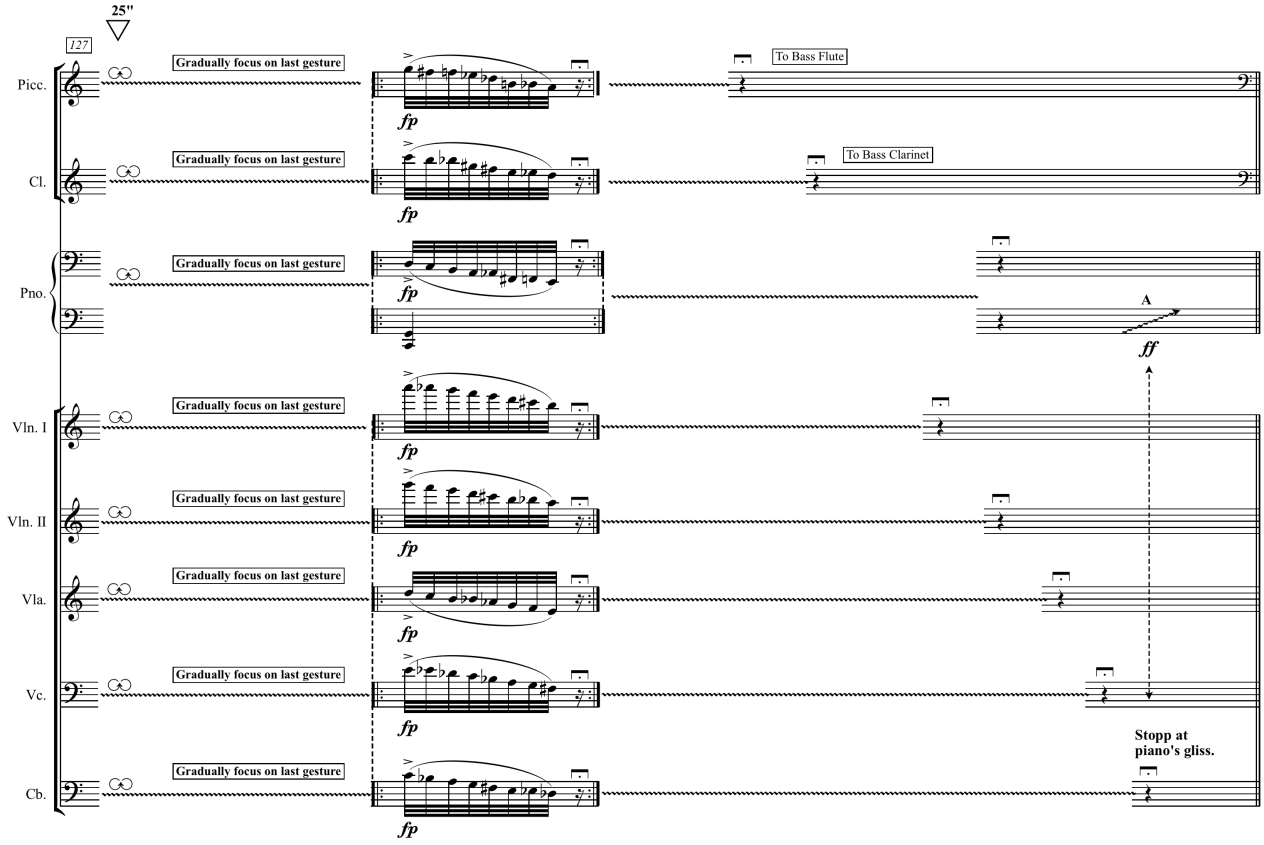
The pentatonic scale constitutes the basic pitch material for the work and it is developed on various levels appearing in various forms such as melodic lines, chords or transformed into other modes inverting the intervalic ratios. The elaboration of this primary material produces contrasting textures which control and modulate the tension of the work. The figure below illustrate the forms and the development of the pentatonic material along with Octaphonia's timeline:



During the second section (bars 19-66) the pentatonic mode (including the F quarter sharp) appears in a chordal form, as found in the harmonic series of pitch $C\#_1$ without octave duplications. In bars 67-125 the pentatonic scale was transformed to an octatonic mode by inverting the pentatonic scale's intervals and combining the two pitch groups. In addition, in bars 126-128 (rehearsal letter D) the accented pitches of each downwards gesture creates a vertical pentatonic sonority.

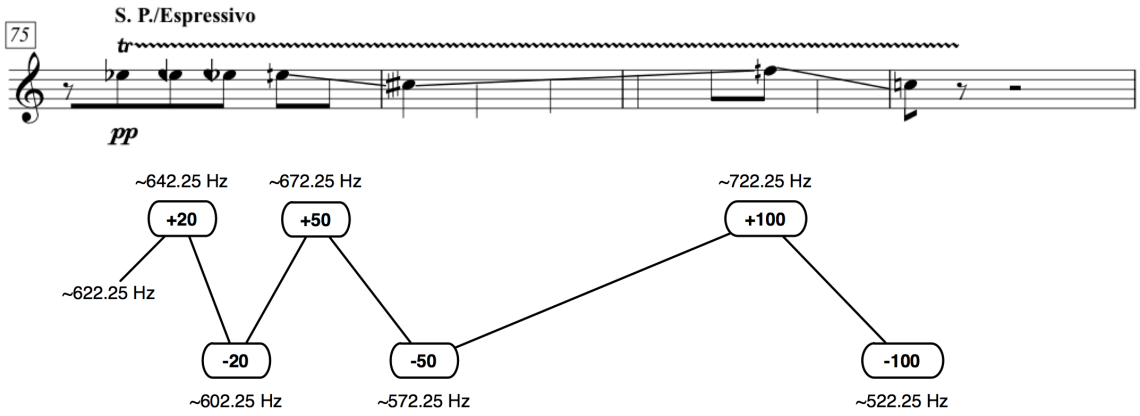


Section III: Transformation of pentatonic scale into octatonic

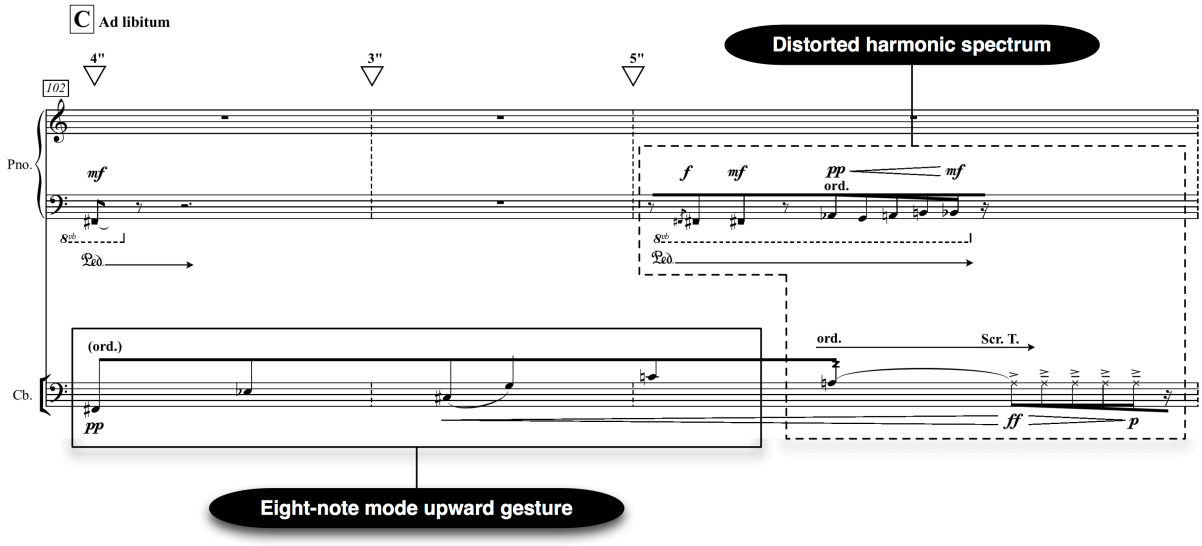


Bars 127-128: Vertical pentatonic sonority by accented pitches

The spectral material is developed through a separate, parallel trajectory forming the harmonic plan of Octaphonia. The main techniques used are frequency interpolation (gradually expanding chord sequence of sections I and VI) and frequency distortion (chords constructed by several distorted spectra in section IV) as they were presented in *Eteromorphia* and *a4*. In addition, the frequency shifting technique was used to construct the trilling glissandi texture of section II. Here, 20, 50 and 100 Herz were added and subtracted consecutively to a single pitch to produce its palindromic expansion. Although the strings' layer seems to be quite contrapuntal, the sound result is a moving cluster-chord, which sounds almost homophonic and accompanies the melodic line performed by the bass clarinet.



Violin I, bars 75-78: Frequency shifting technique



Bars 102-104: Interaction between the transformed eight-mote mode and distorted spectrum

The technique of controlled improvisation is an essential tool in the development of the texture during sections III and IV (bars 67-128). The performer is asked to improvise performing the pitch and rhythm material notated in any order. This technique starts from free key slap gestures by the flute in bar 73 and is gradually developed through free upwards gestures to reach the completely improvised section in bars 126-128, which allows free gestures, rhythms and dynamics. During those bars the texture reaches its most compact form.

Bar 129 flags the point of recapitulation of the trilling glissando idea. The melodic line of the bass clarinet in bars 67-101 reappears supported by the bass flute. This interaction on the low woodwind register contributes to the recapitulative character of this passage and diminishes the tension. Several timbral ideas return, such as the flute's breath tones, the contrabass' sea-gull effect, and the piano's stopped notes. The pentatonic chord reappears in bar 157 as the starting point of a last interpolation leading to pitch $C\#_4$, the starting point of the work.

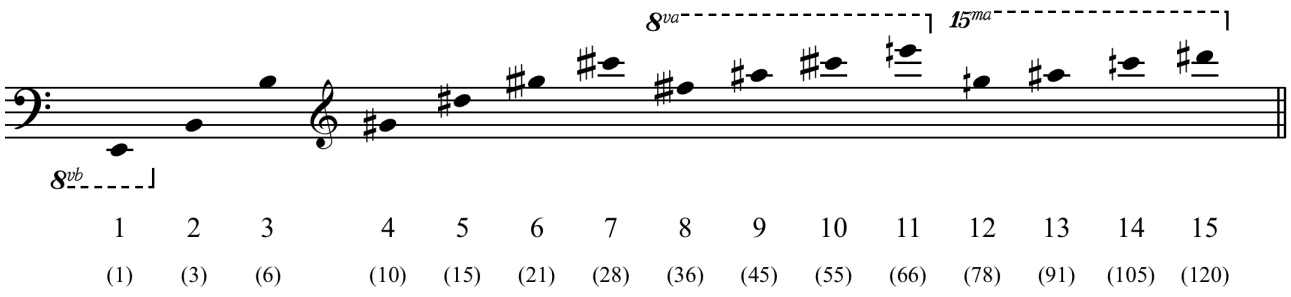
In summary, Octaphonia explores the parallel development of two pitch categories, the modal and the spectral. The main idea on which this work focuses is the way that a mode exists within a harmonic series and the extraction of a new mode by inverting the intervallic ratios. In addition, this work explores several ways that these primary ideas can be developed through Frequency Interpolation and Frequency Shifting techniques. The two different pitch categories are developed simultaneously either by independent or by common compositional techniques creating contrasting textures characterised by various interacting layers. Finally, controlled improvisation was used in order to achieve more complex textural surfaces.

4.7 Echosymplokon (2009-2010) Duration: approximately 10 minutes

Orchestration: Symphony Orchestra (3 fl., 3 ob., 3 cl., 3 fg., 4 hrn., 3 tpt., 3 tbn., 1 tba., 1 timp., 2 perc., full strings)

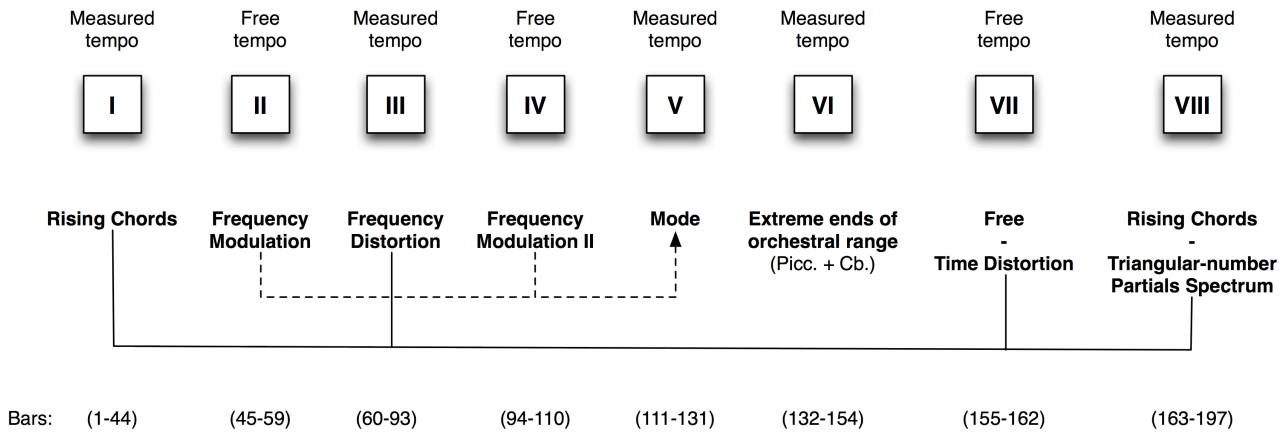
Echosymplokon was composed during the final year of my studies and is the work for the largest ensemble in this folio. The title means sound complexity and is based on the Greek words *ήχος* (=sound) and *συμπλοκή* (complexity or conflict) referring to the contrasting textural ideas and the interacting technical methods used to form the harmonic and timbral plan. Echosymplokon is a further development of ideas discussed in works *Octaphonia* and *Concerto for Piccolo/Alto Flute and Chamber Orchestra,* and explores the development of various harmonic surfaces.

The primary idea for the pitch material of Echosymplokon was the filtering of a harmonic spectrum using an arithmetic series. I used the arithmetic sequence of the triangular numbers[2] both to extract a filtered harmonic spectrum and to set some compositional algorithmic principles which form the harmonic and rhythmical element and transform the spectral material into modal material. The figure below shows the first fifteen partials from the filtered triangular number harmonic spectrum of fundamental pitch E_1. The numbers inside the parenthesises indicate the partial number from the original harmonic series:

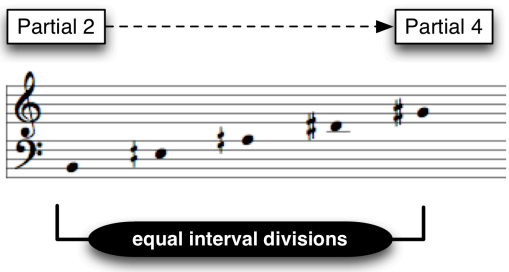


[2] A triangular number is defined as a number of dots in an equilateral triangle evenly filled with dots. The sequence of the triangular numbers comes from a natural number plus every previous number of the sequence (e. g. the first triangular number is: $F_{(1)}=1+0=1$, the second $F_{(2)}=2+1=3$, the third: $F_{(3)}=3+2+1=6$ etc)

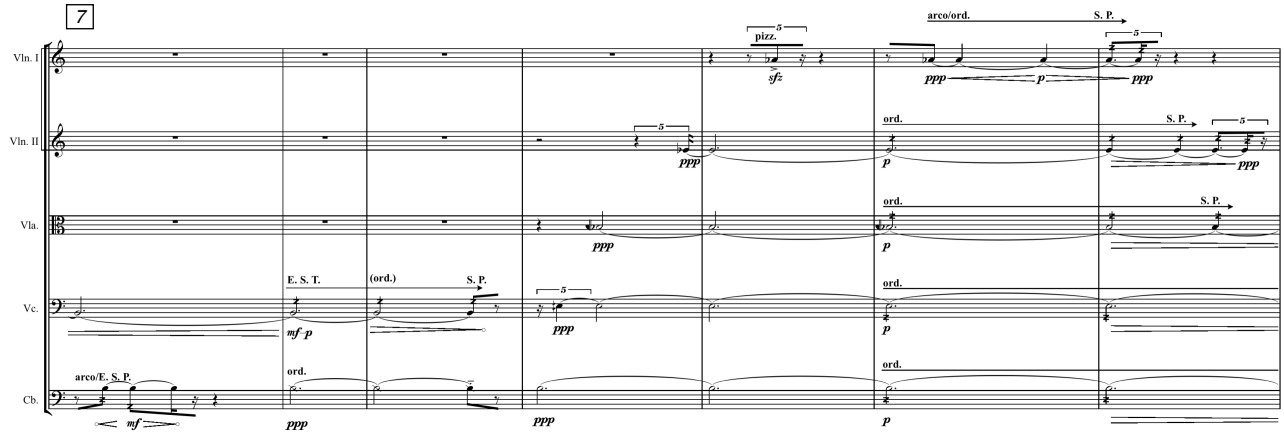
My aesthetic concern in Echosymplokon is the manipulation of two different textures, each of them corresponding to the two kinds of notation used. The first texture consists of static material, such as gradually developing chords which create various harmonic surfaces in multiple layers. By contrast, the second texture includes freely repeating and improvised interlocking patterns which modulate the tension and create a granular atmosphere. The elaboration comprises of the development of the spectral material and the creation of a modal environment derived from the pitch manipulation. The combination of the orchestration, the compositional techniques and the links between them which control the material development, lead to the creation of an orchestral movement divided into eight distinct sections:



The initial gestural idea for Echosymplokon was to create some spectral, gradually rising, chords which specify the harmonic background of the work. In particular, bars 1-44 comprise of six microtonal chords which are based on freely chosen intervals from the triangular number harmonic series, and approximately equal divisions between using the frequency interpolation technique:

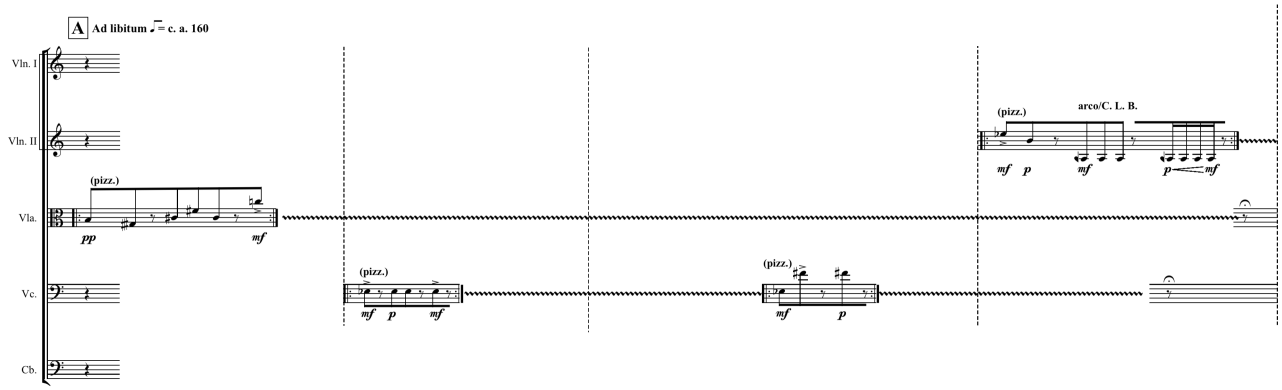


Frequency interpolation performed in 5 steps between partials 2 and 4 and orchestrated for the strings in bars 7-13



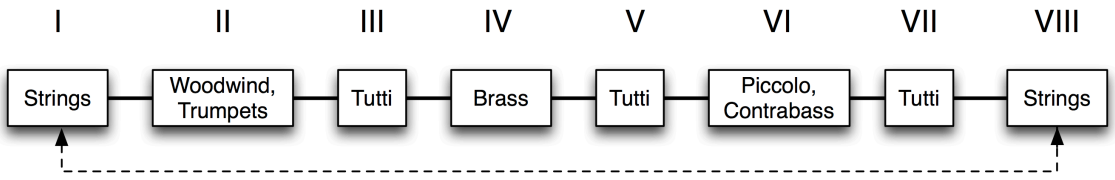
Bars 7-13, the first rising chord

I used the above idea to construct the first section of the work, creating various harmonic densities and finally releasing them into the granular atmosphere of section II (bars 45-59). The controlled improvisation technique (as discussed in *Octaphonia)* was used to develop the harmonic material through the frequency modulation technique. I used pitch Ab_4 and two tonal chords (B major, and C# minor raised by a quartertone) as carriers to perform a series of frequency modulations, to generate a secondary spectrum and develop the harmony. In addition, the strings provide a granular environment by improvising on several pizzicati and col legno battuto gestures which act more as sonorities rather than individual pitches or chords:

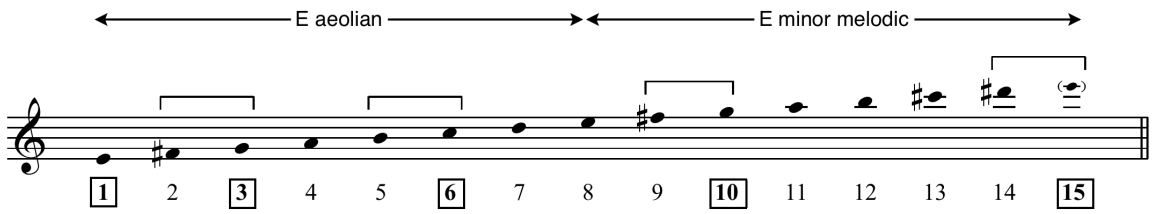


Bars 45-48, granular texture by Strings

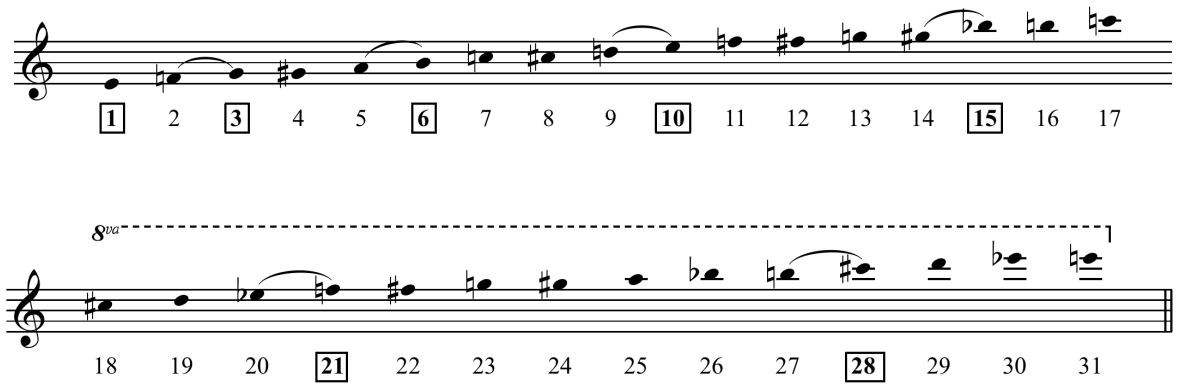
The idea of harmonic expansion through rising chords is elaborated during the third section (bars 60-93) where several small chord expansions, created by the frequency distortion technique, form a larger expansion, leading to the tutti chord in bars 92-93. It is also recapitulated in the last section (bars 163-197). The manipulation of the harmonic density was a substantial parameter which determined the orchestration of the work. I used contrasting orchestration among the sections of *Echosymplokon* to support and underline the contrasting harmonic surfaces. The figure below illustrates the harmonic development among the eight sections using various combinations of instruments which modulate the orchestral timbre:



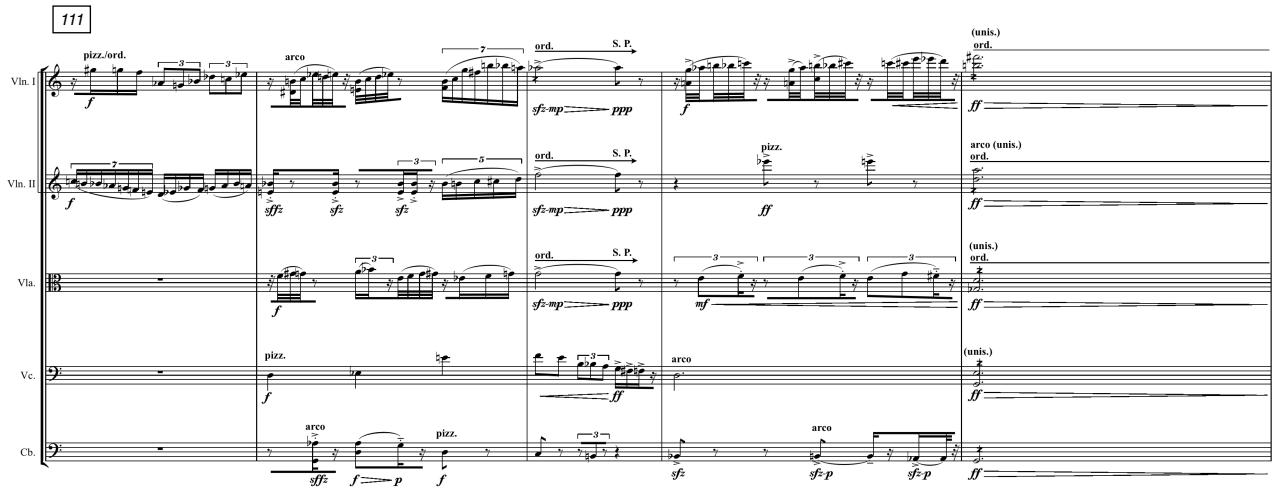
The preponderance of chromatic material over the microtonal during the harmonic development of the fourth section (bars 94-110) leads to the fifth, (bars 111-130), where the main pitch material is transformed into two modes with a starting point of E_4. The first mode is constructed mostly by tones. However, the triangular partials (1, 3, 6, 10, 15) were approached by a semitone. This arbitrary principle generates a two octave periodical mode coinciding with the aeolian mode and the minor melodic scale:



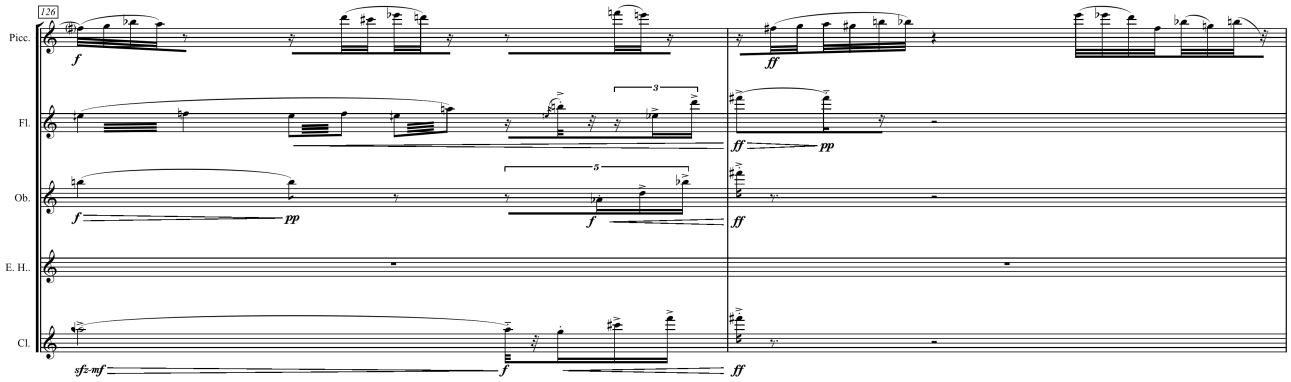
The second mode is constructed mostly by semitones. In contrast, the triangular partials (1, 3, 6, 10, 15, 21, 28) are approached by a tone. This principle creates a non periodical mode:



These two modes were used in various combinations for the elaboration, in order to construct the most energetic passage of the work. The harmonic texture changes to fast contrapuntal passages where several modal gestures are developed by all instruments. By decreasing the number of instruments, the speed and the dynamic tension are gradually released to a 'bare' orchestration passage (bars 131-154), performed on the two extreme ends of the orchestra by piccolo and contrabass. This sonority acts as a 'negative form' of the tutti passages.



Bars 111-115: modal material



Bars 126-128: The gesture development leads gradually to the high extreme end of orchestra (piccolo)

After the dematerialisation of the harmony (section six), the following two sections (seven and eight) work as a conclusion to what was presented before. The recapitulative character of these two sections recalls gestures and textures from frequency modulation technique. The final section (bars 163-197) comprises of a sequence of six chords, constructed in the same way as at the very beginning. The strings (in divisi) perform a sustained, microtonal, cluster-like chord which sounds as a distant echo of the spectral harmony of the work.

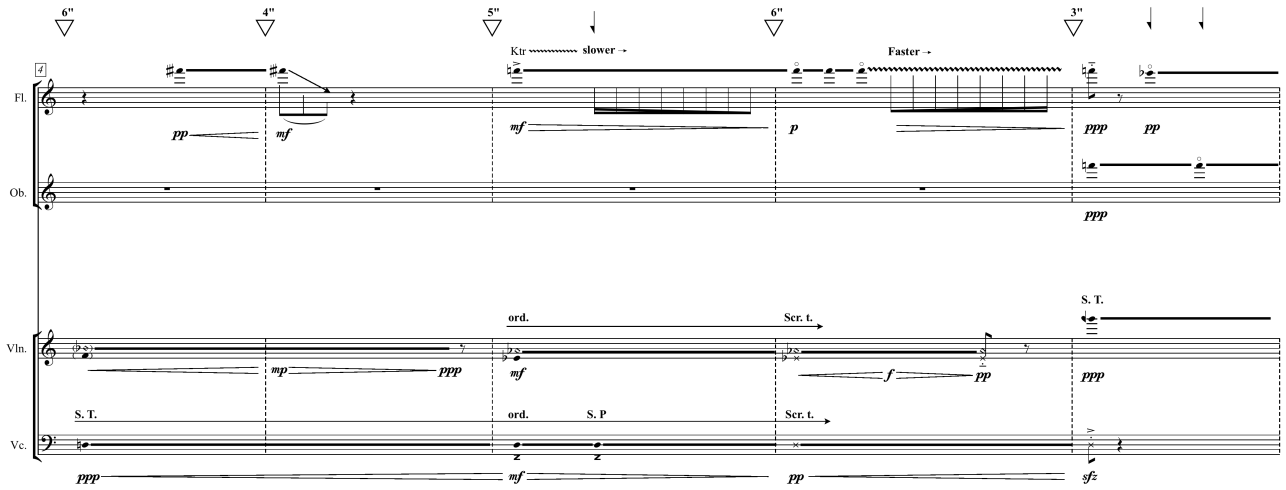
To summarise, Echosymplokon uses material based on triangular numbers arithmetic series and manipulated through spectral technique such as interpolation, frequency modulation and frequency distortion. The free artistic elaboration of the material leads gradually to the creation of a modal environment, completely removed from spectralism. The work explores the interaction between static and kinetic textures which are presented alternately modulating the harmonic density, the dominant registers and the orchestral timbre. The orchestra is used as a large instrument with many faces providing different environments each time, from solid harmonic surfaces to ‘empty‘ sonorities.

4.8 Inertial Motion (2010) Duration: approximately 13 minutes

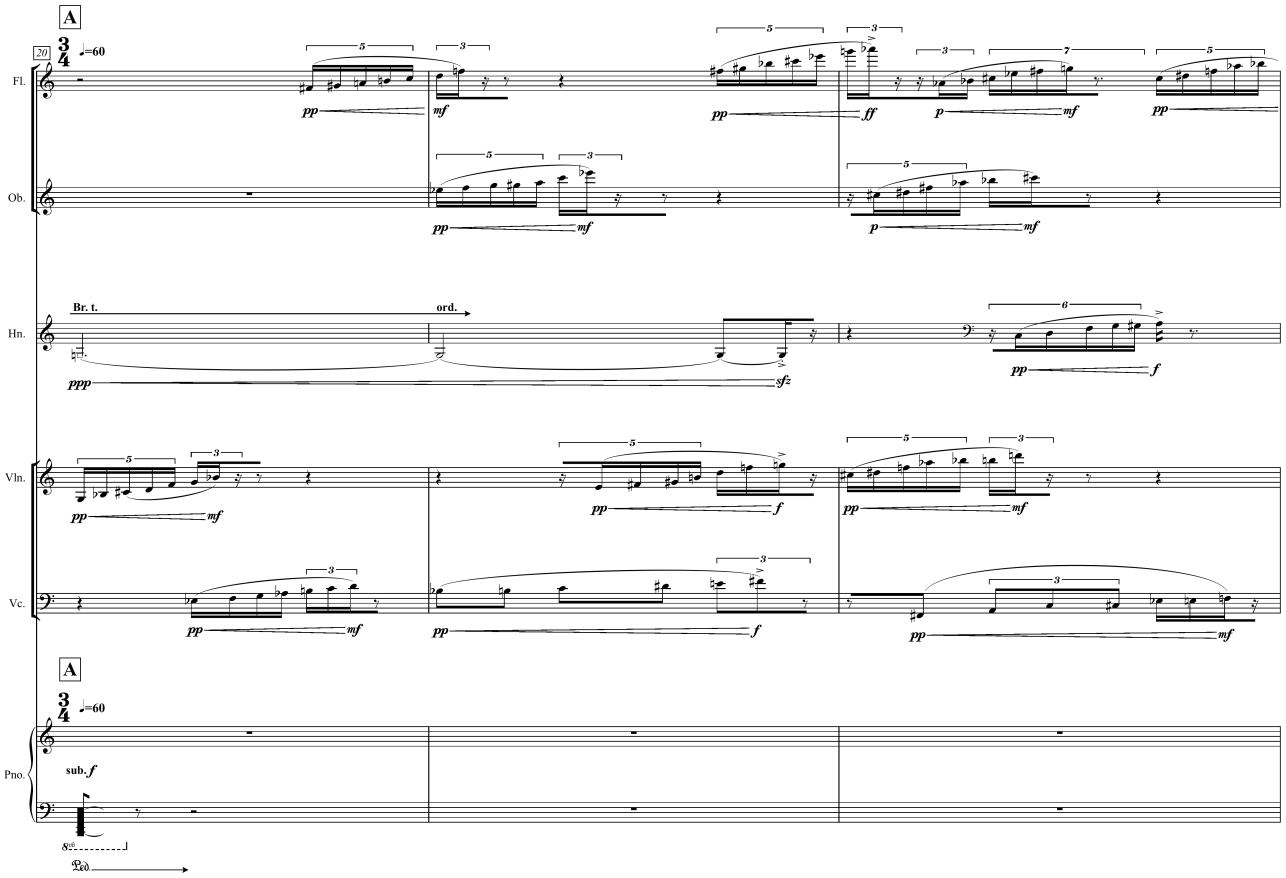
Instrumentation: Flute (Doubling Piccolo and Alto Flute), Oboe (Doubling English Horn), Horn in F, Violin, Violoncello, Piano

This work was composed during the autumn of 2010 and is the last work of this folio. The tittle comes from the cosmological term '*Inertial Motion*' which means *'constant velocity motion'* or *'motion free from any force'*. The concept of motion comprises the main aesthetic idea and refers to the development of the texture. Contrary to the '*Concerto for Piccolo/Alto Flute and Chamber Orchestra*' and the '*Echosymplokon',* Inertial Motion explores the development and variation of one texture along the timeline. From an aesthetic point of view, the manipulation of the texture is based on the expansion of a minimum of musical material to large amounts of sonic information. There are three main descriptive ideas which I used to vary the musical material and shape the texture:

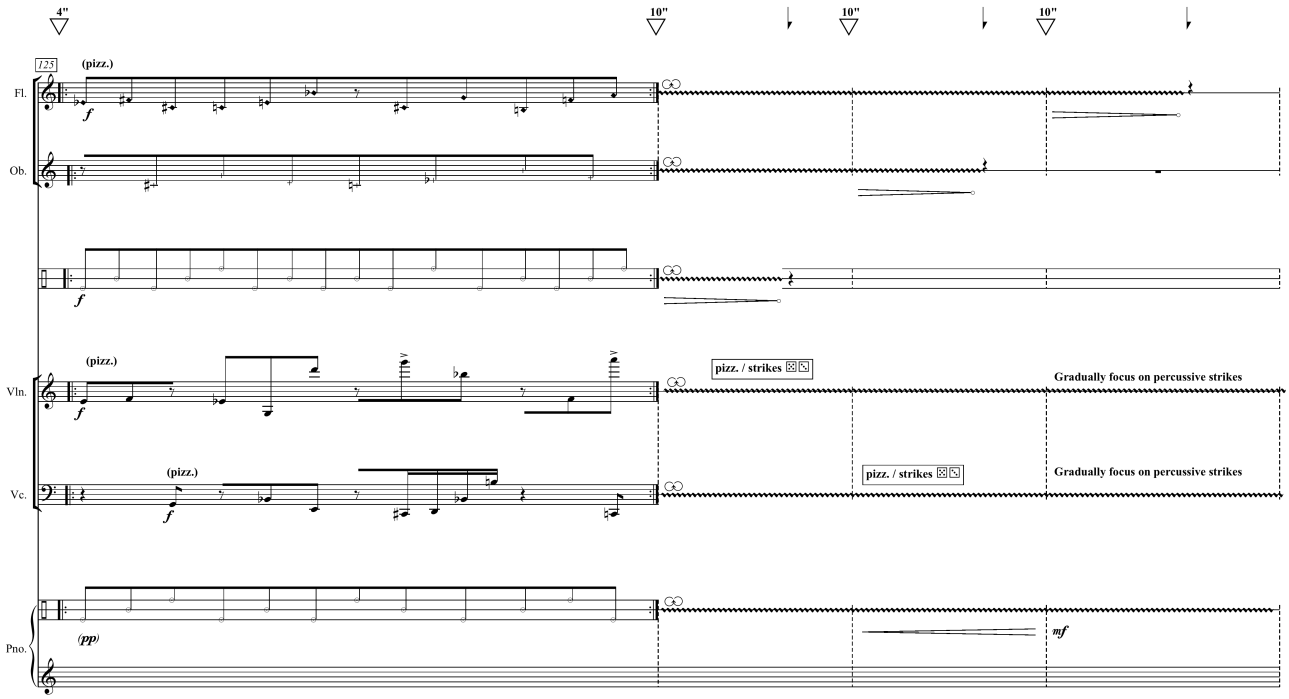
1. 'Smooth' (sustained spectral chords, 1 piece of sonic information per approximately two bars)



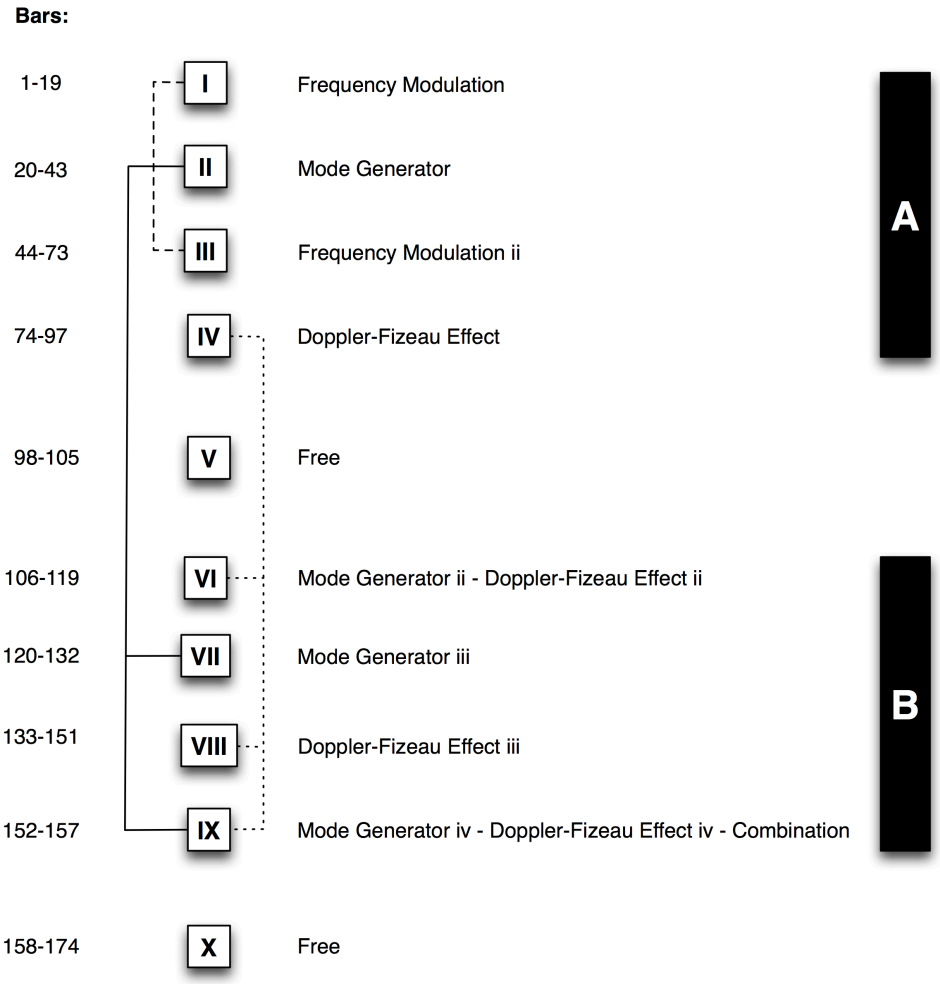
2. ‘Angular’ (upwards modal gestures, one piece of information per gesture)



3. ‘Granular’ (percussive sounds, combined blocks of timbral information)

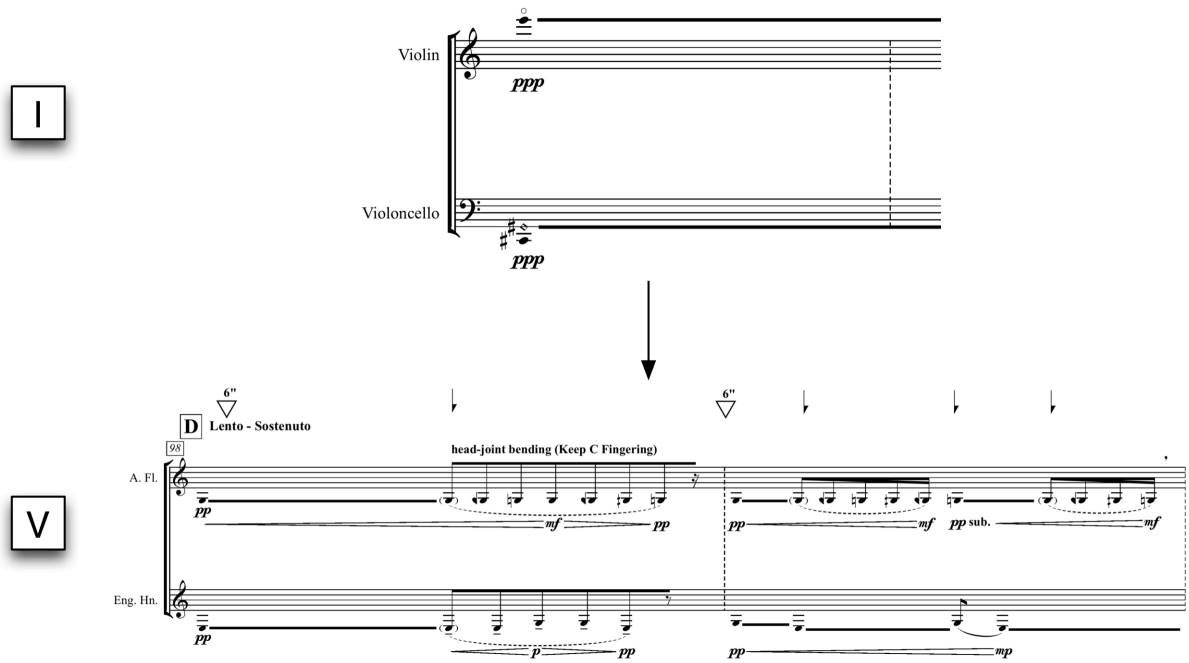


The main technique for the production of the basic pitch and harmonic material of *Inertial Motion* is frequency modulation. Contrary to previous works, frequency modulation was not used as a method for the harmonic development, but as a mechanism which generates and establishes the main harmonic plan of the work. For the elaboration I used additional tools such as the mathematical formula of the *Doppler-Fizeau Effect*[3] and an algorithm created in OpenMusic software which generates random modal scales from a preset reservoir of pitches and predefined intervallic ratios and transpositions. Here, modality acts more as a sonority rather than functional sets of pitches. Both the texture manipulation and the compositional techniques create a two part structure (exposition and elaboration respectively), divided into ten sections:

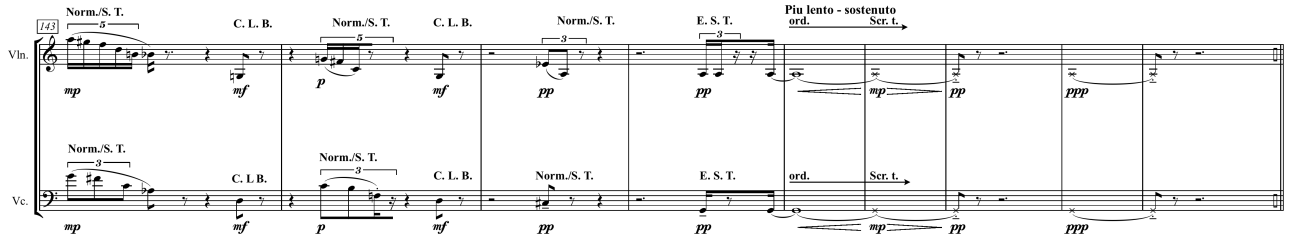


[3] The mathematical formula of Doppler-Fizeau effect was used to produce three part chords based on a fundamental frequency of a hypothetical sound source which approaches and recesses an observer with a freely chosen velocity. The trichord constitutes of the fundamental frequency, the higher (approaching) frequency and the lower (recessing). Although the title '*Inertial Motion*' refers to the textural development, it is also indirectly associated with the use of Doppler-Fizeau mathematical formula, which identifies the frequency of a moving sound source.

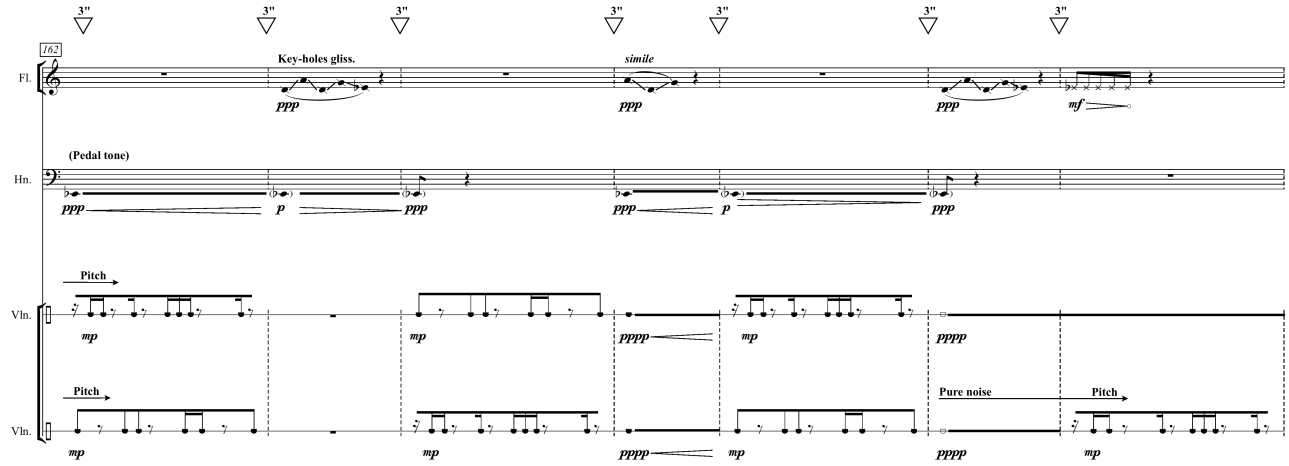
Apart from the compositional techniques discussed above, the elaboration of the initial material is based on the reconstruction of several gestures which are expanded by changing the instrumentation, the register and the timbre. For example, section five (bars 98-105), which is a free episode linking the two main parts of the work, is based on the minor third interval heard at the very beginning and performed by the violin and the violoncello. Here, this idea is reconstructed and appears as a free dialogue between the alto flute and the english horn, recovering the consonance in bars 1-2:



The timbral manipulation is another main feature of *Inertial Motion*. Several extended techniques such as breath tones, multiphonics, timbral trills, jet tones, scratch tones and various percussive sounds were used to form the timbral palette and support the textural development. In numerous passages, the pitch or harmonic material is gradually transformed into timbral sonorities to modulate the tension and prepare for following contrasting passages. The figure below shows bars 143-151, where the downwards gestures by the strings gradually change to scratch tones, preparing for the next section where they play on the instruments' tailpiece:



In the next passage, the harmony is gradually dematerialised and transformed into timbre and leads to a conclusion. The two strings perform mysterious pitches produced by bowing the tailpiece while the flute recapitulates the glissando gesture of bar 3. In addition, the Eb_2 pedal tone in the horn's part recalls the 'smooth' texture of sustained pitches:



In summary, *Inertial Motion* focuses on texture manipulation and shaping through several processes, such as the creation of a spectral harmonic canvas and the algorithmic generation and elaboration of modal scales. Mathematical formulas of techniques and acoustic phenomena such as the frequency modulation and the Doppler-Fizeau effect, are used as tools to manipulate the harmony and elaborate the texture. Finally, the timbral development follows the textural shaping process and supports it by transforming the harmony into timbre and vice versa.

5. Conclusion

After almost four years studying at the University of York, another chapter of my artistic life closes. The eleven works included in this folio reflect the realisation of my compositional research and provide several formalised and artistic methods to explore ways that modality exists inside spectrality and vice versa. My main artistic concern was how one sonic environment interacts with the other in an artistic framework, developing contrasting textures, harmonic surfaces and structures.

The main compositional issues I had to solve, were the balance between the algorithmic and the freely composed material, the scientific and the intuitive way of thinking, and finally the computer and the composer. OpenMusic software was a useful tool to generate and elaborate the spectral material and produce specific textures using several algorithms and aleatoric experiments. However, the final decision always belongs to the composer, a fact that provides a personal way for the development and the manipulation of algorithmic material. For this reason, several mathematical formulas and algorithms had to be revised, substituted or removed during the compositional process, in order to achieve the desirable sound result.

Each time I finish a composition I have two different feelings. On the one hand satisfaction for the fulfillment of a new artistic positioning and on the other a ceaseless desire for further developments of musical thought through new works. The second feeling generates the desire to explore the existence or the generation of modality inside sonograms of recorded sounds from musical instruments, sounding objects, environment and machines, creating an interaction between modal sonic environment and instrumentally re-synthesised spectral sonorities. A further development can also be the use of electronics for a live spectral elaboration of modal material through several algorithms created in Cycling's MaxMSP software.

Studying in York was a great opportunity to deeply explore the sonic reality, extend the characteristics of my compositional language and listen to the sound results through professional performances. During the past four years I managed to combine artistic and scientific elements

leading to the composition of the works in this folio. However, research never ends. There is always space for more as it is tied to the inherent capacity of man to wonder and explore his personal unknown.

Appendix - Performances of works

Aoide: March 2009, Sir Jack Lyon's Concert Hall, University of York, Chimera Ensemble, Conductor: Benjamin Gait

a4 : December 2008, Sir Jack Lyons Concert Hall. University of York, Chimera Ensemble, Conductor: Edward Caine

Octaphonia (first version): December 2009, Goethe Institute of Athens, Hellenic Contemporary Music Ensemble,

Conductor: Theodore Antoniou

Eteromorphia: March 2010, Sir Jack Lyon's Concert Hall, University of York, Chimera Ensemble, Violoncello: James Whittle, Piano: Paul Sild

Tu Solus I: Spring Festival May 2010, University of York, Recorder: Lucy Harrison

Tu Solus III: October 2010, University of York, Flute: Emmanouil Panagiotakis

Inertial Motion: March 2011, Sir Jack Lyon's Concert Hall, University of York, Chimera Ensemble, Conductor: John Goldie-Scot