INTRODUCTION

Looking back to my very early undergraduate studies and my early compositional development, an emphasis on tone colour has been a consistent integral aspect of my work. This has largely remained the case even as my work has undergone changes and matured. One such change, occurring towards the end of my undergraduate period of study, was a preoccupation with microtones (any pitch outside the 12-tone equal tempered tuning system such as quarter or eighth tones), which has become a key compositional concern and is the focus of discussion of my works in this thesis.

The performance of microtones can be problematic in my experience as many instrumentalists are not practiced in producing them, thus often making performances of microtonal works challenging. Given my acknowledgement of this, one may question why I became interested in the incorporation of microtones in my work. The answer has its basis in my above stated preoccupation with tone colour. As my ideas in this area developed it began to seem necessary to utilise microtones as a means to fully explore the timbral possibilities that increasingly suggested themselves during the process of composition.

As a solution to the difficulty of producing accurate intonation of microtones in the harmonic series, I decided to focus on tempered microtones and limited microtonal use in my works to quartertones and later eighth tones. These fit better within the western equal tempered tuning system, as a quartertone is exactly half of a semitone and an eighth-tone exactly half a quartertone. These tempered microtones and their intonation are more easily produced by performers, but are a minor compromise with

regards to later discussion of the harmonic series. Precise accuracy of the microtones within the harmonic series is not a preoccupation in my work however. What is most important is that the musical result is effective.

My initial experiments using microtones were basic and largely focussed on microtonal embellishment of melodic material otherwise composed of 12-tone equal tempered material. Later I became interested in more complex uses of microtones, particularly their capacity to change the harmonic qualities of a work. By including microtones, a greater colouristic depth and intensity is added to the harmony. This is particularly interesting for me considering my preoccupation with tone colour. My first significant works in which I incorporated microtones into their harmonic language was a trio of orchestra pieces entitled *Das Nachte Trio* (The Night Trio) written between 2003-4. The first of these was *Die Nacht fällt* (2003), written for chamber orchestra, the second was *Auftauchen der Nacht* (2004) for full orchestra and the third was *Die Nacht kommt* (2004) also for full orchestra.

All three works use the emotive perceptions of night as an influence, similar to a *Nocturne* and incorporate quartertones into their harmonic language. Each uses chords of 6-8 pitches that include quartertones as part of their construction. Occasionally, equal tempered chords are re-coloured by raising any pitch spelled as a sharp by a quartertone and lowering any pitch spelled as a flat by a quartertone, such as in *Auftauchen der Nacht*. These quartertonal chords are also used in inversion as a development tool that is found in all three works, but particularly in *Die Nacht kommt*. Incorporating quartertones into the harmonic language of these works allowed me to further explore harmonic colour and more complex microtonal textures

where both the accompaniment and foreground use quartertones. What is more important to me is that the accompaniment and foreground textures relate to each other harmonically as they are based on the same chords. There is also a clear sense of harmonic progression and change in these works, clear enough to impart a sense of familiarity as these harmonies return over the course of each work. This is very important from the listener's perspective so that the microtones do not sound too out-of-place or foreign. This therefore ensures that they are indeed meant to be present and do not sound as added out-of-tune pitches.

The preceding technique was a more controlled use of microtones, which I continued to build upon in my next and most recent development as a composer. As a result of studying works by spectral composers such as Murail and Grisey, in 2005 I began to utilise the harmonic series and spectral harmony to build on the harmonic language and microtonal use of earlier works. The first of these was *Landscape of Diffracted Colours* (2005), my most frequently performed piece to date having received several performances in Europe. *Landscape of Diffracted Colours* is scored for mixed chamber ensemble and electronics and uses spectral harmony to metaphorically synthesise tone colours and employs the inclusion of more vivid timbres than earlier works.

The combination of both quarter and eighth tones in this work adds increased colouristic depth to these timbres. This combination also adds intensity, which I perceive to be a form of dissonance, but this is not necessarily a traditional form of dissonance. Microtones on their own do not automatically add dissonance, but when combined with the techniques discussed in later chapters to create inharmonicity,

intensity and dissonance is added when compared to a harmonic spectrum. This strategy has continued in more recent works discussed in later chapters where my compositional language has gravitated towards constructing contrasting tone colours using similar techniques to the French composers Murail and Grisey, and the incorporation of microtones as key elements of the aesthetic and expressive capacity of my work.

This more developed approach is highlighted in my portfolio works such as *Tensility-Vortex* (Chapter One), where the intervals of the harmonic series are used to construct various inharmonic spectra (refer to **Appendix IX** and **X** for definitions of harmonic, sub-harmonic and inharmonic spectra, microtonal accidentals and the harmonic series) and therefore new timbres that relate to the work's mathematical concept. This is consolidated in *The German Hills* (Chapter Two), *The Styx* (Chapter Three) and *Zodiac Turbulence* (Chapter Four). In all of these works microtones are used to construct different tone colours as part of their harmonic language. They also use microtones as an expressive tool for the differing aesthetic concepts of these works, such as expressing the pagan underworld of Ancient Greece in *The Styx* or the destructive forces of the universe in *Zodiac Turbulence*.[1] Through the analysis of these pieces I will demonstrate how the microtonal techniques are used to construct contrasting timbres and how these serve as a basis of expression and aesthetics in the works discussed.

[1] General background information is provided on the various mathematical/physical phenomena and mythological/historical subject matter my analysed works contain as an influence. The reader should refer to the cited publications for more detailed information. My 2006 Masters Thesis "Stretching the Boundaries of Listening" includes extensive research on microtones and spectral composers and is held in the rare books section of the Sydney Conservatorium Library.

Chapter One

TENSILITY-VORTEX

General

Tensility-Vortex was composed in 2007 and was created as a result of a New South Wales Government grant called the Western Sydney Artists Fellowship. The work is scored for a small mixed ensemble comprising flute, clarinet, violin, cello, piano as well as a prominent solo oboe part. There is also an arrangement for string quartet, piano and oboe, but this analysis will concentrate on the original mixed ensemble version. The title of the work refers to two physical and mathematically describable phenomena that inspired its composition: vortex, and tensility. A vortex is a spinning mass, such as a whirlpool. However, a vortex can also take other forms; for example whenever an aircraft takes off a vortex of air is created by the sudden lift forcing the air to briefly swirl between the ground and aircraft. Tensility is a word that relates to the elasticity of an object, or whether or not it can be stretched. As a result, the basic emphasis of this work is the concept of stretching a vortex.[1]

The main musical material of *Tensility-Vortex* is a series of surging chords characterised by a constant increase and decrease in dynamics. This surging is intended to portray a whirlpool-like image to the listener and to depict the forces that cause a vortex to spin. Each chord is based on four fundamentals (D, F, Ab and B) that are arranged a minor-third apart and evenly divide an octave. For each of these fundamentals a harmonic and an inharmonic spectrum is constructed using a numeric series that governs its intervallic structure and rhythmic length. The stretching of

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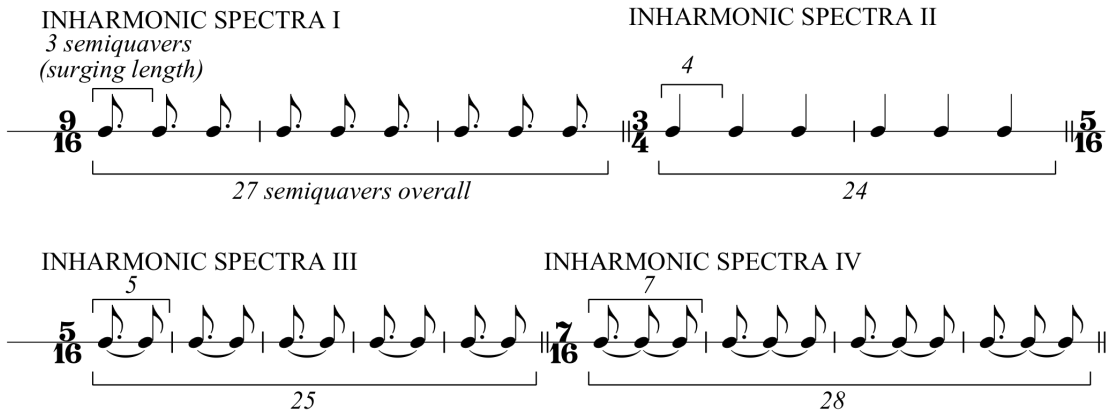
[1] Galanti, B; Gibbon, J.D & Kerr, R.M. (1999) "Stretching and Compression of Vorticity in the 3D Euler Equations", from Turbulence Structure and Vortex Dynamics, Cambridge University Press 2000 p. 23-5.

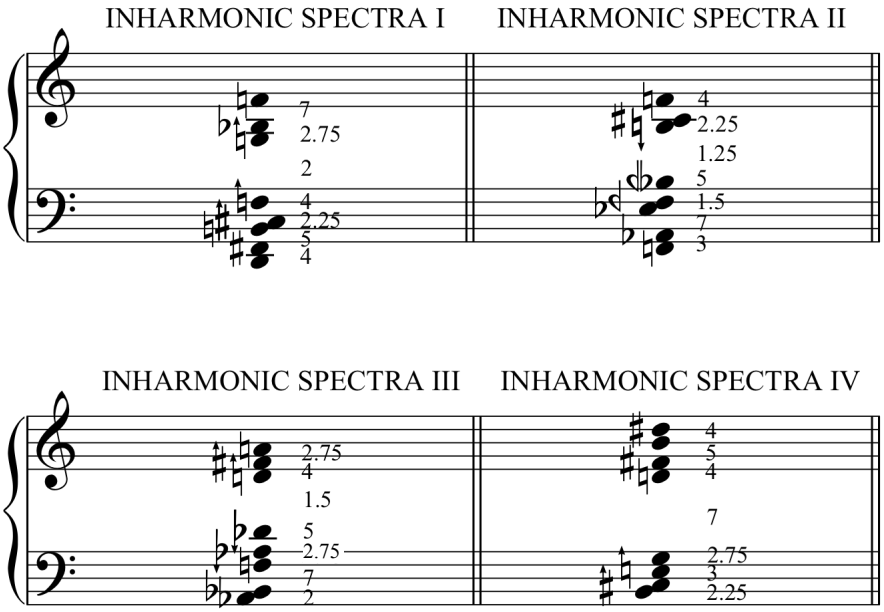
these vortex-chords occurs on two levels: 1) rhythmic stretching by permutating the length of the chord surges between 3, 4, 5 and 7 semiquavers. 2) stretching the pitches by detuning them up or down over the top of a particular fundamental.

I decided to focus predominantly on the inharmonic spectra constructed as I felt that they were more aurally interesting. Each of the inharmonic spectra, as mentioned above, is allocated a numeric series comprising of intervals found in the harmonic series. The sum of each numeric series in each inharmonic spectrum when added together forms the overall rhythmic length of each spectrum using semi-quavers. Each is also allocated a different value (3, 4, 5, or 7 semiquavers) to act as its surging length. The sum of each numeric series must therefore be divisible by 3, 4, 5 or 7 when added together. Each spectrum is labeled **inharmonic spectrum I-IV** throughout this chapter and the numeric series and surging length for each is as follows. Inharmonic spectrum **I**: 4, 5, 2.25, 4, 2, 2.75, 7 with a surging length of 3. Inharmonic spectrum **II**: 3, 7, 1.5, 5, 1.25, 2.25, 4 with a surging length of 4. Inharmonic spectrum **III**: 2, 7, 2.75, 5, 1.5, 4, 2.75 with a surging length of 5. Inharmonic spectrum **IV**: 2.25, 3, 2.75, 7, 4, 5, 4 with a surging length of 7. **Example 1.1** demonstrates the rhythm of each numeric series with each pulse outlining the length of each crescendo and decrescendo, and also demonstrates how the chords are rhythmically stretched.



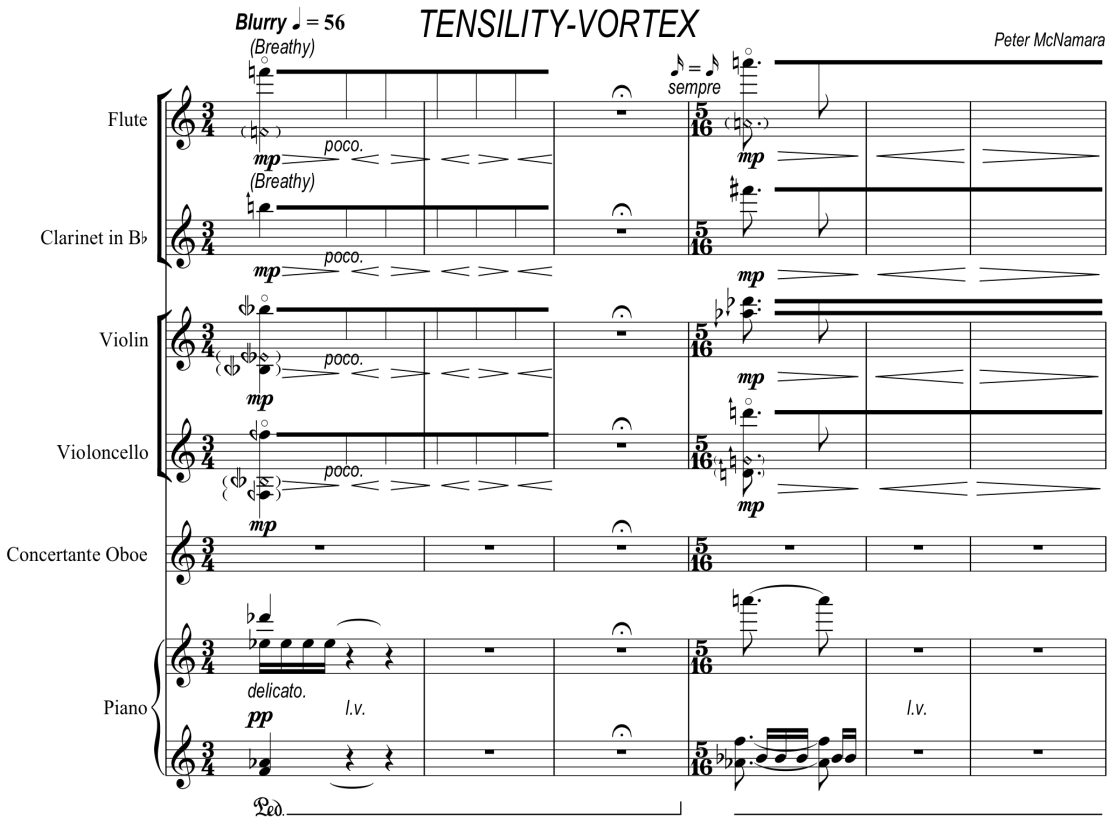
Example 1.1. Rhythmic outline of each inharmonic spectrum.

The pitches for each inharmonic spectrum are formed by adding its numeric series cumulatively on top of its fundamental as demonstrated in **Example 1.2**. Each whole number represents the number of semitones in the interval, 0.5 represents a quartertone and 0.25 an eighth of a tone. These microtonal intervals are taken from the harmonic series by measuring the distance between a microtonal partial and an equal tempered partial, such as partials 7 and 8. Any of these intervals are rationalised or rounded up/down however, to the nearest quarter or eighth-tone, rather than using the ratio interval (7/8 for example).



Example 1.2. Inharmonic spectra I-IV.

This surging material required an alternative form of notation used by spectral composers such as Murail in *Désintégrations* and Grisey in *Modulations*. The straight line extending from the notehead shows its rhythmic length and indicates an unbroken sustained pitch, a wavy line indicates vibrato. The rhythms without any noteheads outline the dynamics of a sustained pitch, and later other techniques such as vibrato, fluttertongue etc. This notation is clearer in my opinion than using multiple rhythmic values tied together and better expresses the continuous nature of the sound. **Example 1.3** shows how this notation is used in bars 1-6.

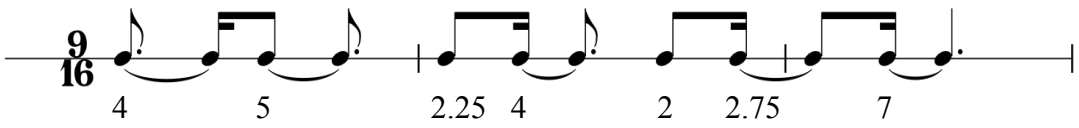


Example 1.3. ***Tensility-Vortex*** **bb. 1-6.**

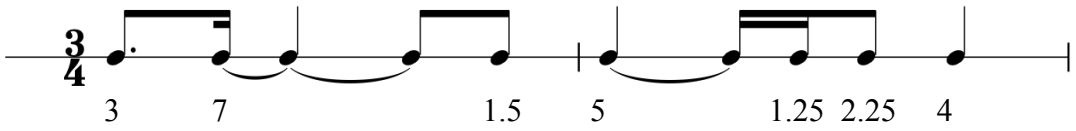
Use of Harmonic/Inharmonic Spectra and Texture: bars 18-121

The predominant realisation of these spectra is for the flute, clarinet, violin and cello to provide a sustained background and the rhythmic surging described above. The solo oboe part provides a lyrical melodic line as a foreground focus over this texture usually accompanied by the piano. This melodic line also relates rhythmically to the interval structure of each of the inharmonic spectra. Semiquaver groupings are again used for the length of each note, with any 0.75 and 0.5 values normally rounded up to the next whole number and any 0.25 values rounded down (a mistake was made however when devising these in the composition process for numeric series **III**). This rounding is done for ease of performance and results in the following rhythms shown in **Example 1.4**:

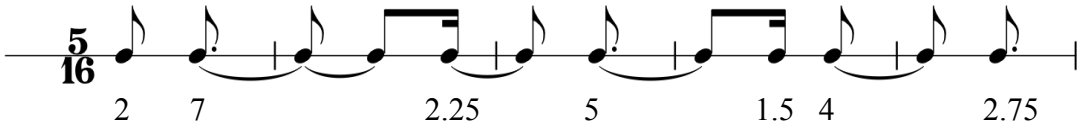
OBOE RHYTHM: NUMERIC SERIES I



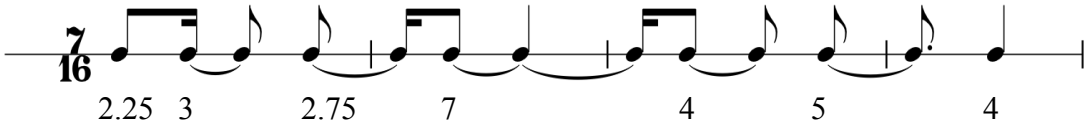
OBOE RHYTHM: NUMERIC SERIES II



OBOE RHYTHM: NUMERIC SERIES III

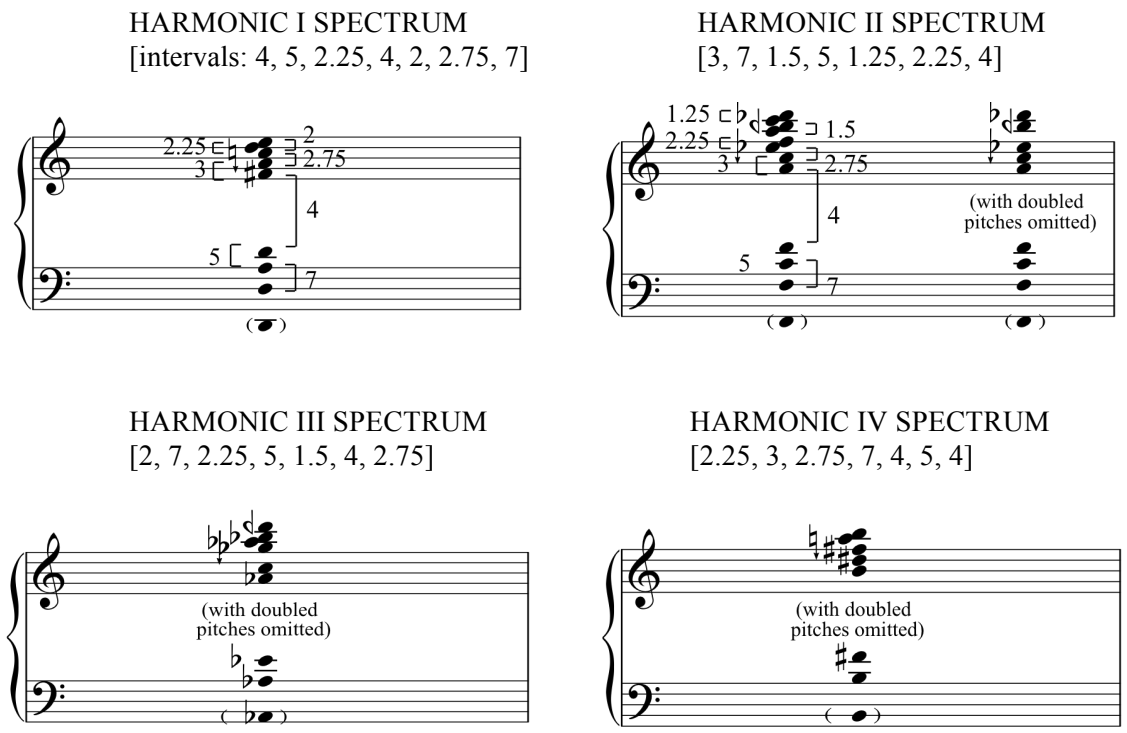


OBOE RHYTHM: NUMERIC SERIES IV



Example 1.4. Oboe rhythms derived from numeric series I-IV.

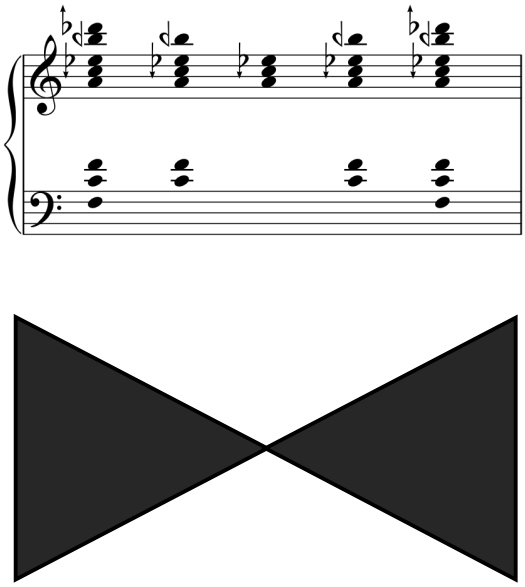
The inharmonic spectra are initially stated in the work's short introduction but appearing transposed up two octaves to facilitate the blurry opening orchestration with most pitches appearing as harmonics. This also acts as a registral link to the beginning of what could be described as the work's exposition at bar 18. Initially, in this exposition, the aforementioned inharmonic spectra are not used. Instead harmonic spectra based on the four fundamentals of each inharmonic spectrum appear. However, each of these harmonic spectra retains the surging and overall rhythmic lengths used with its corresponding inharmonic spectra, establishing a link between the two structures, one harmonic, the other inharmonic but projected over the same fundamental. As well as the fundamentals and rhythms, a further relationship is established by using the partials of each fundamental that correspond to the intervals used in each inharmonic spectrum (refer to **Example 1.5**).



Example 1.5. Harmonic spectra I-IV.

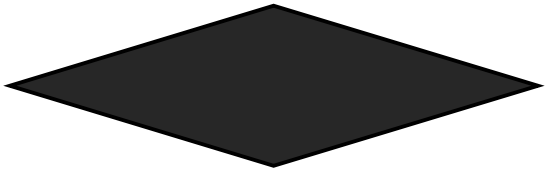
Occasionally, I was of the opinion that there were too many pitches in these harmonic spectra than was practical to realise for the ensemble. In these cases any doubled pitches were omitted.

The four harmonic spectra in **Example 1.5** occur between bars 18-41. This section also includes the initial development of the material. The duration of harmonic spectrum **II** is doubled (beginning b. 23) affecting a change in momentum at this point. This is the first example of rhythmically stretching the vortex-like material. Particular geometric shapes are projected onto the spectrum and used to filter the harmony, which is outlined in **Example 1.6** and very characteristic of filtering shapes used by many spectral composers.



Example 1.6. Filtering shape: bb. 23-6.

This augmented and filtered version of harmonic spectrum **II** is also emphasised by the first entrance of the oboe. The oboe briefly outlines two of the pitches in the spectrum in the middle of the filtering process (A and C) before fading from the texture. The next entrance of the oboe occurs at bar 36 where an augmented version of harmonic spectrum **I** appears. This time the oboe part takes on a more active role, which is preserved throughout the remainder of the work. The augmented spectrum at bar 36 is again doubled in length and filtered with a contrasting shape to harmonic spectrum **II** at bar 23 (refer to **Example 1.7**).



Example 1.7. Filtering shape bb. 36-41.

Tensility-Vortex contains a number of transitions where pitches are stretched up or down over the top of a particular fundamental. This is where one spectrum is transformed into another, and these transitions are used to introduce each inharmonic spectrum (outlined previously in **Example 1.2**) into what I have termed the exposition. The process of this first transition begins in bar 42 and is used to transform from harmonic spectrum **I** into inharmonic spectrum **I**. Since both spectra have the same fundamental, the resulting transition is perceived as a detuning of the pitches over the fundamental in a predominantly downward direction. Each pitch is detuned by using quartertonal voice leading, excluding the piano, which uses semitones. This continues until the corresponding pitch of harmonic area **I** is reached by each part. As some parts have a smaller interval distance to travel than others this process happens at different rates for each instrument. This process again relates to the work's title, in this case the stretching refers to the detuning of the pitches over the present fundamental.

These transitions also use surging rhythms of 3, 4, 5 and 7 semiquavers. This initial transition uses the same surge length for all parts (4 semiquavers). The oboe and piano provide a contrast to the sustained texture in the strings and woodwinds with the piano playing a texture consisting of arpeggiated material and syncopated rhythms. The oboe is instructed to play slightly distant and is continually emerging and fading from behind the other instruments with a lyrical melodic line that is derived from the pitches used in the transition.

This process ends at bar 47 where inharmonic spectrum **I** is reached. This spectrum appears an octave higher than originally devised however in order to make the

transition from harmonic spectrum **I** smoother as the register between them is very remote. This statement of inharmonic spectrum **I** is the first where the oboe material is intended to be in the foreground, projected over the surging texture. The oboe material at this point is connected to all preceding activity in the piece: its rhythmic pattern is determined by the numerical sequence of inharmonic spectrum **I** as described above in **Example 1.4**, and its pitches derive from this structure also (refer to **Example 1.2**), although they are re-octavised to close position for ease of performance for the oboe. The piano provides accompaniment to the oboe by introducing imitative writing (short canon) dispersed between the two hands. The pitches of this imitation also appear out of their original register. This texture continues as inharmonic spectrum **IV** follows at bar 50. The transition process and statement of inharmonic spectrum **I** between bars 42-9 is outlined in **Appendix I**.

The next transition begins in bar 72 immediately after augmented and filtered versions of harmonic spectra **III** and **IV**. This transition begins with harmonic spectrum **II**, with each pitch again detuned by the transition process until the spectrum is transformed into inharmonic spectrum **II** at bar 86. The inharmonic **II** spectrum also appears up an octave again to facilitate a smoother and easier transition from the natural spectrum. This is one of the longest transitions in the work and uses the same texture as the previous metamorphosis at bar 42. To affect further development however, two surge lengths are applied. The woodwind material surge lengths have five semiquavers as a base while the strings have seven.

Later transitions are also developed by using different combinations of surge length. The transition of harmonic spectrum **IV** at bar 93 into inharmonic spectrum **IV** uses

four semiquavers in the strings and five semiquavers in the woodwinds. The transition actually begins at bar 97 after the statement of harmonic spectrum **IV** and is also different to previous transitions as many of the pitches are detuned in an upward direction. This transition ends at bar 102 where inharmonic spectrum **IV** is reached. Here it appears an octave higher (as with previous occurrences in bar 47 and 86) so it is placed in the same registral space as harmonic spectrum **IV**. The effect is a shift from harmonicity to inharmonicity relative to the same fundamental, affecting a shift in tone colour of similar but related harmonic structures. This repeat of inharmonic spectrum **IV** is altered from the previous occurrence at bar 50 as the oboe pitches and rhythm is permutated. The rhythmic values that are derived from the spectra's interval structure (refer to **Example 1.4**) are arranged from longest to shortest to develop the melodic line. The original relationship between the pitches and their rhythmic length in the version at bar 50 is preserved however. An example is the pitch D that was 5 semiquavers in length in the version at bar 50. The length of this pitch is the same in the bar 102 version, just appearing in a different order.

The next transition begins at bar 106 with harmonic spectrum **III** stretched and detuned into inharmonic spectrum **III**. This transition uses four semiquavers in the flute and cello with three semiquavers in the clarinet and violin for its surging combination. A further change is the 3/4 time signature, in contrast to the predominant use of 4/4 in previous transitions. Inharmonic spectrum **III** is reached at bar 117 and also uses a permutation of the oboe rhythm that appeared when this spectrum was last used at bar 88.

Development and climax: bar 122-177

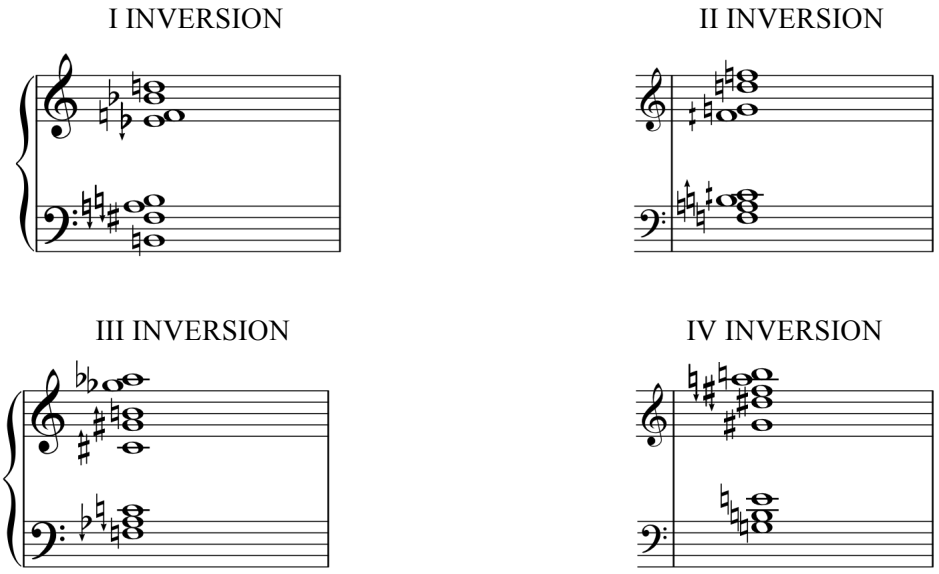
The section from bar 122-177 is not unlike the exposition section, but it does contain some developments and re-colouring of the harmonic areas used previously that differentiate it and that lead to the work's climax. From bar 122 each of the four derived inharmonic spectra of the work is used. A further process of development is applied – the overall rhythmic lengths are doubled, and accompanying this rhythmic augmentation each spectrum undergoes a filtering process. As in previous examples, a filtering shape is applied, but different shapes are used here resulting in different filterings. The oboe rhythms in **Example 1.4** are also doubled in length and permutated for further development. Apart from the first spectrum, which is arranged longest to shortest, the pitches used in the oboe correspond to the filtering process, which determines their order. As in the statements in bar 102 and 117, the relationship between the pitches and their original rhythmic lengths is preserved.

These inharmonic spectra appear in the registers in which they were originally devised for the first time (refer to **Example 1.2**), and are thus in a lower register than previous occurrences. In addition to this many microtonal intervals are re-orchestrated to occur in lower registers, such as those in the clarinet and cello, which is contrary to where they naturally appear in the harmonic series. This re-colours the spectra/fundamentals and provides a much darker colour in contrast to previous occurrences.

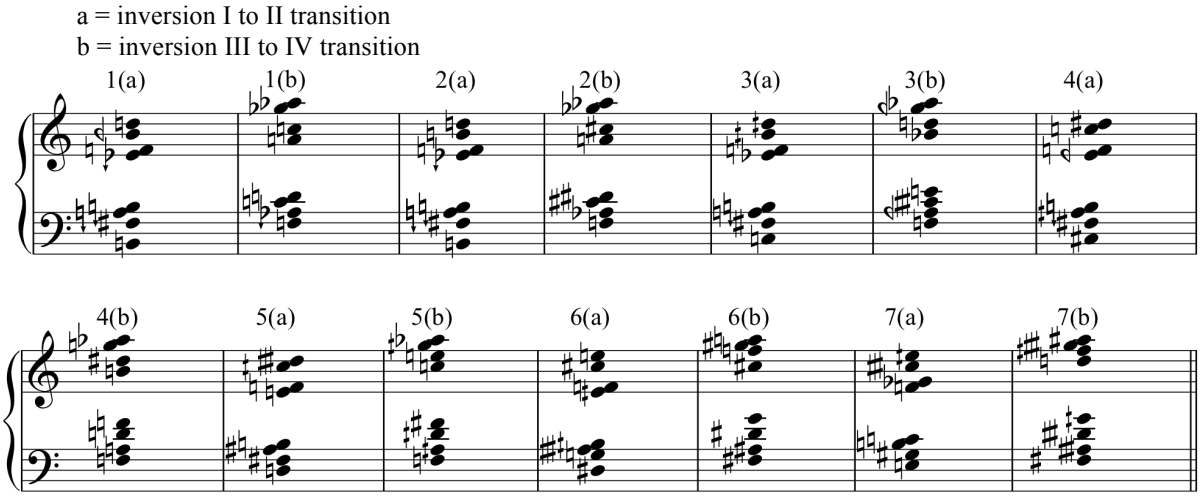
For the climactic point, the inversions of all four inharmonic spectra are utilised (refer to **Example 1.8**). There is also a double transition comprised of the transformation of

these inverted inharmonic spectra occurring alternately between bars 158-73. At bar 150, the inversion of inharmonic spectrum **I** is used proceeded by inversion spectrum **III** at bar 153, both with the original surge and original rhythmic length preserved as outlined in **Example 1.1**. The double transition then begins from bar 158 with the inversion of inharmonic spectrum **I** transforming into the inversion of inharmonic spectrum **II**. The inversion of inharmonic spectrum **III** meanwhile transforms into the inversion of inharmonic spectrum **IV**. This transition results in every second bar allocated to each of the processes. This means that bars 158, 160 and 162 etc. have a focus on the transformation from **I** to **II** while bars 159, 161, 163 etc. have a focus on the process of changing **III** to **IV**.

These transitions are also unique to this work as they are the first to use two different fundamentals. The texture and processes are also slightly different from previous transitions. Each string and wind instrument crescendo independently of each other for each bar. These crescendi increase over time to ***fff*** by the end of the process at bar 172. The rhythmic length of the transition is also compressed and accelerated over time to assist the increase in tension. There are 14 events overall with the first five in 4/4, the next five in 3/4 and last four in 2/4. This is to accelerate the transition process and create climactic tension. The double transition ends at bar 173 where the inversion of **II** is used followed by the inversion of **IV**, which represents the climax of the work. This process is outlined in **Example 1.9**.



Example 1.8. Inversions of inharmonic spectra I-IV.



Example 1.9. Climactic double-transition, bb 158-72.

<u>Finale: bar 178-209</u>

Tensility-Vortex ends with a texturally contrasting Finale, and is focused on re-colouring the spectra used previously. The finale begins at bar 178. In contrast to the rest of the work, in which the rhythmic content is strictly organised, the finale is treated much more freely.

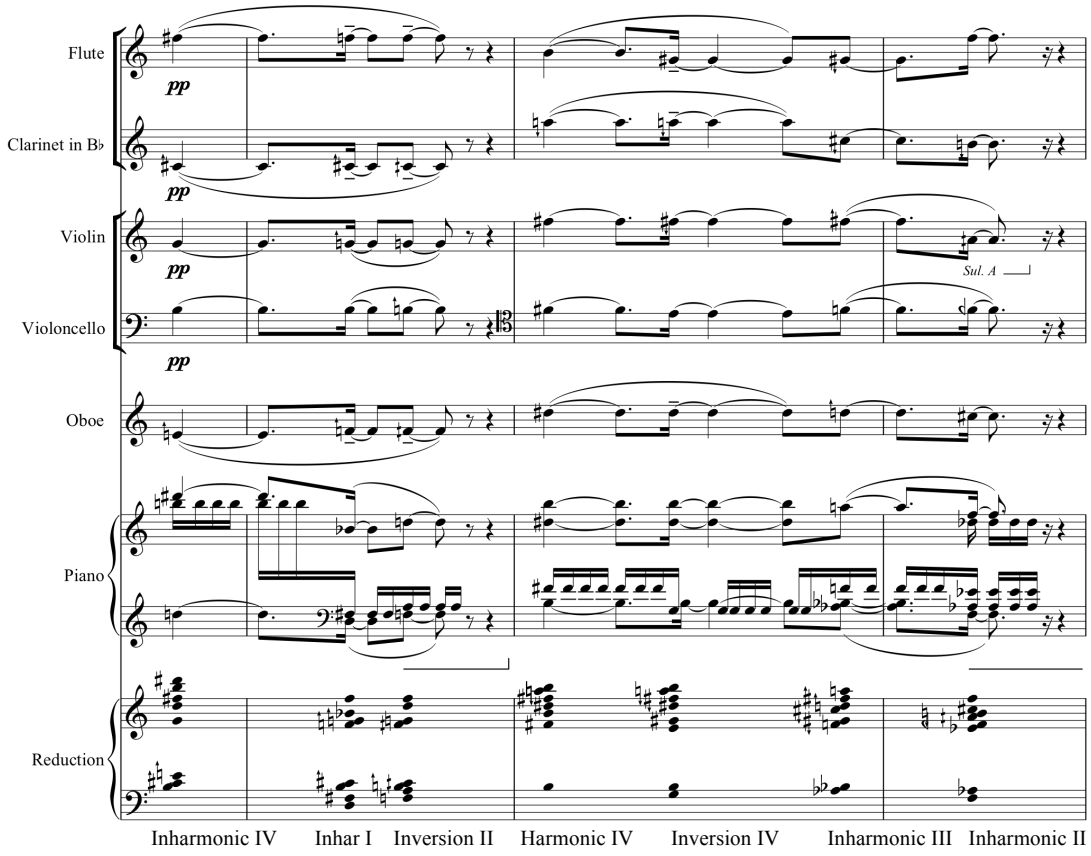
The previously used harmonic and inharmonic spectra are again featured in the finale, but they are used in various intuitively determined progressions. Each progression contains spectra where the voice leading, predominantly for the microtones used, is relatively smooth. Each spectrum is either 3, 4, 5 or 7 semi-quavers in length, depending on its original surging length. The texture though is simply sustained with no surging used.

The climax ends abruptly at the beginning of bar 178, creating a brief overlap with the beginning of the piano solo at the start of the Finale. This solo is very free and resonant, with several pauses breaking up the events. The piano texture uses a melodic counterpoint in the outer voices and a subtle semi-quaver texture in the middle voices. This texture is meant to be very resonant and bell-like, and the harmonies used are short truncations of progressions that will be used later in the finale.

At bar 179 the oboe joins the piano with a lyrical melodic line converging in a short duet until bar 185. The spectra used for this duet, as mentioned above, are repetitions of those used in the previous sections and also appear between bar 185-9. During the duet though, they are incomplete as it is not possible to include all the microtonal pitches. The oboe contributes the occasional microtone to the harmony as a spectral veneer however, to avoid a complete abandonment of a principal element of the work.

From the end of bar 185 to 189, the duet texture is continued only with the rest of the ensemble joining the piano and oboe by providing a soft sustained background and completing the spectra and the remaining pitches required. The spectra though, are

now used as harmonic objects in the aforementioned progressions. The instrumental parts constantly weave in and out of each other using different orchestration of the spectra used earlier. This is partly due to voice leading concerns but also to re-colour these spectra for contrast. This is shown in **Example 1.10** which contains a short score excerpt as well as a reduction and labeling of the spectra used.



Example 1.10. Excerpt bb. 186-88 (with upbeat).

These progressions lead to the work's ending beginning at bar 190, which is related to the introduction. Each of the original inharmonic spectra is used with a delicate sustained texture that utilises gentle crescendi and decrescendi. Each is four measures in length, and also contains the emergence of intricate colours. The first two inharmonic spectra are played by the winds and strings and uniformly crescendo and

decrescendo. The last two spectra, from bar 198, contain crescendi and decrescendi between the strings and woodwinds that are contrary to one another. This highlights different sections and intervals within each spectrum. In addition to this, towards the end of each spectrum, the oboe is instructed to play *molto vib* to highlight its timbre and pitch appearing at the time. This is combined with glissandi in the strings where the sustained pitch is re-emphasised with a notated rhythm within the same bow stroke. *Tensility-Vortex* ends with inharmonic spectrum **II**, also used to open the work. During the last four bars, there are several statements of this spectrum that gradually fade away, with each statement progressively using fewer instruments.

Conclusion

Tensility-Vortex is a work that metaphorically synthesises tone colours by creating inharmonic spectra that use various intervals in the harmonic series. It also conveys imagery of how a vortex can be stretched by its use of distorted rhythmic surging, rhythmic augmentation and permutation of different rhythmic groupings. This imagery is further demonstrated by the pitch stretching used in the work's transitions. It also demonstrates how microtones are used to construct and vary timbre in my compositions.

Chapter Two

THE GERMAN HILLS

General

The German Hills was written for the Sydney-based chamber group Ensemble Offspring as part of the 2008 Sibelius Emerging Composer Commission, and is scored for Bb clarinet, percussion, violin and cello. The work's title refers to the Adelaide Hills District in South Australia, where many Prussian immigrants settled in the 1830s. These immigrants were forced to leave their homeland due to the negative attitude the King of Prussia held towards Lutherans at the time, and the resultant widespread discrimination and political uncertainty. This part of Australia therefore exhibits a fusion of cultures with very Germanic styles of architecture and cuisine combined with a sense of space and openness that is distinctly Australian.[1]

To represent this German/Australian fusion, the pitch material for *The German Hills* is derived from a nine-note motif from the introduction of Beethoven's *Kakadu* Variations op. 121a. Kakadu is the German word for Cockatoo and the theme used by Beethoven was from a popular aria of the time by Wenzel entitled *Ich bin der Schneider Kakadu*.[2] In *The German Hills* the derived nine-note motif is used as a basis for a series of drones and fundamentals beginning in its original order during the first section, then in inversion in the middle section and finally in retrograde during the last section. The original motif and its inversion are shown in **Example 2.1**.

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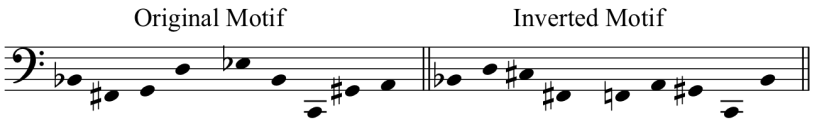
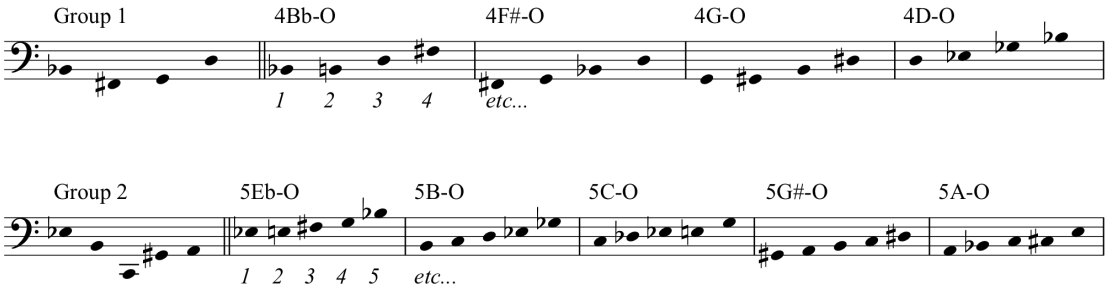
[1] Dyster, T. (1980), "Pump in the Roadway: Early Days in the Adelaide Hills", Investigator Press Hawthorndene SA, p.33. Hahndorf Village Profile, www.southaustralia.com/AdelaideHills.aspx.
[2] Schumann, K. (1986). "Beethoven Piano Trios" CD Liner Notes, Novalis Switzerland.



Example 2.1. The Beethoven nine-note motif and its inversion.

The original motif also forms the foundation for the work's harmonic material. This motif is split into two groups of four and five pitches respectively as shown in **Example 2.2** with the intervals of each group forming the basis of chords once being condensed into their smallest possible breadth or intervallic prime form. Each four-note chord is then transposed over the top of each pitch in group one of the motif, and each five-note chord transposed over each pitch in group two of the motif. These chords are also shown in **Example 2.2**.



Example 2.2. Motif divisions and devised chords.

Each pitch of the nine-note motif is then treated as a fundamental and the pitches contained in these chords are also used in relation to their closest corresponding partials from the harmonic series in relation to each fundamental. Pitches 2 and 3 of the four-note chords therefore correspond to partials 17 and 5 of the harmonic series with pitch number 4 falling in between partial 25 and 26. Due to the fourth pitch in each of these chords falling in between two nearby microtonal partials, this tempered

pitch is often detuned slightly in an upward or downward direction to approximate partials 25 and 26. This adds a spectral veneer to the harmony and is further demonstrated by the inclusion of similar microtonal bending to detune partial 5 downward, which corresponds to the third pitch in these chords and approximates a justly tuned major-third (the natural major-third that appears in the harmonic series, slightly less than a tempered major-third).

The same technique is applied to the five-note chords, with the fourth pitch of these chords corresponding closely to the fifth partial. As in the four-note chords, this pitch is also detuned downwards to approximate a just major-third. The fifth pitch in the five-note chords corresponds closely to partial 3 and is frequently detuned up to create a just fifth. The other point of interest with regards to the work's microtones is that during the first and last sections, microtones of an eighth-tone are used while quartertones are used in the middle section. This is done with the aim of contrasting the work's harmonic colour, with the smaller eighth-tones used in the calmer first and last sections. The quartertones meanwhile are used in the chaotic middle section. In my opinion, the eighth-tones are more subtle while the quartertones are more audibly uncomfortable. This is another reason for applying different microtones in different sections.

Section A: bar 1-76

The opening and final sections of *The German Hills* represent the sense of stability and harmony that the Prussian migrants experienced in their homeland before their experience of discrimination, and after their subsequent settlement in Australia described above. As previously stated, the microtones used in these sections are

primarily eighth-tones. This is to fit with the sense of stability, as they have a more natural and less invasive sound. The microtones are used to predominantly provide colouristic inflections to the texture, particularly in the work's melodic lines presented mainly by the clarinet. These inflections add intensity to these melodic lines that is gradually increased over time. Colouristic microtonal detuning of equal tempered pitches often occurs in the violin simultaneously with the same tempered pitch in the crotales, causing an aural clash and blurring the resonance of the crotales.

The drones of the Beethoven pitches are very distinctive in this section and are present in the texture most of the time. The resonant metallic percussion, such as the crotales, also assists to achieve a sense of space that is very characteristic of the Australian landscape. The shimmering effect achieved from tremolos used in the string parts and the fluttertongue techniques used in the clarinet is used to convey an image of central Australian heatwaves. Underpinned by an unaccompanied cello drone, which functions as the first fundamental from which the proceeding harmony emanates, the initial texture is also very sparse and sustained. Colouristic playing techniques such as *Sul Pont* bowing and harmonics are used by the cello to alter the timbre and colour the sound. The remainder of the ensemble is soon added however, led by the clarinet with an initial and short statement of the work's melodic phrases. The initial microtonal detuning also soon occurs. After initially doubling the F# in the crotales, the violin detunes this pitch up an eighth-tone creating dissonances with the resonance of this pitch during bar 12.

Many of the textures in the opening of *The German Hills* possess similarities with those found in many works of Peter Sculthorpe (such as *Sun Music*) and are meant to

convey a sense of vastness indicative of central Australia. Bars 13-20 are very representative of these textures types, although there are distinct differences between *The German Hills* and the works of Sculthorpe, such as the microtonal harmony and melodic lines. The fundamental is F# between bars 13-20, and the chord used for the harmony is therefore 4F#-O (refer to **Example 2.2**). The drone and fundamental is provided by the cello, which uses *Sul Pont* bowing on occasions again to change the tone colour of the drone. The pitches of 4F#-O are used initially as harmonic partials of the F# fundamental, and appear in the registers that correspond to these partials. This results in the parts spread across a large range with the clarinet approximately two octaves above the fundamental and the crotales and violin another two octaves above the clarinet resulting in textural transparency. The clarinet focuses mainly on the third pitch of the chord (Bb), which functions as the fifth partial. Other non-harmonic pitches are also added to the clarinet such as the chromatic flourishes around the Bb. Partial 7 is also occasionally used to thicken the harmony. Initially the clarinet plays these pitches unaltered, which changes from bar 18 where microtonal alterations are made.

The crotales are used to articulate sporadic occurrences of pitches 2 and 4 of chord 4F#-O, which also appear as partials of the fundamental. The violin accompanies this with artificial harmonics predominantly to blur the high D of the crotales by an eighth-tone in either direction, thus realising partials 25 and 26 and providing colouristic changes. This texture remains predominantly the same until bar 36. Please refer to **Appendix II** for the score excerpt of this section.

At bar 37 the instruction “With more energy” appears and is a marking point for several changes. The first of these is the five-note chords beginning with 5Eb-O. The texture also becomes more active. Another fundamental change is the transposing of parts down into lower registers, which transforms the texture. Earlier examples of material being transposed down exist, such as the vibraphone part at bar 27 and the clarinet at bar 35-6, but this process becomes normative from bar 37. This occurs largely to add a dimension of transformation to the texture. It also allows the instrumental timbres to blend with each other better and makes the colouristic blurring and microtones more obvious, which has the effect of further creating tension as the work progresses towards the more intense middle section.

The texture between bars 45-52 is an example of the transitional changes that occur in section **A**. All of the parts take on a more active role, including the cello, which occasionally diverts from just providing the drone/fundamental (B). Microtones are more widespread and brought to the foreground of the texture more frequently. An example is the double-stopped semitone in the violin (D and Eb) that becomes even smaller when the Eb is lowered by an eighth-tone. This increased dissonance is further emphasised by the blurring of the bowed Eb in the vibraphone at bar 51. To provide a further link to the middle section, the clarinet also adds the seventh partial to the harmony, which is a dissonant interval with the fundamental. The clarinet also frequently appears in the *Chalumeau* register, such as at bar 47 where the fifth pitch of 5B-O (F#) is detuned by a microtone. This gives this pitch (also acting as the third partial), and texture a distinctive dark quality. Refer to **Appendix III** for the score excerpt of this section.

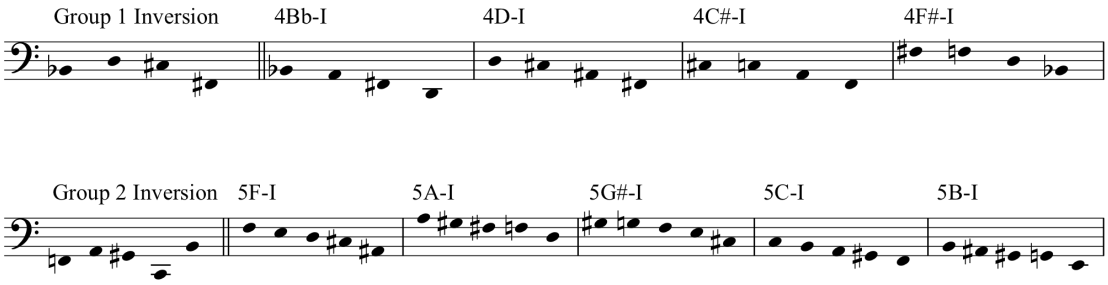
By bar 61-68 the texture has become so active and complex the initial sparseness in the harmony has disappeared completely. Double-stopping in the violin and cello appears with more frequency, an example of which appears in bar 62-63, as an aggressive, syncopated chordal gesture used earlier is developed further. This gesture also incorporates bowing changes to *Sul Pont*, again to transform its tone colour. Further intensity is achieved at bar 68 where the chordal gesture (from bar 62-3) appears again with microtones incorporated for the first time. This section also introduces a change in the clarinet melodic lines with the flourishing gestures no longer just chromatic, but quartertonal to constrict the ambit of these flourishes, and is intended to add further intensity.

These changes and developments are all related to the work's conceptual framework and are aimed at achieving a gradual transition to the chaotic middle section. The manner in which the microtones are used is also related to this framework as they are transposed down to become more audibly obvious. This is further emphasised by the gradual addition of quartertones in the clarinet melodies and other parts such as the strings in bars 70-1.

Section B: bar 77-137

The work's middle section begins at bar 81 after a short bridge passage at bar 77. There is also a change of tempo from bar 77 to "Poco Piu Mosso". This section is very chaotic, which is representative of the uncertainty that led the migrants of the Adelaide Hills to flee their homeland. Material used earlier is developed in this section, beginning with the series of nine drones, now used in inverted form. The basis for the harmonic material is also similar to the first section with four-note

chords used in conjunction with the first four fundamentals and five-note chords with the last five fundamentals. A change occurs though, where the inversions of these chords are also added to the harmony. These chords are shown in **Example 2.3**. The eighth-tones that coloured the harmony in the first section are replaced here by quartertones. The use of quartertones not only makes the work's microtones more obvious to the listener, but in my opinion also more uncomfortable and unpleasant. As stated previously, this is to relate to the chaotic concept of this section.



Example 2.3. Beethoven motif in inversion and devised inverted chords.

As in the first section, each fundamental is assigned an overall length. In addition to this for the middle section, each fundamental is assigned a number series. The numeric values in these number series are used for rhythmic length (in crotchets), and divide the different textures used. Each begins with, and is later also interrupted by either a 5, 6 or 7/16 bar. These bars of 5, 6 or 7/16 contain the most aggressive material in this section, and are punctuated by clarinet multiphonics (determined by the instrumentalist for ease of performance), harshly attacked woodblocks and frequent Bartok pizzicato and general aggressive attacks in the strings. The numbers used in the number series relate to the nine-note Beethoven motif and contain the numbers 5 and 4 (the two divisions of the motif), 3 (which divides 9), 2.5 (half of 5), 2 and 1 (divides 4) and 1.5 (half of 3). Each fundamental is issued a series of seven

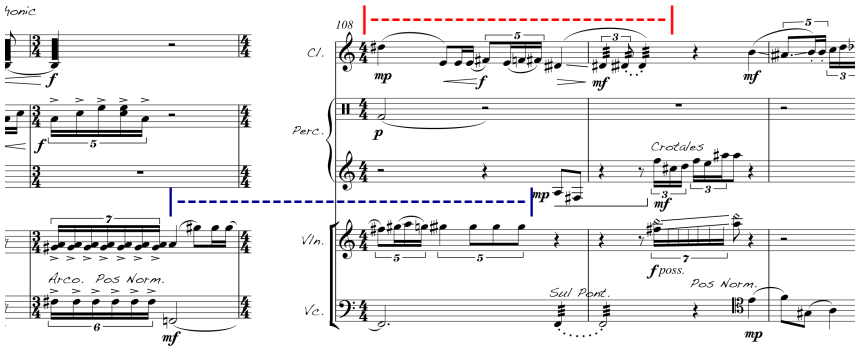
values with some even issued two different series, all of which are permutations of the above numbers and with each whole number equal to one crotchet beat.

The first of these number series is 5, 2, 1, 3, 1.5, 2.5, 4 and begins at bar 81. This occurrence also demonstrates how the series is used to divide the textures in this section. The drone/fundamental used for this occurrence is Bb. The drones are normally present only in the longer numerical values such as 5 and 4, and appear less often than in the first section. The shorter values normally consist of a contrasting faster gesture of some kind. **Appendix IV** shows the different texture mosaics outlined by the number series. The first value (5) has the fundamental present as well as double-stopped gestures in the violin, a texture commonly found in the first section. The chord used here is 4Bb-O and the double-stopped quartertone and vibrato techniques in the violin are a manipulation of the fifth partial. The texture then changes for the next value in the series (2), which uses melodic counterpoint between the clarinet and cello; a texture first used towards the end of section A. The third value in the series (1) changes the texture again, with a rapid passage of crotales and violin artificial harmonics related to the very opening. Mosaics of previous textures continue to be the main feature throughout the remainder of section **B**.

There are several occasions where two different number series are used simultaneously, in two instrumental groups. An overlapping collage of textures results, as the texture changes between these groups are not simultaneous. Bars 99-105 are an example of this with the strings using the series 2, 1, 4, 1.5, 3, 2.5, 5 and the clarinet and percussion using the series 2, 4, 1, 3, 5, 1.5, 2.5. There is also an interruption to the number series sequences by the addition of a 6/16 bar at measure

102, which breaks up the process. At the time of composition it became apparent that this interruption (and later interruptions of a similar nature) must occur at the end of a whole number in both number series for this to be possible. This led to careful selection of which pairs of numeric series would be possible to interrupt at the same time and demonstrates an acute level of planning for this section. The fundamental for this occurrence is F# and the harmony used is therefore 4F#-O, but the inversion of this chord is also used (refer to **Example 2.3**). As the difference between 4F#-O and the inverted chord 4F#-I and all other four-note chords devised is only one pitch, this note is simply added to the harmony at random points. As the different pitch corresponds to partial 15 in the harmonic series, a non-microtonal partial, no extra microtones are added to the harmony when using the inversions of any four-note chords.

Imitations (short canons) in inversion are also used in the middle section to add a further layer of development to the material. An example of this can be found between bars 106-11. The fundamental is F natural for this section with the imitation beginning from the last two beats of bar 107 in the violin, where there is a short melodic passage using the chord 5F-O as its basis. This is then followed by the clarinet two beats later using the inversion of this chord (5F-I). This also includes any quartertones, which are also inverted (refer to **Example 2.4** below). Imitation also occurs between the same two instruments in bars 110-11, as well as other points in the middle section. As the inversion of chord 5F-O, and the other five-note chords, is more distinctive and involves several different pitches, the inverted imitations are therefore more effective and contrasting.



Example 2.4. Imitation in bars 107-9

The climax for section **B** and the work as a whole occurs during the last fundamental division between bars 132-7. For this climactic occurrence, the fundamental is B and the harmony therefore a mixture of 5B-O and 5B-I. This section freely uses the numerical values from earlier number series, excluding the number 4. All parts use the same values excluding bar 135 to the first 3 beats of 136. The ensemble is divided here into two groups with the percussion and violin forming one group and the clarinet and cello the other. The predominant material is the aggressive repeated chordal gesture discussed above and developed further by this point. This material is harsh in sonority, with the strings again using double-stopping and the clarinet fluttertongue and multiphonics, as well as frequent quartertones. Short random silences are also added between these chordal arrangements where only the resonance of the percussion remains. This breaks up the texture and adds another layer of drama to the climax. The final occurrence of this repeated chordal gesture appears in bar 137 with all parts involved in a crescendo to ***fff*** supported by the tam tam.

The use of quartertones adds further intensity and dissonance to the gestures of section **B** and assists the work's climax. These intensifying uses of quartertones

support the chaotic concept of this section and demonstrate its more unpleasant, aggressive and uncomfortable nature.

Section C: bar 138-203

The final section of *The German Hills* is very similar to the first. The original Beethoven nine-note motif is used again in this section as drones, only they appear in reverse and above the main melodic texture rather than below the focal material as in section A. There is also a similar process of registral metamorphosis with section A, which gradually expands over time. This results in the drones gradually moving into the higher register, while the melodic material gradually lowers. The microtones used soon revert to eighth-tones as in the first section to once again reflect the calmer theme of the work's outer sections. These are again used for melodic inflection with some occasional uses to clash with vibraphone equal tempered pitches as discussed above.

Many of the instrumental roles are also reversed in this section. The first drone in this section initially appears in the clarinet at bar 140 with the main melodic line played by the cello. The cello remains the main melodic focus throughout the majority of the final section, with the clarinet and violin providing accompaniment using the original chords (refer to **Example 2.2**) or drones above these melodic lines. The percussion material again is based on short sporadic chordal material in the vibraphone, with crotales used towards the end accompanying the violin artificial harmonics now functioning as drones. There are also changes of timbre added to the drones as in the first section, such as fluttertongue and vibrato etc.

The same harmonies are used as in the first section only in reverse order to correspond with the retrograde of the drones. The same microtonal pitches are also utilised such as the fourth and fifth pitches of the chords as well as the added sevenths to the harmony. The main difference with these microtones is the register in which they appear, with the majority performed by the cello in lower registers contrasting with the mostly higher occurrences of section A. There is also a gradual thinning of the work's textures, with a slow decrease in the complexity and an expanding sense of space. This is particularly prevalent in the work's coda between bar 193 and the end of the work where the rhythmic space is stretched in between two repeating events in the cello and clarinet, and the violin and crotales. This gives the finale a sense of longing and reflection due to the strong relationship with the opening.

Conclusion

The microtones in *The German Hills* are used to colour the harmonies and textures of the work as well as intensifying its sense of expression. These colouristic techniques include microtonal bending and audible interferences between equal and non-equal tempered pitches resulting in colouristic blurring. By adding further dissonance, the microtones are also used to intensify the melodic passages that are so commonly found in the work, as well as its structure. This collectively results in an increased sense of disharmony and even unpleasantness in order to musically convey the work's main form of expression; the sense of discrimination and chaos that led to many fleeing their homes to become the fabric of a new culture in an adopted country.