In Search of Musical Language: an investigation of the Tone Clock as a *gestalt*-based approach to musical organisation

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Abstract

In this research, the concept of Peter Schat's Tone Clock and Jenny McLeod's extension of his theory are explored as a *gestalt*-based approach to composition, in the search for a holistic musical language. It aims to investigate the extent to which the Tone Clock can function as a holistic generative principle within composition. The 51,000-word thesis shows how Schat's and McLeod's work evolved from the mid-20th century, expanding its theoretical encompassment to a potential holistic musical language, with new insights drawn from McLeod's unpublished papers. Chapter 1 sets out the context. Due to its underrepresentation in music pedagogy, the Tone Clock's lineage is traced to position it in the history of contemporary Western classical music. Chapter 2 discusses Schat's theory and McLeod's extension of the Tone Clock, and how it suggests possibilities for a *gestalt*-based approach to musical organisation that can permeate multiple structural levels and musical space. Chapter 3 provides a detailed analytical commentary of each composition using the established theoretical framework, and indicates future directions for research. The portfolio of six compositions, totalling approximately 60 minutes of music, systematically explores how the Tone Clock can shape musical structures, including elements other than pitch. *Seven studies in interaction* investigates the interaction of 'minor' and 'MAJOR' intervallic poles, a fundamental part of Tone Clock theory; *An Exequy* explores my 'halftone' approach to understanding the Tone Clock; *The flood on which all move and wish to move* investigates spatialisation of the Tone Clock; *Form gulping after formlessness* explores the microtonal string harmonics, with the Tone Clock 'translating' these structures; *Sikah* maps the Tone Clock's organisational principle to 24-TET; *Auguries of Innocence*, a thirteen-piece song cycle (due to time limitations, only six pieces are included), unifies all compositional threads set out in the thesis and explored in the earlier pieces.

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List of Compositions

Seven studies in interaction (2021) 20 minutes

For solo piano

First six studies workshopped by Rolf Hind in 2024 (recording)

XIm–XIM (NotePerformer audio)

An Exequy (2021) 5 minutes 4 seconds

For symphony orchestra

NotePerformer audio

The flood on which all move and wish to move (2022) 5 minutes 8 seconds

For oboe, horn, and string quartet
Written for Ensemble 360
NotePerformer audio

Form gulping after formlessness (2023) 6 minutes 50 seconds

For string quartet
Written for the Arditti Quartet
Performed 11/5/23 in Firth Hall, Sheffield (recording)

Sikah (2024) 10 minutes

For Arabic ‘ud and harp
Melodies 1, 2, and 3
NotePerformer audio

Auguries of Innocence (2024) 15 minutes 47 seconds

For soprano, banjo, and cello
Songs 1, 2, 3, 4, 7, and 9
NotePerformer audio

In Search of Musical Language: an investigation of the Tone Clock as a *gestalt*-based approach to musical organisation.

Background

"What is music? Music is language." (Reich, 1963, p. 42). This quote by Webern embodies the conceptualisation of music as a language that has permeated music history. Messiaen's book *The Technique of my Musical Language* defines a personal expression of this concept where "language is considered from the triple point of view, rhythmic, melodic, and harmonic"; it "is not a treatise on composition", but an expounding of his compositional language (Messiaen, 1966, p. 7). Writing in the late 1970s, Boulez declared that the "utopian vision" of a unifying musical language had died with Schoenberg and the Second Viennese school (Boulez, 2018, p. 60).

Presenting himself as a Boulez reactionary, Peter Schat saw otherwise, and in 1982 proposed his Tone Clock (TC) theory of chromatic hours. Through a systematic investigation of Peter Schat's TC, and New Zealand composer Jenny McLeod's extension of his theory, I explore its potential as a holistic musical language through the concept of *"Gestalt"*. Meaning 'shape' or 'whole' in German, it defined a psychological movement to understand visual perception in the early 20th century, and was incorporated into TC theory by McLeod. In this research, I will draw parallels between the TC, other musical continuities, and larger structural concepts, to *gestalt*, with the goal of developing an extension of TC theory that McLeod had begun.

This extension has the potential to form a foundation for a unifying musical language, where interactive relationships within the musical 'field', as defined by McLeod (see p. 80), afford a purposeful manipulation of tension and release. From the inherent and

natural structural qualities of the 12 tones of the equal temperament system, as well as principles of sonic perception, comes holistic musical relationships that can apply to a larger musical language. Therefore, the concept of "language" and its application to music also needs to be defined to avoid superficial connections to linguistics.

My Musical Background

My musical background is admittedly unusual for the position I am in now. My contact with Western art music was extremely minimal until starting university, and music following the adoption of Schoenberg's 'emancipated' twelve tones was almost completely unknown to me. Having only previously been familiar with popular music and some non-Western music (particularly Arabic), my exposure to the breadth of Western art music–modal, tonal, and atonal–came all at once. As a result, atonal music was never segregated from modal and tonal music in my perception of this new sound world. I believe this played a part in my affinity for the TC upon my exposure to it, as well as my research direction and desire to find a holistic musical language.

Before learning of the TC, I was broadly experimenting with both tonal and atonal concepts. I felt overwhelmed at the potential possibilities for compositional structuring, but at the same time constrained and unsatisfied with the effects of the control I was exerting over a composition. No method, material, or process made me feel like I fully understood the effects of what I was creating.

Schoenberg's twelve-tone method was my main source of atonal control at this time, and Webern's approach to row division (particularly in his *Concerto for Nine Instruments*, Op. 24) particularly interested me. When challenged to compose with limited pitch material during my second year of undergraduate study, I instinctively chose to limit myself to three singular pitches–a triad–that underwent permutations as a separate continuity interacting with repeated rhythmic and thematic structures. This would prompt my lecturer (now

research supervisor) to recommend Schat's *The Tone Clock* (1993), as translated by McLeod. I had a similar reaction to Schat's theory as McLeod, where I experienced an overwhelming affirmation and recontextualisation of my creative thoughts, finding a lens through which I could view and understand music and the patterns I was instinctively creating.

I abandoned serialism and from here on composed using the TC, as defined by Schat, where I became increasingly interested in the control of deeper levels of musical structure. Towards the end of my undergraduate studies I read McLeod's extension of TC theory–*Chromatic Maps I & II* (1994)–and began experimenting with her developments, deepening my understanding of the capabilities of the TC for musical understanding and structural control. My interest in her writings and compositions became the topic of my MA dissertation, where I took her *24 Tone Clock Pieces* (written over 1988-2011) as a case study of a composer's changing use of the TC (Barker, 2020). As a result of this analysis, my own compositional explorations during my MA, and gaining access to McLeod's personal writings in Alexander Turnbull Library (ATL) in New Zealand, I was left with questions that I felt were important to explore.

Initial research questions

At the end of my MA I was in search of a dialectic bridge, between not only tonal and atonal approaches, but also the TC and other musical continuities. I was looking for something to help illuminate all the connections and interactions in music that I felt other musical organisational schemes did not provide, to move towards a potential (and possibly utopian) holistic musical language. I believed the TC was the starting point. My questions were as follows:

- What kind of control does the TC afford composers, and how can its influence permeate local and global levels of musical structure?

- How can the perspective of the TC enrich composers' control of the dimensions of the musical field, both horizontally (temporally) and vertically (spectrally)?
- How does the TC affect perception of musical structure?
- What are the benefits and consequences, both practical and musical, of methodically controlling deeper levels of musical structure through the TC?
- What is the TC's potential to be expanded to larger spheres of musical control, such as other divisions of the octave, non-pitch elements, larger structural forms, and even physical space?

An overview of TC theory

Before proceeding, certain concepts need to be clarified to aid the narrative flow. The TC itself needs some brief outlining because of its position in music pedagogy as an obscure, post-serialism theory of the twelve-tone, and to help contextualise its lineage.

The TC is a lens through which to view music, specifically the element of pitch in the context of the equal temperament system. Schat believed the triad (redefined to three non-repeating pitches of the twelve tones, forming two key intervals in its simplest form) to be the fundamental element of music, or the "minimal definition of tonality" (Schat, 1993, p. 57). He found twelve mathematically possible triads to which all others could be reduced, with each displaying a distinct intervallic colour, forming the 'hours' of his clock (see p. 51). The pitches of these hours (at any transpositional level) could be used in any order, with any amount of repetition and/or prolongation, and still be recognised as that hour. Strict order was renunciated, and the "note-mobility" of the pitches in the traditional triad was applied to the twelve triadic hours, thereby exploiting proximity to create fields of intervallic colour (Schat, 1993, p. xv). Schat found that each hour could be multiplied to fit the octave, where all twelve pitches were used without repetition. These chromatically saturated "hour-forms" created a secondary structure below the musical surface that functioned in the same way as

the TC surface (Schat, 1993, p. 58). If the triads functioned on the intervallic distance or proximity of the three pitches, this "steering" substructure did the same between the triads themselves–see, for example, four Hour I triads being steered by an Hour X tetrad (see p. 52).

McLeod developed Schat's principles in her seminal *Chromatic Maps I & II* (1994), giving TC theory far more nuance in its potential as a structuring principle and expanding its reach by integrating other concepts of organising the twelve tones. She contextualised the TC in a larger sphere of atonal understanding by translating Forte's set theory, Messiaen's modes of limited transposition, and Xenakis' sieves into TC interval notation, charting a map of all possible interval patterns, which she termed IPFs ("Intervallic Prime Forms") (McLeod, 1994, p. 3). These are similar to Forte's "normal order prime form" (Forte, 1973, pp. 3-4), but bring the analytical definitions of the sets closer to the musical surface through the use of movable interval notation, as well as prioritising features of the set indicative of its actual compositional effects, such as symmetry. This meant that non-triadic sets could be understood through the TC, and as also displayed by McLeod's use of the TC, Schat's bias towards chromatic saturation was renunciated and could be treated as a compositional tool, not something to be beholden to or maintained. Just as Schat had redefined the triad for the atonal world, McLeod would do the same for the concept of major and minor. McLeod extrapolated the intervallic make-up of the traditional major and minor triad to mean the major triad has its largest interval first, and the minor has its smallest interval first, allowing greater and more nuanced control of TC structures (McLeod, 1994).

In addition to these previously established TC concepts, it is also beneficial to briefly outline some concepts that I have either adopted and redefined for my work, or created myself:

- minor/Neutral/MAJOR (Abbreviated to: min/Neut/MAJ, m/Neut/M): A refining and extension of McLeod's definition and case-sensitive notation of

the concepts of minor and major. “minor” is always presented as lower case (even in abbreviation i.e. IIm or a minor Hour II triad), While “MAJOR” is always presented in upper-case. The intermediary “Neutral” which represents an interval pattern or hour with only one interval class (e.g. Hour VI or 2-2), is presented in a mix or upper and lower case.

- Hour purity/impurity: A way of describing how strongly the base colour of an hour is being presented. Simpler, more exposed uses of particular interval patterns will more strongly represent the base hour colour, while more complex or obscured uses (such as multiple transpositions used at once, dense counterpoint or chordal forms, or extremely prolonged uses) will mean more interpretations of the passage will be possible.
- Field/s: Adopted from McLeod’s personal writings, this is a holistic and inclusive term to describe the abstract musical domain and its limits. Existing in time and space, it has temporal (horizontal) limits, a beginning and end, vertical (spectral) limits, a highest and lowest point–it has “limits in every direction” (McLeod, 1980-1995, MS-Papers-7349-050). The term “field” can apply to any level of focus. For example, a temporal field could be a single beat, a musical section, or even a full piece. A field can also exist in physical space when performed. It is the role of the composer to inhabit the field and either consciously or subconsciously control it and give it structure.
- Half-toning/halftone fields: An adaptation of the visual analogy of “halftone,” a process used in visual reproduction and printing in which colours and gradients are produced through the use of small dots of colour. These atoms of colour, when close or overlapping one another, produce an optical illusion that tricks our perception into blending them together instead of seeing them as separate entities. My adoption of the term in music refers to forming

TC fields from two or more different hours. This is a less analytical reframing of McLeod's "12-note dual tonalities" (McLeod, 1994, p. 24)

- Interaction: The relationships shared between fields in a larger collective field.
- Substructure: A level of structure one or more steps removed from the musical surface.
- Recursion: Patterns that can be elaborated indefinitely by the same rules.
- Magnification: The derivation of larger structures from smaller ones, retaining the features that define the original structure.

Chapter 1 presents the lineage of the TC, which begins with Schoenberg's break from tonality. Chapter 2 deals with the TC directly, showing the concept as presented by Schat, then McLeods extension. The differing approaches of each composer is divided by a short section dealing with more general concepts needed to fully understand McLeod's extension and my development. Finally, in Chapter 3 I analyse my portfolio of compositions through the established theoretical framework.

Chapter 1: Tone Clock Ancestry

Earliest twelve-tone theory

Due to the underrepresentation of TC in both theoretical and compositional literature, it is important to contextualise it within Western classical musical history. The context from which it grew, its connections to other chromatic understandings, and its evolution, all need to be discussed to lay the foundation for its further development and connection to other musical and conceptual understandings. For the most part, I will proceed with this tracing of chromatic lineage chronologically. The following narrative connects parallels in musical and visual perception to lay the groundwork for a *gestalt* musical theoretical framework.

Early intervallic modality

The modal approaches of French, Russian and Hungarian composers in the late 19th and early 20th century, such as Rimsky-Korsakov, Debussy, Ravel, Stravinsky, and Bartók, presented a reaction to the Germanic musical world defined by Schoenberg. These interval-defined explorations can be seen as an early precursor to the thinking that defines the TC.

The Germanic ultra-chromatism of the late Romantic period, as defined by composers such as Wagner, and the later atonal world defined by Schoenberg, provoked nationalist responses to Germanic musical dominance (Antokoletz, 2014). French, Russian and Hungarian composers sought to find styles which were representative of their country, with some looking to national folk music and the modal scales used in them. Even in the early-mid 19th century, Russian composers such as Glinka integrated traditional folk elements into his compositional work (Woodside, 1990). His opera *Ruslan and Ludmilla* (1842) presented his first use of the whole-tone scale (Messiaen's Mode 1 or cyclical Hour

VI), as well as various other allusions and imitations of Russian folk music, dance and stories to create a "national opera" (Woodside, 1990, p. 68). Rimsky-Korsakov presented his first explicit use of the octatonic scale (Messiaen's Mode 2, or Hour II cyclical oedipus) in his tone poem *Sadko* (1867), with this piece and the aforementioned work of Glinka having a great influence on the French adoption of these modes by Debussy and Ravel (Baur, 1999). Later Russian composers delved further into this ethnology, with Stravinsky's early works presenting direct influence from Russian folk music, such as the frequent use of the octatonic scale in his work (Antokoletz, 2014). Hungarian composer Bartók also integrated folk music into his work, exploring whole-tone, octatonic, and particularly hexatonic sets (Russ, 1994). These modes were derived from Eastern-European folk traditions that used protoforms or features that were integrated by these composers into new symmetrical intervallic collections (Antokoletz, 1984). They can be described as transpositionally symmetrical, and function on the principle of an equal division of the octave being used to transpose a small intervallic cell, which is Schat's steering principle (discussed further on p. 51).

In addition to Debussy's extensive use of the whole-tone and octatonic modes, works such as his *String Quartet in G minor* (1893) and *La Mer* (1905) can be positioned as some of the earliest TC hour-like compositions. Both are saturated with the union of the intervals of a tone and a minor third, which are used in referential, unordered pitch collections and motifs (Yih, 2000) and also present shades of Schat's Hour VII. Debussy (and others) frequently made use of chromatic parallelism or 'planing', where traditional chord functions are replaced by parallel chord changes to create harmonic motion, which can be seen in his *Nocturnes* (1899) (Antokoletz, 2014). This essentially can be seen as related to Schat's steering, for example in the passage of descending dominant ninth chords in b. 14 of *Nuages*, which are uniformly transposed, with the first four chords being 'steered' by a Hour VII MAJ tetrad (323) (Debussy, 2002, p. 2). Even though the Germanic tradition, which

led to the SVS and serialism, is positioned as opposed to these modal and intervallic explorations, McLeod's (1994) *Chromatic Maps I & II* shows that both traditions were doing the same thing but with different approaches and materials.

Free atonality

The move towards the equalisation of the twelve tones and a subsequent twelve-tone compositional approach was not a sudden and radical change, and as Schoenberg always stated, it lay "along the path followed by the evolution of music, through the works of our greatly revered predecessors" (Schoenberg, 1984, p. 261). The increasing chromaticism of the late Romantic period, especially that of Wagner, led to the first step of what Schoenberg (1984, p. 260) later termed "the emancipation of the dissonance," where consonance and dissonance no longer fulfilled the hierarchical functions imposed on them by tonal music. They were no longer opposites–thus enabling the composer to explore the varying colouristic qualities of each, individually and together, without hierarchical constraints.

Works of this 'free atonal' period made use of intervallic cells as integrative referential elements which are transformed and combined in various ways, and used both horizontally (temporally) and vertically (spectrally), creating "microcosmic sets of fixed intervallic content" (Perle, 1991, p. 9). In Schoenberg's *Drei Klavierstücke,* Op. 11, No. 1 (1909) there are echoes of what would become Schat's Hour III, where transformations of the opening pitch cell of B, G♯ and G, with the intervals of a semitone and minor third, form the intervallic atmosphere of the piece (Antokoletz, 2014). Nevertheless, the use of these sets varied by piece and composer, with no unifying method yet appearing; some uses even with non-fixed use-order of the cell (Antokoletz, 2014), resembling the TC. With the twelve-tones no longer functioning through tonal hierarchy, what was gained in possibilities for tonal colour and expression was at the loss of the unified structural qualities and cohesion that tonality provided. Composers were beginning to think differently about how

to explore the continuities that make up music (pitch, rhythm, timbre, etc), which increasingly became separated, allowing each to be controlled as individual entities (Perle, 1991).

This period saw Schoenberg (and his contemporaries) move towards musical expressionism, mirroring the general trend in artistic aesthetics at the time. Schoenberg's first steps towards his 'emancipation' in 1908-9 did not occur in isolation from either earlier musical theory or the aesthetics of the visual arts. A noticeable shift away from pictorial representation in the works of Kandinsky also occurred over these two years, where traditional artistic illusions like perspective were abandoned. The objects of his paintings became abridged to the point of abstraction, separating the artistic semiotic object from its sign through the distortion of the latter to create an "emancipation of colour and form" which "corresponds to the emancipation of [the] dissonance" (Hahl-Koch, 1984, pp. 141-142). Traditional structural concepts of both mediums were dissected; realistic object representations were fully abandoned for new shape and colour 'atoms' interacting in the visual realm, mirroring the same use of rhythmic, textural, and pitch-related 'atoms' in free atonal composition after abandoning tonality. A trend towards separation of the perceptual continuities of both mediums, where rhythm can be separate from pitch, and colour can be separate from shape, represents a shedding of past structural constraints to find a way to "express the primordial" (Hahl-Koch, 1984, p. 142). Schoenberg wanted to express the natural and almost innumerable possibilities of the twelve tones without hierarchical limitations, and Kandinsky wanted to express the possibilities of colour, shape, and pattern without limitations of congruence of object and sign. Expressionism's aesthetic concerns revolved around expressing something deeper than just physical representation; it was the artist attempting to "render their emotions visible on the surface of their chosen medium" (Makela, 2002, p. 42).

This trend between the two artistic forms–visual and sonic–suggests there is at the very least some overlap between these realms, and perhaps even that the perceptual experiences of both senses can be understood in similar ways or share principles that define their structure. This connection is something that will serve as an undercurrent to my exploration of the TC and its lineage; a connection that was also recognised by McLeod.

Twelve-tone Serialism: Schoenberg and the Second Viennese School

The beginnings of the concept of unified chromatic organisation lie in the desire to find order and structure after this period of 'free atonality'. Two figures led this movement–Schoenberg and Hauer, and in the early 1920s, both independently arrived at concepts to organise the total chromatic. Schoenberg and the Second Viennese School (hereafter referred to as the SVS), as well as twelve-tone serialism more generally, are topics that are well-represented in music scholarship. That being said, understanding the position they take in the post-tonal epoch is essential to understanding the birth of the TC, as Schoenberg's serialism and its followers constitute the environment that Schat was formed by, but ultimately rejected. After Schoenberg (and the other SVS composers not long after) made the move to writing consistently atonal works, they would face criticism of "anarchy and revolution," but Schoenberg would maintain that it was "evolution, and no more revolutionary than any other development in the history of music" (Schoenberg, 1980, p. 86). In his *Harmonielehre* (1911) he stated that even in "ultramodern" music (talking of the free atonal period), there may be "something corresponding to tonality," but that they simply didn't know how to explain it yet (Schoenberg, 1978, pp. 128-129) (see also Schoenberg, 1980, p. 86). The final step of his "emancipation of the dissonance" was in the substitution of a new unifying force in place of tonality–twelve-tone serialism, or "composition with twelve tones related only to one another" (Schoenberg, 1980, pp. 261-263).

Openly refuting any claim at a universal twelve-tone 'system', he is very careful to describe it as a 'method' to be used as a compositional tool (Schoenberg, 1980, p. 213). This system revolves around the constant use of an ordered twelve tone row without tone repetition, which "functions in the manner of a motif" to define the melodic and harmonic materials of the piece (Schoenberg, 1980, p. 219). The forty-seven other rows "automatically derived" (totalling forty-eight), divided into prime, inversion, retrograde, and retrograde-inversion categories, would form the melodic, harmonic and to some extent structural basis of composition (Schoenberg, 1980, p. 225). Schoenberg's 'method' developed through the late 1920s and early 1930s; his striving for a more pure expression of 'atonality' was expressed through a more controlled and conscious set construction. At first, this would result in his use of "semicombinatoriality," a hexachordal aggregate relationship that can be seen in most of his twelve-tone compositions (Babbitt, 1950, p. 265). In later works, his interest in these relationships would go further to use "all-combinatorial" sets, of which there are only six (Babbitt, 2003, p. 42). This is where the combinatorial relationship is extended to "*all* of its transformations and one, or more, of its own transpositions" (Babbitt, 1950, p. 265). The obsession with maintaining pure 'atonality' with no allusions to tonal music would be maintained by the serial lineage as started by Schoenberg, and continued to be prevalent in Schat's time at Darmstadt.

Schoenberg, Berg and Webern all had different approaches to their use of twelve-tone serialism. Additionally, their stringent application of twelve-tone 'rules' is something that has been overexaggerated, as each composer evolved over time to display their individual idiosyncrasies and compositional proclivities in their use of it. Berg and Webern took opposite directions from Schoenberg's starting point. While Berg looked to the past and to tonality, Webern looked to abrogate all tonal allusions as well as traditional structural compositional schemes.

Berg would consistently challenge the 'rules' of twelve-tone composition as set by Schoenberg, and was critical of the lack of expressiveness in Schoenberg's early twelve-tone serial works (Adorno, 1991). In Berg's second opera *Lulu* (1937), he displayed his unique and personal use of the twelve-tone method. Firstly, contrary to Schoenberg's rule, Berg made use of many twelve-tone sets in this one piece, and while some of these can be seen as "Schoenbergian" in structure, his use of them diverges from his teachers (Perle, 1985, p. 85). While Schoenberg's sets are seen as retaining their identity no matter the transposition or direction (P, I, R, RI), Berg treats his sets as having distinct melodic contours that are mostly maintained in their use (Perle, 1985). He also made use of unordered intervallic sets resembling those of Hauer's 'tropes' (see p. 26) (Perle, 1985). The use of unordered intervallic sets is unusual for the time, aligning less with the SVS, and more with Hauer. Finally, Berg pushed against the pervasive view that twelve-tone music should avoid any possible reference to tonality, with his overt mixing of suggestions of tonal harmony and dodecaphony, whereby the twelve-tone set implies tonal elements in its construction and therefore implies tonal harmonic movement (Perle, 1991).

Berg's compositional language also shows a persistent interest in a unique form of symmetry, which can be seen across the full span of his compositional output: the interval cycle. In the period of free atonality, Berg was the most "obviously preoccupied" of the SVS with trying to "regain a normative procedure", with interval cycles taking this position to "define harmonic areas, generate thematic elements, and serve as means of progression", as can be seen in *String Quartet*, Op. 3 (composed 1910, published 1920) (Perle, 1977, p. 4). Even after his adoption of the twelve-tone serial method, Berg would still often use interval cycles subjected to serial ordering, as in the first movement of his *Lyric Suite* (1926), where its serial structure is derived from the "interval-7 cycle" (Perle, 1977, p. 21). The use of interval cycles and the perceptual effects of their unique construction is something I explore in *IIIm–IIIM* from my *Seven studies in interaction* piano set.

If Berg was pushing the boundaries of serialism by looking to the past, Webern can be seen to have done the opposite. Consequently, he became the figure revered by the second wave serialists of Darmstadt. Even in the period of free atonality, Webern separated himself from Schoenberg's expressionism and Berg's romanticism.

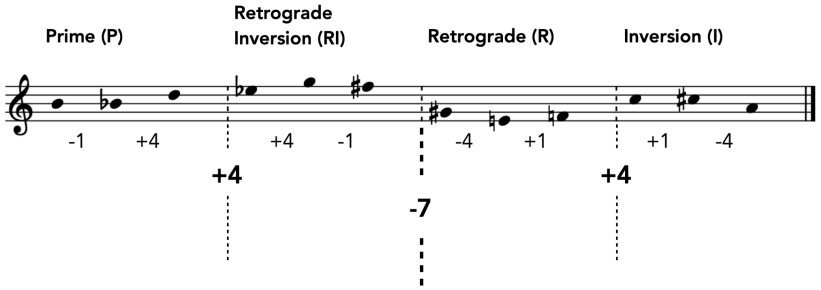
Webern adhered to the principles of Schoenberg's twelve-tone method more closely than any of the SVS (Antokoletz, 2014). Webern's precise and extremely structured style can be seen as a move away from Schoenberg's expressionist influence into a "New Objectivity" in compositional style; a movement also found in visual arts at the time in the Germanic world (Antokoletz, 2014, p. 237). Even as early as his *Six Bagatelles*, Op. 9 (1913), in particular the fifth piece, echoes of what would influence Darmstadt's extension of serial procedure to other musical continuities is evident. He begins to uncouple the elements that form music (in this piece, pitch and dynamics) into separate continuities which can purposely interact with each other, and his obsession with symmetry unifies them through a central point of reflection in the piece (Antokoletz, 2014). Traditional building blocks of musical structure, such as theme, are mostly irrelevant to Webern's style. Instead, the serialisation and influence of the row is extended to other elements like rhythm, timbre, dynamics, articulation and textural ideas (Perle, 1991). The extent to which this systemisation is conscious and fully formed is something that later scholars have reflected on as being slightly overexaggerated by the Darmstadt total serialism movement, to the point of mythologising Webern's works (Brindle, 1987).

We can trace Webern's extension of serialised elements back to Schoenberg's '*Klangfarbenmelodien*', which he discussed in his *Harmonielehre* (1911). He defines three aspects of musical sound (*Klang*): "pitch, colour [timbre], and volume", where the second–Tone-colour (*Klangfarben*)–is the defining aspect of our perception of a musical sound (Schoenberg, 1978, p. 421). Schoenberg (1978, p. 421) would state that "if it's possible to

create patterns out of tone colours that are differentiated according to pitch" then "it must be possible to make such progressions out of the tone colours of the other dimension".

As well as his distinct structural explorations, Webern's use of the twelve tones was also defined by symmetricality in multiple ways. As previously mentioned, not only could twelve-tone rows be defined by divisions into smaller subsets, but even in the period of 'free atonality' small intervallic sets were used to form referential elements. Webern took this idea and distilled it into a way of expressing a whole piece through one microcosmic element. In his *Concerto for Nine Instruments*, Op. 24 (1934), his row is based on a single three-tone cell that when combined with its transposed RI, R and I, forms the twelve-tones, and an intervallically economical row:

Fig.1: The row used in Webern's Concerto for Nine Instruments, Op. 24 (1934), with intervallic analysis



In its ordered form, only the intervals of a semitone (1) and a major third (4) are used in each three-note subset, and there is a point of symmetry between the two subsets of each hexachordal half (P and RI, R and I). The intervals between each subset form another point of symmetry where the interval pattern of 474 appears, a secondary structure which we can begin to link to Boulez's 'frequency multiplication' and Schat's 'steering'. Even in its ordered form, an anticipation of what will be Schat's TC is immediately evident; the focus on repeated triad interval structures, the use of four transpositions of the original triad structure to form the twelve-tones, and its secondary level of intervallic structure. If we remove the parameter of order from each subset, Webern's row can be expressed in the manner of

Schat's TC, clearly showing its intervallic colour, where four Hour III (1-3 or 3-1) triads are 'steered' by an Hour V tetrad (151)–described as "Webernian" by Schat (1993, p. 61):

Fig.2: TC analysis of the row used in Webern's Concerto for Nine Instruments, Op. 24 (1934).

In contrast to Schoenberg's increasing interest in combinatoriality, which maintained the 'strength' of atonality, Webern made use of a concept called "strict inversional symmetry", which creates a "kind of tonality" by prioritizing pitch-classes (Antokoletz, 2014, p. 44). Combinatoriality is maintained through pairings of prime (P) and inversion (I) set forms in parallel motion (resulting in a perfect 5th interval difference between all pairs); strict inversional symmetry is "conversely maintained by transposing the two set forms in each P/I pairing in opposite directions by an equivalent number of semitones" (Antokoletz, 2014, p. 44). In doing so, a "sum of complementation" is maintained, which creates an "axis of symmetry" around a single pitch-class, assigning it a heightened importance incompatible with Schoenberg's original theory (Antokoletz, 2014, p. 44). This concept, when joined with interval cycles, forms the basis of a branching continuation to serialism distinct from the Darmstadt composers: American composer George Perle's (1996) "twelve-tone tonality". This concept defines many post-1928 pieces by Webern, but the larger concept of symmetry is obsessively exploited by him, affecting all aspects of his compositional expression.

Symmetry, and by extension his use of palindromic structures, defined many structural aspects of his *Symphony*, Op.21 (1929). Explicit palindromes of "forward statement[s] of material followed by its exact reversal" are used in both smaller scale thematic constructions and across larger structural areas (Bailey, 1983, p. 185). An extension

of the row's mirrored intervallic contour, the second movement (variations) presents a recursive palindromic structure, where "the Theme and Coda and all the variations except IV are direct palindromes" (Bailey, 1983, p. 185). Variation IV acts a central fulcrum of the large scale palindrome, and also presents another symmetrical formation exploiting the row's unique qualities, where the prime row and the inversion row-form three semitones higher creates dyad pitch-class units in a graduated pattern of symmetry (Bailey, 1983). Unity of material (the row) and structure, with the former influencing the construction of the latter, is something I frequently exploit in my compositional practice.

Twelve-tone serial theory, and the composers who espoused it, established several features that would still be present in Schat's TC theory. While a pitch-based understanding of the twelve tones is woven into serialism's theoretical construction, the interval takes on an assumed importance, shown by how the SVS approached row construction, use of interval cycles, and conceptualisation of rows. By recognising that any transposition of the row is structurally equivalent to any other, and that row derivations (P, I, R, RI) are also expressions of the row corresponding to the "principle of the absolute unitary perception of musical space" (Schoenberg, 1984, p. 225), the implication is that the perceptual form or *gestalt* of this structure (and any pitch-structure) is defined by its intervallic make-up. Across transposition and transformation, pitch structures maintain their intervallic structure, and when these structures are ordered (e.g. twelve-tone row) the expression of the set's intervallic colour is strictly maintained. Berg's exploitation of interval cycles and Webern's purposeful engineering of row divisions to express intervallic purity are both further articulations of the interval's importance. This demonstrates that the relationship between objects (as an abstract concept) is more important than the objects themselves.

This concept represents a facet of a larger perceptual framework for understanding music: *gestalt*. The notion that transposed melodies retained their identities had already been recognised by *gestalt* psychologists in the early 20th century (Koffka, 1935, p. 460).

Additionally, it has inherently been accepted through the history of Western classical music that even through motivic transformations, such as inversion, retrograde, fragmentation, and various rhythmic rewriting, *gestalt* is retained and audibly recognisable when contour is preserved. This concept forms the basis of the compositional technique outlined by Schoenberg in his *Fundamentals of Musical Composition* (1967), where coherence is managed by the retention of elements. It is also recognised in contemporary contour theory and *gestalt* theory that shape and extremity is an "essential element of categorisation" in our perception, "where cognition begins at the very periphery" (Terhardt, 2016, pp. 135-136). The symmetrical proclivities of all the SVS composers is a further representation of this retention of tonal-colour (and shape) through interval relationships, but also of the overlap of visual and sonic realms. In addition to the inherent symmetrical construction of row derivations–vertically in inversion, and horizontally in retrograde–all the SVS composers explored symmetry as a concept to be used in all aspects of musical structure, which is a concept that earlier composers also exploited (Puffett, 1996). Symmetricality is a feature of both visual and sonic perception, such as shapes, colours and forms mirrored on a canvas, or rhythmic, pitch and structural forms mirrored in the sound field (either temporally or spectrally).

Even the concept of a circle or cycle has rotational symmetry, a concept which I later apply both to pitch (in *VIIm–VIIM*) and to physical space (in *The flood…*). Symmetrically related patterns are perceptually grouped because of their shared *gestalt*, functioning through the principle of similarity (discussed below p. 83), and are even defined as "one of the five basic *Gestalt* 'principles of organisation' suggested for form perception" (Freyd & Tversky, 1984, p. 109). Symmetry's prominence as a structural paradigm in both visual and sonic art is, therefore, unsurprising. It is a way of controlling perceptual groupings, enhancing structural coherence by enabling easier perceptual detection of form, and an

"economical organisation factor" that is a fundamental part of how humans perceive the world around them. Symmetry is also prioritised in McLeod's development of the TC.

Schoenberg's emancipation of the dissonance embodied the move toward musical expressionism, defining the free atonal period and mirroring the similar cultural movements in visual arts of the time. Nevertheless, his later formation of twelve-tone serialism would push music away from expressionism and into the burgeoning aesthetic movement of New Objectivity. Defining Germany's Weimar era (1918-33), the art of New Objectivity would express a "desire for order" and "a clear and simple style", initially as a revolt from expressionism (Makela, 2002, pp. 48, 51). Similar desires were pursued by Schoenberg and the SVS (and Hauer), where they would expound a theory that attempted to regain the structural qualities lost in the abandonment of diatonic tonality in the early 1920s, just as New Objectivity re-established art being "representational" (Makela, 2002, p. 47). Berg's look to the past for influence in his twelve-tone style connects parts of his oeuvre to French Impressionism and Debussy, such as his use of "fields of static suspension", where the music submits to sustained harmonic uniformity (Adorno, 1991, p. 38). However, Webern's extreme distillation of form, texture and colour, which came as a natural extension of his use of serialism, would position him as the proponent of the New Objectivity aesthetic–even more so than Schoenberg, whose expressionist influences remained even after his move to serialism. Webern's compositional style would go on to take an almost mythic position in the next school of serialists.

Twelve-tone Tropes: Josef Matthias Hauer

Josef Matthias Hauer is an unusual musical figure; outside the German speaking world, he is mainly known in connection to Schoenberg and twelve-tone music, and the contentious debate of who reached their concept for organising the total chromatic first. His actual theories however, and his compositional output even more so, are mostly overshadowed by

the monumental influence of Schoenberg's serialism. Hauer was a composer and theorist from Vienna, who maintained a wide circle of connections and friendships with the cultural elite in the early 20th century. He was closely associated and would meet to exchange ideas with philosophers, writers and painters, such as Bauhaus colour theorist Johannes Itten (Gustafson, 1979). Apart from a few notable exceptions, Hauer's work, both theoretical and compositional, was not well received, and his fame became notoriety due to the growing animosity between him and Schoenberg (Gustafson, 1979). Hauer believed that Schoenberg had stolen his concept for organising the twelve-tones, and even went so far as to use anti-semitic remarks in tirades against Schoenberg to his colleagues (Gustafson, 1979). Schoenberg's own responses to Hauer's work and the situation were far more measured. Compositionally, Schoenberg believed Hauer's work to "appear more as examples of theory than actual compositions themselves" (Harvey, 1980, p. 25).

Hauer called his method for organising the twelve tones by many names, but it is most often referred to as 'tropes'. While this concept first appeared in an article by Hauer in 1921, his theoretical output is expounded in detail in three main treatises. Hauer's theoretical works are not simply a presentation of his theory of tropes and his compositional processes; every part of these writings is overtly intertwined with his world view and influences. The first, from 1923, *Vom Wesen des Musikalischen: Grundlagen der Zwölftonmusik*, is Hauer's perspective on atonal music in the free atonal period, in which he presents his "*Nomos*," or "law" of atonal melody. This is formed from three points; the first is that atonal melody is born from the equal temperament of the twelve tones, and is therefore only "of value purely on an equal-tempered instrument" (Harvey, 1980, p. 142). This instrumental bias led Hauer to have a strict favouritism for the piano (and other analogous keyed instruments), which most closely aligned with his wants in an instrument.

Hauer's second assertion is to avoid giving individual tones implied importance, something which Hauer and Schoenberg would both espouse. Hauer states that in a

tone-row, "no tone can be repeated, and non omitted" so that "no scale degree significance or leading-tone track can arise" (Harvey, 1980, p. 143). This rejection of any structural functions that may imply tonicisation or older ideas of tonality was a common element of much post-tonal theory and music, especially in its beginnings. Schoenberg doubted the validity of Hauer's assertion of this by attacking his use of tropes (Schoenberg, 1984).

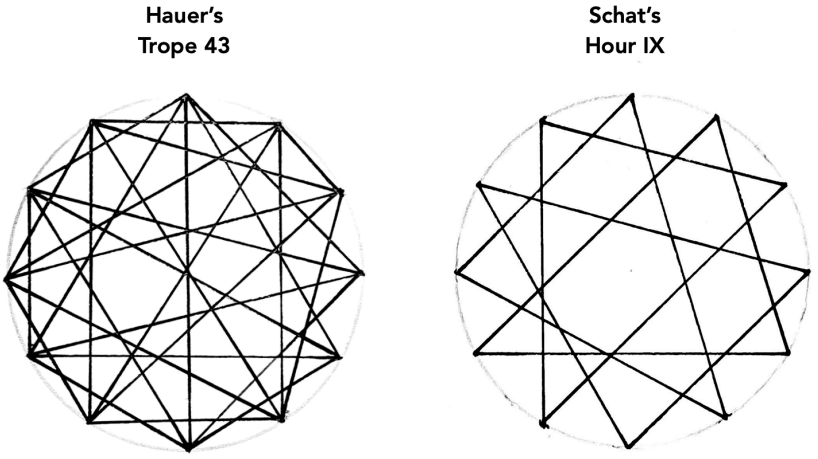
Finally, and most significantly, is the importance Hauer places on the interval instead of the tone. This is very interesting considering that the post tonal pedagogy from Schoenberg up until Schat's Tone Clock was mostly dominated by a fervent focus on the individual tone or pitch-class, and while both Hauer and Schoenberg agreed that sets in their respective theories, regardless of the transposition, maintain a consistent identity, Hauer was the one who would prioritise intervallic content rather than pitch (Perle, 1991). Contrary to the prevailing views of the time, Hauer believed that individual tones were not the defining element of tone colour, but that "the ratio of the fundamental to the interval determines the musical character of tone colour. The quintessence of any tone-colour is therefore determined by two tones (an interval, the simplest chord) and their interval ratio" (Harvey, 1980, p. 85). This is a very enlightened view for the time, and one which would be shared and extended by Schat and McLeod.

Hauer's other two treatises, *Vom Melos zur Pauke: eine Einführung in die Zwölftonmusik* and *Zwölftontechnik: die Lehre von den Tropen*, both from 1925, display his trope theory in detail for the first time. Tropes are a division of the twelve tones into unordered, bipartite structures, with each half being related through "quite precise interval-relationships" (Harvey, 1980, p. 190). He lists his 44 tropes in a table with each being depicted as two hexads divided by a bar line (Fig.3). Hauer is careful to state that

Fig.3: Hauer's Trope 1 (Harvey, 1980, p. 189)

their transpositional level is irrelevant as it is their interval relationships which define them, and he begins to describe the multiple different relationships between each half's intervals (Harvey, 1980). These tropes were used to derive both spectral (vertical) and temporal (horizontal) material, and he thought of tropes as replacing traditional keys (Harvey, 1980). Hauer would go on to refine and further explore the tropes and their idiosyncrasies, grouping (and renumbering) them into four subcategories based upon their internal symmetries, and presenting them as circular geometric line diagrams (Harvey, 1980, pp. 167-170). Their depiction is strikingly similar to Schat's visual representation of his TC hours, as well as my spatial translation of the TC used in *The flood…* and *Auguries of Innocence*:

Fig.4: Comparison of the visual representations of Hauer's and Schat's theories.



There is a conflicting dichotomy in Hauer's work. In his explanation of tropes, he consistently frames the examples of their use as his own compositional practice, and that "no rules or conventions should be set up here", instead rationalising his compositional insights as

"laws" (Harvey, 1980, p. 215). Unlike Schoenberg, Hauer preached that his theory was a universal language of atonal music, but his compositional use of tropes was rigid and unimaginative, hardly highlighting its "universality", which will have affected the reach of his work (Harvey, 1980, p. 29). His compositional output also implies a quality of disposability to his works; from 1912-1939 he wrote 92 opus-marked works, but from then on it is believed he composed around a thousand unmarked works (Harvey, 1980). The latter period of Hauer's compositional output is almost exclusively "twelve-tone games" (usually for piano or harpsichord), of which Hauer would dejectedly state "music died long ago. Now it is only a game of mathematics", and told a visitor to "throw them away; I write a new one every day" (Harvey, 1980, pp. 19, 250). His conflict with Schoenberg, his inflated ego, and rigid compositional output seemingly fueled this isolation from a larger compositional influence.

Hauer's writings are more than just a presentation of his atonal music theory. Reflecting his wide influences, all his theory is deeply entwined with interdisciplinary connections, particularly that of colour theory. Even though Hauer's tropes were far less influential, they bear in many respects a closer resemblance to the TC's theoretical construction. But as there is no written link between Hauer and Schat, this connection can only be speculation. Firstly, Schat's work can be aligned with Hauer's work in one key point of perspective; while serialists were focused on the importance of the pitch-class, Hauer believed that "musical character" is expressed "only" through "the totality of the intervals and tone-colours" (Harvey, 1980, p. 142). He even recognised that interval patterns are more finite than at first glance, where out of the "endless number of intervals within an octave", the "others are, to be sure, only repetitions" which echos the twelve possible TC triads which all others can be reduced to (Harvey, 1980, p. 102). In describing the harmonic series, he also implies the concept of recursion being inherent in music, whereby "each

tone carries in its harmonic series a scale in itself", with "melody" being a "synthesis of multiplicity" (Harvey, 1980, p. 101).

Overlap of the visual and sonic realms is just as apparent in Hauer's work as in serialism, if not more so. The visual depictions of Hauer's tropes and Schat's TC are kindred in construction and overtly express both of their 'cosmic' ideas, in addition to a connection to visual perception. Both are circular arrangements of the full chromatic cycle, with geometric patterns emerging as a result of interval patterns being applied to the circle. To Hauer, these patterns aided in "assimilating the rationality of the system", in addition to giving "visual as well as audible form to his music" (Harvey, 1980, p. 71). Schat ascribed a similar reasoning, describing them as a "visual analogy which can be read accurately in musical terms" (Schat, 2002, III). In addition to both composers recognising the compatibility of form in both sound and image, each presented theories laden with connection to the concept of colour. Hauer's written theories (as translated in Harvey, 1980) are intrinsically entwined with his interest in visual colour. Goethe and his *Theory of Colours* (1810) is liberally referenced, where long excerpts are used "to make analogies and corroborations of his own theories" (Harvey, 1980, p. 44).

Hauer's connection to visual arts and colour theory extended to his circle of connections, where he formed a composer-artist relationship with Bauhaus artist Johannes Itten, similar to that of Schoenberg and Kandinsky. Hauer stated that Itten's art "corresponded to his 'atonal' method of composition", and Itten was inspired by Hauer's "colour circle": an arrangement of colours "according to musical principles" (Harvey, 1980, p. 10). Hauer would also assign colours and characteristics to the individual intervals of the octave, a concept not unusual for composers, with keys being assigned colours by Scriabin and Rimsky-Korsakov (Harvey, 1980). Each of Schat's hours are accompanied by similar descriptions of colour and mood, none of which are objective but purely personal, which represents both Schat's and Hauer's "return to the musically original experience in its

spirituality" (Harvey, 1980, p. 94). On the differences between Hauer and himself, Schoenberg stated "he sought his solution in the cosmos. I limited myself to the human brain available to me" (Schoenberg, 1984, p. 212). Hauer saw music as something more than sound, expressing something cosmic and spiritual, a philosophy that faded until Schat's break from the second-wave serialists.

Later serialism and attempts at musical structure

After this early period of attempts at chromatic organisation and understanding dominated by Schoenberg's serialism (and Hauer's tropes), atonal music theory expanded into a larger and more diverse field. As with the individual use of the serial method by different members of the SVS, developments in chromatic organisation theories were highly individualistic, even when following particular schools of thought. This period is also when composers sought to control deeper levels of structure, a concept which not only defines the TC, but also much of my own work. This next phase of atonal composition can be split into two branching aesthetic areas: those whose work and theories constitute a direct continuation of the serial oeuvre (and tangentially of Hauer's teachings too), and those whose work either lies outside of this trajectory with non-serial theories (such as Messiaen, whose influence lies both in and out of Darmstadt).

Darmstadt: the new serialists and substructural explorations

Although the composition of twelve-tone music did not cease during WWII, its development and dispersion was certainly disrupted, and the increasing influence of the Nazi party and Hitler's rise to power in 1933 had a profound effect on the SVS composers. The increasing hostility towards Jewish people meant that Schoenberg had to flee to the United States in 1934, and the composers that stayed in central Europe saw their music branded 'degenerate', leading to its suppression (Antokoletz, 2014). Composers such as

Webern and Bartók were even led into extreme poverty because of this (Brindle, 1987). Both Berg and Webern would not live to see the next development of the new musical language they helped define, with their deaths bookending the war–Berg dying in 1935, and Webern in 1945. The war's conclusion saw a rebirth for modern music; where serialism was once banned, it was now "a symbol in the post-war years of spiritual and intellectual freedom and renewal" (Brindle, 1987, p. 8). The continuation of serialism would radiate from the location of its conception, Germanic Europe.

The most significant continuation in Europe of the serial work of Schoenberg–or perhaps more accurately, Webern began with the founding of the Darmstadt International Summer Courses for New Music in 1946. Even though Webern's student, René Leibowitz, came to teach at Darmstadt in 1948, none of their teacher's serial developments were taught–only that of Schoenberg's original method (Brindle, 1987). What would come to be the Darmstadt 'style', and that of the rebirth of modernist music after the war period, was highly influenced by the late style of Webern. This change began when Olivier Messiaen began teaching twelve-tone technique at Darmstadt in 1949, where he would espouse concepts like the extension of serial technique to elements other than pitch, which were born from Webern (Antokoletz, 2014). Messiaen's serial teaching in this period culminated with his piano study *Mode de valeurs et d'intensités* (1949), where serial technique was extended to duration, articulation and dynamics (Delaere, 2002). However, Messiaen's use of pitch cannot be described as serial. He makes use of a 36-tone mode (three twelve-tone groups), and while the pitch sequence isn't ordered like a serial row, in each of the three twelve-tone groups, pitches have a different but fixed register which occurs in a non-transposable pitch sequence (Toop, 1974). Messiaen's interest in modes and non-transposability is something that will be discussed later, as it forms part of his compositional language independent of Darmstadt and serialism.

Griffith (2010, pp. 5, 34) recognises that Darmstadt composers like Boulez recognised Webern as a "touchstone of unflinching modernism", but he also suggests that John Cage's views on the characteristics of sound are the starting point of total serialism. Cage's views expressed on the structure of sound in 1949 could have been influenced by Schoenberg's aforementioned *'Klangfarbenmelodien'*, to which Cage adds one more characteristic of sound: "pitch, timbre, loudness, and *duration*" as well as sound's "opposite and necessary coexistent", which is silence (Cage, 2009, p. 63). Nevertheless, both Webern's and Cage's influence contributed to the aesthetic landscape at Darmstadt, with trends towards greater systematisation of musical elements and the concept of sound being dissected.

In the early 1950s, this new musical aesthetic, influenced by Webern but pioneered by Messiaen, was taken up by five Darmstadt members: Luigi Nono, Bruno Maderna, Karel Goeyvaerts, Karlheinz Stockhausen and Pierre Boulez. While all were working within their own oeuvre, they all also represent a movement towards greater systemisation of compositional elements. Their views on this move away from Schoenberg are exemplified by the incendiary written protest by Boulez, "Schoenberg is Dead", in which he argues that the full potential of serialism was never realised by its progenitor (Boulez, 1991, p. 212). The key point of contention raised by Boulez is that he believed the thematic and constructional elements of music that Schoenberg retained from pre-twelve-tone composition, were "historically unconnected with dodecaphony" (Boulez, 1991, p. 212). Therefore, a "yawning chasm opens up between the infrastructures of tonality and a language whose organisational principles are as yet but dimly perceived" (Boulez, 1991, p. 212).

With Schoenberg's investigation of serialism being entirely biased towards pitch, Boulez believed that the whole concept of the row creating "semantic unity" is already corrupt, as it is tainted by expressing it through a "pre-existing, non-serial, rhetoric" (Boulez, 1991, p. 213). It was through Webern, who Boulez states "investigate[d] the

musical EVIDENCE arising from the attempt at generating structure from material", that the *language* of serialism could be illuminated (Boulez, 1991, p. 214). This would be achieved through viewing and controlling other elements like "the four constituents of sound: pitch, duration, dynamics/attack, and timbre", and maybe even "intervals other than the semitone: micro-intervals, irregular intervals, complex sounds", through serialism (Boulez, 1991, p. 214). In addition to this, Cage's rejection of harmony as the defining quality of musical structure, in favour of duration (both sound and silence) and rhythm, would mean that the spectral (vertical) and temporal (horizontal) dimensions of music were becoming equalised and defined through serial technique (Shultis, 1995).

Goeyvaerts and Stockhausen not only represent some of the first steps in the total organisation aesthetic, but also a desire for deeper levels of structural control. Goeyvaerts' compositional talents and influence were, in many ways, unappreciated and largely overshadowed by Stockhausen and Boulez, even though he arguably had just as much influence on this developing oeuvre. Much like Jenny McLeod, Goeyvaerts is a difficult composer to define briefly. His compositional style, like McLeod's, was frequently and drastically changing, and both also took an extended period away from the music world (Delaere, 1994). However, it is Goeyvaerts' development of serialism and ideas of substructure, produced while at Darmstadt in the early 1950s, as well as his connection to Stockhausen, which are of most concern to this discussion. His developments were born from the union of Messiaen's teaching and Webern's (and Cage's) influence.

Goeyvaerts brought his *Sonata for Two Pianos* to Adorno's Darmstadt composition seminar in 1951. The piece's pitch material is formed from a constant alternation of two heptads, which overlap on E♭ and A, and act as ever-present fulcrums through which the other material is contextualised (Iddon, 2013). On each heptad use, pitch classes are upwardly displaced by an octave, with the exception of the fulcrum pitches, which serve another function as the substructural determinants (Iddon, 2013). This governed his

so-called "synthetic number" principle, whereby each pitch is categorised by its distance from the fulcrum pitches by being assigned an integer of 1, 2, or 3, with the fulcrum pitches being 0 (Iddon, 2013, p. 54). Integers are also applied to other musical parameters (duration, dynamics and articulation) so that each musical 'point' can add up to 7; while he does 'cheat' sometimes to achieve this value, the piece still remains one of the "most highly deterministic pieces" of this musical movement (Iddon, 2013, p. 55).

This concept is representative of how he viewed his work in this period, as he says that he saw his compositions as "'static music', i.e., music conceived as a projection in time and space of a basic idea generating the structure" (Goeyvaerts, 1994, p. 45). Also regarding this piece and his synthetic number principle, Goeyvaerts (1994, p. 45) recalls that "there was only one young man who saw something in it and asked me more about it: Karlheinz Stockhausen". When there was pushback from the old guard of the serial world, Stockhausen supported Goeyvaerts when his piece was critiqued by a baffled Adorno, with the response "professor, you are looking for a chicken in an abstract painting" (Iddon, 2013, p. 57).

Goeyvaerts' work and relation to Stockhausen was not always seen favourably, as negative comparisons were made between the two good friends. After Stockhausen had noted that Goeyvaerts' *Sonata for Two Pianos* (1950-51) had predated Boulez's *Trios Structures pour Deux Pianos* (1951-1952), Boulez's response was that Goeyvaerts was "an invention of Stockhausen's. He was to me what Hauer was to Schoenberg" (Iddon, 2013, p. 61). This shows that the Schoenberg/Hauer dichotomy and the narrative of Hauer's 'lesser' value was still very prominent. However, Goeyvaerts was one of the composers in this period who purposely sought to explore deeper levels of musical substructure, and with a similar cosmic or philosophical approach, he stated the purpose of music is "to present 'Being' in time and in sound matter", with this forming the top level of his three-tiered hierarchy of musical structure (Christians, 2003, p. 170). In spite of being overlooked in

favour of Stockhausen, Goeyvaerts holds an important place in the development of serialism and substructure.

Boulez's response to Messiaen's *Mode de valeurs* brought the increasing systemisation of this period to a new height. His *Structures* (1952 and 1961), in particular the first part of book one, *Structure Ia*, represents the total serialisation of all parameters, where he "deliberately rejected all responsibility in order to see how far it was possible to go" (Boulez & Deliège, 1976, p. 55). While paying homage to Messiaen by using a serialised version of the first twelve-tone division in *Mode de Valeurs*, he also strictly uses serialised rhythms, articulations and dynamics (Antokoletz, 2014). While working with these serial materials–what he calls "a mechanical object"–his only responsibility as a composer was to choose the registers of the PC on each use, to which he also admits were "completely undifferentiated", thereby creating a piece which is essentially "purely automatic" (Boulez & Deliège, 1976, pp. 55-56). To Boulez, this was a way to shed the shackles of ingrained musical tradition; to "make a clean sweep of one's heritage and start all over again from scratch, to see how it might be possible to reconstitute a way of writing that begins with something which eliminates personal invention" (Boulez & Deliège, 1976, p. 56).

It is interesting to note the incongruence of how the move toward total control also resulted in more aleatory elements in these compositions, something which Boulez comments on: "disorder is equivalent to an excess of order… the general theme of this piece is the ambiguity of a surfeit of order being equivalent to order" (Boulez & Deliège, 1976, p. 57). Again, like his contemporaries, he searched for musical control and expression through a sublevel of structure. With his piece *Le marteau sans maître* (1952-55), Boulez used an operation to derive the PC sets which form the cycle of its movements 1, 3 and 7 ("*L'Artisanat furieux*"); this would be called "multiplication" (Heinemann, 1998, p. 72). 'Complex' multiplication can be described as the creation of "privileged linking functions as

well as series of privileged networks", thereby creating "isometric objects" and "series having multiple isometric relationships" (Boulez, 1971, pp. 78-79). A single twelve-tone series is divided into "frequency groups" through the use of a "proportion row"; for example, 24213, which can be understood as taking the first two ordered tones of the row as a group, then the next four as a group, and so on (Koblyakov, 1990, pp. 3-4). The proportion row is permuted to acquire a unique division of the row for each permutation, which for the example above would create five "harmonic fields" (a, b, c, d, e) (Koblyakov, 1990, p. 5). Each frequency group in each harmonic field can also be multiplied by one another, and itself, to produce new groups, creating a matrix of systematically interrelated and potentially recursive musical blocks. This process is a transpositional operation, where pitch-class sets are transposed by other pitch-class sets, a process that is essentially Schat's 'steering' concept. McLeod would see it as such, where she states that "Boulez's 'frequency multiplication'... [was] resurrected in… his pupil Schat's concept of 'steering'" (McLeod, 1994, p. 2). However, for more detailed information on Boulez's 'multiplication' I would direct readers to Koblyakov (1990), Heinemann (1993, and 1998), Losada (2014) and Boulez (1971, pp. 78-80)

Stockhausen represented a similar delve into deeper structural levels, with serialism acting across these depths, surpassing the level of substructure and control employed by Boulez in *Structures*. His *Kontra-punkte* (1952-53) (as well his *Klavierstück I*, composed at the same time) presents the earliest use of his concept of "groups" which are "formal units that combined several tonal points through the intersection of their various parameters" (Antokoletz, 2014, pp. 310-311). Groups could be defined by the number of tones and their durations, and identified by dynamic level and differences in register between groups; all of which could be subjected to transformations. This means groups could be "both quantitatively and qualitatively differentiated" while being governed by deep serialised structures to create a counterpoint from the "dimensions of sound" (Antokoletz, 2014, p.

311). Stockhausen's interest in sound as space, and the consequences of the "polyphony of polyphonic principles"–the extension of serial technique to other musical continuities he had found in Webern's work–had given him a vision of the future of music, which lay in electronics (Iddon, 2013, p. 97).

Personal musical languages: non-serial structures

The resulting dissection of sound at Darmstadt that Cage had influenced in his equalising of the temporal/spectral dynamic would contribute to the growth of a burgeoning development of electronic music, and an increased focus on the interaction between music and space. The earliest "sound-compositions" to come from Darmstadt emerged from discussions between Stockhausen and Goeyvaerts, where a desire for "pure, controllable sounds without subjective emotional influence of 'interpreters' [performers]" resulted in explorations with sine tones (Stockhausen, 1971, p. 649). While space has been explored frequently throughout compositional history, the move towards electronic musical systems (and projection), resulted not only in a greater control of music's spatial expression, but a greater interest in exploring space as a concept (Miller, 2012).

In the exploration of spatialised sound, a connection between the visual and sonic dimensions again becomes clear. The inspiration of geometry would be a continuous feature of composer's explorations of space, with performers forming the points of visual shapes, and outlining divisions of the performance space (Trochimczyk, 2001). The circle is one such shape that has a symbolic significance throughout human history, with its position as a representation of infinity–i.e the ouroboros. It is no surprise, then, that composers have been drawn to its unique visual geometry. Stockhausen explored the circle in his *Carré* (1959-60); the audience is positioned in the centre of four equally spaced orchestras with choirs, where long motionless chords of a static sound world are rotated around the circle

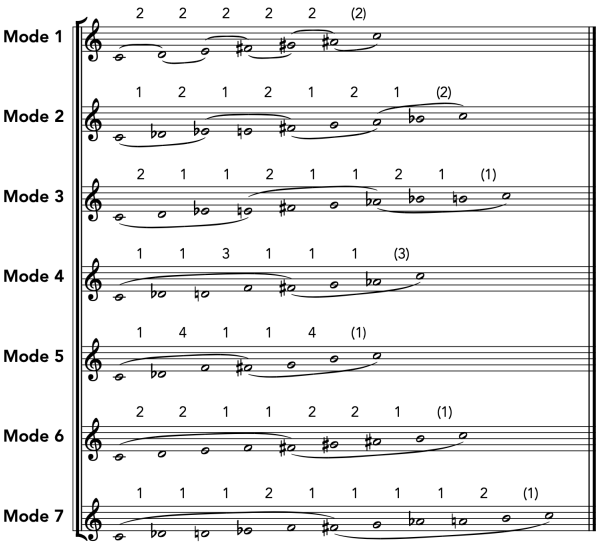
(in a clockwise or anticlockwise direction) (Trochimczyk, 2001). The creation of a circle through the four orchestras is dependent on a circular movement around these points or "squaring the circle" (Trochimczyk, 2001, p. 45). I make use of a similar circular arrangement of performers with rotational cells in both *The flood…* and *Auguries of Innocence.*

Iannis Xenakis also explored circular spatialisation in *Terretektorh* (1965); the performers would be seated within the circularly arranged audience–"the orchestra is in the audience and the audience in the orchestra" (Trochimczyk, 2001, pp. 47-48). Xenakis also explored another facet of space, one not in the physical realm; his 'sieves', which are categorisations of regular or irregular sequences of intervals (not connected to pitch exclusively) into scale-like structures. He describes their structures as "points on a line", which can be contextualised through a starting point and a unit of distance for a given length (Xenakis, 1992, p. 268). This creates a movable system of relations that can be applied to different aspects of music, such as non-12-tet understandings of pitch, and durations of time. Xenakis' theory would later be understood through the TC by McLeod, where his sieves would be categorised through their intervallic content (as applied to the twelve tones) into her IPF table. Additionally, this moveable concept, defined purely through relationships between things, plays a large part in my own developments of the TC.

While Messiaen's impact on the development of the post-war serialism movement placed him in an almost messianic position in the early 1950's, his theoretical works from before this time provided a more direct influence on the TC, specifically McLeod's extension. Therefore, if we separate Messiaen from these connections to serialism, we will find a musical language that is far more unique and personal. This is also important to detangle, as while the Darmstadt aesthetic would increasingly remove expression, instead letting musical meaning hang on the process that created it, Messiaen always had an "unshakable faith in music's power to describe or symbolise" (Hill, 1994, p. 3). This is a quality that both Schat and McLeod would embody. Messiaen published his *Technique de*

mon langage musical in 1944, in which he explained his unique musical perspective, giving a personal insight into the way in which he works as a composer. In connection to the TC, chapter XVI, titled "Modes of Limited Transposition" (Messiaen, 1966, pp. 87-95) (see Fig.5), is of utmost importance. Here he presents seven symmetrical chromatic fields with unique intervallic qualities, of which it is "mathematically impossible to find others of them, at least in our tempered system of twelve tones" (Messiaen, 1966, p. 87). Messiaen was actually wrong in this statement as there are a total of fifteen, with the other eight modes derived from truncations of the original seven. Nevertheless, this description already solidifies a theoretical connection to the TC, as both function on the principle of a limited mathematical possibility of combinations to which all others can be reduced (Schat, 1993).

Fig.5: Messiaen's Modes.



Each mode can only be transposed a certain number of times without repetition, with mode 1 having two transpositions, mode 2 having three, mode 3 having four, and modes 4-7 having six (Messiaen, 1966). These modes are therefore transpositionally symmetrical, meaning each can be formed from the steering of any small intervallic cell by the three non-trivial equal divisions of the octave in 12-tet. These are a tritone (6), XII or X^4, which will always produce either the chromatic aggregate or a mode of limited transposition. For example, mode 1 is Hour VI steered by a tritone (6), and mode 2 is Hour II steered by X^4. However, they are units of intervallic information too large to form the basis of a unifying musical understanding, they seem more to be full elaborations of smaller

atoms of information; which were to be defined by Schat and then used by McLeod to recontextualise Messiaen's modes in her *Chromatic Maps* (McLeod, 1994).

In addition to Messiaen's modes, two other points are relevant to my own work. Firstly, Messiaen's interests were not confined to Western art music tradition, with his interest in rhythms from Indian classical music being clear in chapter II (Messiaen, 1966). Also, while his modes have "nothing in common with the three great modal systems of India, China, and ancient Greece" (Messiaen, 1966, p. 102), his interest in modes drew him into explorations of *raags* and the modal improvisation of Indian classical music (Hill, 1994). Messiaen also believed his concept of non-transposable modes was a fertile area which could be expanded to non-12-tet music such as a quarter-tone or 24-tet (Messiaen, 1966). Both the influence of non-Western music and the expansion to microtones come to coalesce in my exploration of the *Jins* of Arabic music, viewed through the lens of TC, in my piece *Sikah* for *'Ud* and Harp (see p. 148).

Serialism had ruled the atonal music landscape from Schoenberg's adoption of it all the way to the beginnings of the Darmstadt School. The pursuit of greater systemisation and a rejection of earlier musical structures that came from serialism pushed music into a realm that was in conflict with itself. The push for greater control of individual musical elements that emanate from Darmstadt, allowing each to be ruled by an interconnected, or individual ordering through serial practice, meant that, contradictorily, composers were abrogating their control of these materials. Music became less about structural control, and more about the unfolding of stringent mechanisms, with aleatoricism replacing inspiration and compositional expression. This would only strengthen the dominance of a pitch-class and mathematical understanding of the chromatic. Boulez critiqued this "fetishism of numbers" and Darmstadt in general, which he described as a "sterile cul-de-sac" with "academicism" that displayed a "disparity between what was written and what was heard: there was no sonic imagination" (Boulez & Deliège, 1976, p. 64). This, however, was an

aesthetic culture which he helped to form with the extension of serialism in his *Structures* and his abstruse 'multiplication' concept seen in *Le marteau sans maître*. As much as Boulez admired Webern's investigation of the musical 'evidence', serialism as it was expounded by the Darmstadt school would fall into the fallacy of over-control to the point of oppression; the actual music evidence became more and more distant.

Out of this conflict, deeper levels of structural control came to the forefront of the exploration of musical structure, as well as a dissection of sound as a concept. The idea of substructure, to some extent, had existed for a long time. Could we, for example, call Bach's *Well Tempered Clavier* a substructure outlining the twelve chromatic focal points of the equal temperament system? I would argue yes; one which places the chromatic system that defines the music in a position of reverence, but is also prisoner to it. The deep structure explorations of Goeyvaerts, Stockhausen and Boulez (among others), were, like serialism as a whole, tainted by their reverence to the system. The considerations of the effects of these deep structures was of little concern, and serialism had begun to cannibalise itself. Cage's visit to Darmstadt again in 1958, and subsequent lectures, would signal this end of serialism's centrality, and a move towards exploring music's perceptual qualities (Iddon, 2013, p. xi).

Chapter 2: TheTone Clock

Schat's TC

To finally understand the TC, Schat must now be placed within this above lineage to demonstrate how he is both a product of, and semi-revolutionist against, his predecessors. This is especially important since Schat's musical legacy has long been marginalised to the confines of his own country, and mostly overlooked by the rest of music pedagogy (apart from a few scholars and composers, whom I now join in writing this). While achieving some modicum of success and fame as a composer in Europe, his theoretical writings, such as his 'Toonklok', were mostly confined to his native Netherlands and to those who could understand Dutch. Therefore, his TC was mostly unable to be disseminated beyond this circle. The reason I am now able to read, take great influence from, and build on the TC, is wholly because of McLeod's assiduous endeavour to learn Dutch in order to translate Schat's writings, which were subsequently published in 1993.

The root of Schat's interest in the structure–and more importantly the substructure–of music began with his love of Bach's musical language, with particular admiration for the "extraordinary beauty and the logic of the deepstructure [sic] of this music: of *diatonic tonality*" (Schat, 2002, IV). He asserted that "composers recognised this by adding keys to their titles: Mass in b-minor, Symphony in A major, etcetera, thus expressing gratitude to the system" (Schat, 2002, IV). This is something I have done in my own compositions (albeit not in a conscious expression of gratitude), including both my *Seven studies in interaction* and my *Auguries of Innocence,* where the title of each piece reflects the Hours used. To Schat, Bach had given composers a "common language", a "bottom line"; Schat's "quest for a new bottom line" sums up his nature and his theories, and would result in The Tone Clock (Schat, 2002, IV).

After some initial success with his compositional debut *Passacaglia and Fugue for organ*, which premiered in 1954 in his birthplace of Utrecht, Schat would make some defining connections that year (Schat, 2002, VII). During the Gaudeamus Music Weeks in Utrecht, he met and was introduced more fully to the music of "all the serial big shots of those days: Stockhausen, Kagel, Ligeti and many more", but he writes forlornly that this did not include Boulez, whose "work had been rejected by the Dutch jury…" (Schat, 2002, VII). That same year, he was invited to be a pupil of composer Kees van Baaren, who had just been appointed the director of Utrecht conservatoire, thereby becoming the "first member of a composition class which would dominate Dutch musical life for a generation" (Schat, 2002, VII). The revolutionary nature of the class that Schat refers to in this quote is due to the effect it had on Dutch musical culture and its appreciation of Serial music. Serialism, and Dodecaphony in general, were not easily accepted by Dutch composers of the 20th century, possibly stemming from their rejection by the highly influential Dutch composer Willem Pijper (Ibarz, 2015). However, Van Baaren's appointment as composition teacher in Utrecht, and then at the Hague's Royal Conservatoire in 1958, would begin to change this attitude towards serialism and provide one of Schat's biggest influences (Ibarz, 2015). Schat states that van Baaren "gave us the musical inheritance of Schoenberg, Berg, and Webern. He was the only Dutch composer who taught these things" (Dufallo, 1989, p. 367).

From this point onwards, Schat was "a confirmed serialist" and, consequently, his work reflected the prevailing ideas of the time: "anti-tonal" pitch groups, the "taboo octave", and the preoccupation with chromatic saturation that serialism fulfils (Schat, 1993, p. xi). Schat attended the Darmstadt summer courses from 1958, where he would see "Pierre Boulez at work, admiring him very much" (Schat, 2002, VII). So, when Boulez announced his Basel masterclass in 1960, Schat attended "with trembling knees", and stayed in the city for 2 years (Schat, 2002, VII). Much of his work from this period, such as his *Entelegies I and II* (1960-61), is tinged with "Boulezian musical thinking"; his deep

connection to Boulez's work, and his multiplication theory, may have influenced the later development of Schat's steering concept (Schat, 2002, VII).

Schat was at Darmstadt during the height of serialism's popularity, but this was also the key moment of its eventual decline. By considering the courses, tutors, and performances at Darmstadt from 1958 onwards, even more connections can be made between Schat and other composers and their theories, even if admittedly speculative in nature. As is evident from the lecture and performance programme in Iddon (2013, pp. xix-xx), Schat was exposed to composers such as Boulez, Stockhausen, Nono and Maderna (among others). Importantly, Cage gave seminal lectures in this period, which signaled the end of serialism centrality, and his influence undoubtedly helped to shape Schat's musical thoughts (Wouters, 1965).

Schat's second compositional phase, beginning in the mid 1960s, was marked by conflict, both in Schat's theoretical thinking and in his musical life, in which key ties to composers of the old guard, Boulez and Stockhausen, were irreparably broken. Schat's view of serialism and Darmstadt would drastically change, where he felt he'd reached the limit of the possibility of serial language. Firstly, Schat's confidence in the foundation of serialism, the power of an individual PC to assert itself in musical space, began to wane, as he believed that PCs were "incapable, or insufficiently capable of defining their place from within, from the composition itself, of justifying a choice of tone" (Schat, 1993, p. 15).

Schat's focus became the relationship between PCs–their *interaction*, the *interval*. This is evident in his essay titled *Circular Fragments of a Theory*, written in 1966 (Schat, 1993, pp. 1-6), where several other embryonic elements of the TC also began to take form. Here he takes Schoenberg's concept of post-tonal music to its absolute limit, by creating a "note-constellation" (reminiscent of Hauer's description of tropes) where the "maximum of Schoenberg's structural principles is compressed" (Schat, 1993, p. 5). By approaching the symmetrical all-interval series through interval permutation, using a "double rotation of the

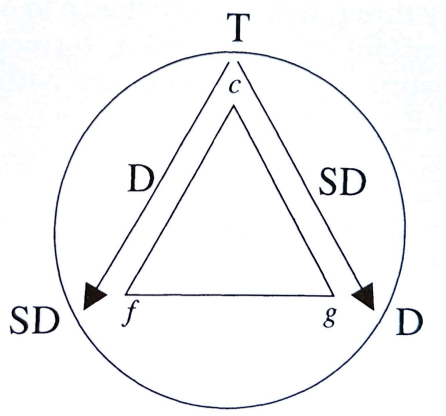
intervals", he found a method of obtaining "four related sets" where only two had previously been found (Schat, 1993, p. xi). In addition to making an insightful extension to Serial theory, Schat reflects on the definition of tonality in an atonal world. By considering "to what extent was Schoenberg's concept of the series really a breakthrough from the closed symmetrical world of tonal harmony?", Schat begins to speculate on the nature of a dialectic bridge between tonality and atonality, which would eventually culminate in his chromatic tonality (Schat, 1993, p. 2). By doing so, he puts forth that "tonal law can be seen as a series with a fixed centre", which "should contain a maximum of information in the most concentrated symbolic form. It must be, as it were, the generator, the microstructure from which all macrostructures arise organically" (Schat, 1993, p. 3).

This concept of "tonal law" and the musical "generator" are unresolved ideas that would come to fruition with his TC. In addition, this adherence to Serial values is further expressed in his response to the all-interval constellation he finds. He sees the set created as "inversely proportional to its theoretical value in serving as a model for symmetrical serial thinking", and that the set is "unattractive as a compositional departure-point" (Schat, 1993, p. 5). His reasoning is that "it does not fulfil the 'anti-tonal' functions" and contains "tonalising centripetal effects" (Schat, 1993, pp. 5-6). At this time, he would only accept five "anti-tonal functions", which would later correspond to the first five hours of the TC (Schat, 1993, p. 6). The reverence he gives to the "holy trinity", or the "generator of centuries of music… tonic, dominant, subdominant", preempts his eventual focus on redefining the triad (Schat, 1993, p. 1). His presentation of this "closed circular form" of the system of tonality, which shows the "constellation"-like relationship of the tonic (T), dominant (D) and subdominant (SD), even resembles his later TC hour diagrams (see Fig.6).

Schat reached his ultimate breaking point with serialism in 1967, with his piece *On Escalation*, where he states "it was a deadend… I could go no further than that. It made no sense to further the language itself, in complexity or mobility of the score" (Dufallo, 1989,

p. 371). This also signalled his break from the musical world that formed him, stating that "the whole problem of Darmstadt, the whole problem of Stockhausen, of serialism, is that you can develop incredible thoughts, complex developments in parametric development; but it has no musical meaning" (Dufallo, 1989, pp. 372-373). Schat's disillusionment came from the overcomplexity of serialism, as well as the lack of musical meaning stemming from an over-adherence to unrelated or esoteric musical processes, which created a creative chasm between composer and composition, and between listener and these works. Schat "[felt] that serial music became unintelligible, socially speaking" and, as a consequence, "the breach between the audience–the music-loving audience–and new music became bigger than ever" (Dufallo, 1989, p. 374).

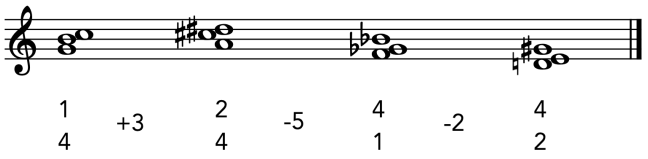
Fig.6: Schat's circular depiction of tonal functions (Schat, 1993, p. 1).



Schat believed that Schoenberg's dodecaphony was an attempt to reconcile the chaos of the unordered twelve-tones, as "if you are free to do everything, you can do nothing" (Dufallo, 1989, p. 373). To Schat, however, serialism "was not musically viable" as "it was not a law that is inside the music. It was a law that was inside the numbers–"Thou shalt count!" (Dufallo, 1989, p. 375). Therefore, both systems–tonality and serialism–were inadequate, since they were corrupted by being structures imposed upon the twelve-tones, rather than defined by them. Schat sought to regain the 'musicality' in his compositional practice, instead of being beholden to a process he believed to have been unjustly enforced upon music, a process that did not allow for the composer to express the full range of colours and tonal properties that the twelve tones can provide. Schoenberg's emancipation of the dissonance was no more! To Schat, an equalising of the tones had become "discrimination against the consonant" (Dufallo, 1989, p. 375).

Schat's first attempt towards his goal of a new bottom line, and reinstating meaning in music, was to reconcile his "tonical ideas" into serial principles in his piece *Anathema* (1969). He strived for a musical language "that is unity…because otherwise, you cannot be understood"–something he admits this piece did not achieve, as "you hear the breach between serialism and history" (Dufallo, 1989, p. 374). Apart from unsuccessful branches like this, Schat's compositional work for the majority of 1970s was based around interval permutation techniques, as seen in works like *Canto General* (1974) and *Houdini* (1974-6) (Ibarz, 2015). It was in his *Symphony I* (1978) that the key step was to be made towards his new language: the move from the interval to that of the *triad*. Schat constructed a twelve-tone "field", which was divided into four triads of repeated interval patterns, echoing Webern's row-construction techniques (Schat, 1993, p. 25) (Fig.7).

Fig.7: "Field" used in Schat's Symphony I (1978) (Schat, 1993, p. 25).



The strict ordering of serialism does not define the use of this field. Each pitch within these three-note groups "can occur in any order one wishes", and in doing so, Schat solidified a–if not *the*–defining element of the TC: the control of tonal colour through the exploitation of proximity (Schat, 1993, p. 30). This loosens the tight grip of absolute ordering, while retaining a conscious control of tonal colour, thereby liberating both the composer's control and the possibilities of the twelve-tones. While his previous attempts at "tonicalisng [sic]" the twelve tones had not fulfilled his "elusive dream of a 'general field theory' of the tones", here he had "solved this dilemma" with his concept of "interval-steering" (Schat, 1993, pp. 26-27). Making use of a concept he had discovered while writing *Canto General* (1974), Schat first defined its use in *Symphony I*, where "notes are sent past the 'tonicalising [sic]' octave points, thereby making use of this gravity" (Schat,

1993, p. 27). Schat had created a secondary intervallic structure–a *substructure*–through which the relationship between his four triads could be maintained.

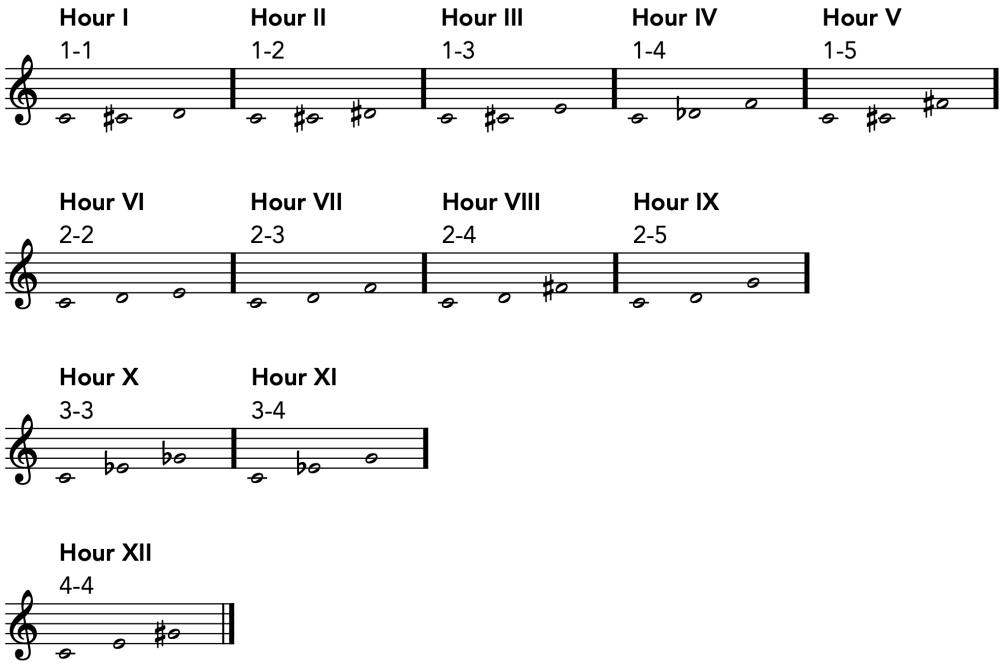
The move from the interval to the triad in his *Symphony I* (1978) was immensely significant, but it wasn't until Schat fully formed his TC theory (first written about in 1982) that the concept of the "triad" was insightfully redefined for the chromatic world. One tone is adrift in a lonely sea of tonal space; through the interval, Schat found a dimension that enabled an understanding and control of this space through the interaction of tones. The relationship they shared became more important and more unifying than the tones themselves. This, however, was still a "merely two-dimensional" relationship, unable to properly assert itself in tonal space. Only through the combination of three tones–the triad, Schat's holy trinity–can we achieve the "minimal definition of tonality" (Schat, 1993, p. 57).

The triad being the generator of music is not new as a unifying theory of music. Since Rameau's *Traité de l'harmonie,* written in 1722, the supremacy of the triad has reigned strong, defining composers' understanding of tonality. Rameau solidified the concept of the major triad being the "perfect chord" and that "all perceptible differences in harmony arise from the different arrangements of the sounds which form this fifth and these thirds" (Rameau, 1971, p. 35). Even the minor triad was seen as a product of "reflections [of the major triad] within the octave" (Schat, 1993, p. 16). His theories on the division of the overtones from a single string, as well as the major triad being the generator of all music, would influence composers until and even after Schoenberg's emancipation. The 'proof' of tonality and all harmony being an expression of the overtone series is shown through the ratio division of a string, where "each string contains in itself all other strings shorter than it, but not those which are longer. Therefore, all high sounds are contained in low ones" (Rameau, 1971, p. 5). This is echoed by Schoenberg in his *Harmonielehre*, written in 1911, where he emphasises that all music, even the triad itself, is derived from the single tone–"the material of music" (Schoenberg, 1978, p. 20). Here he also shows how our

equal-temperament system is derived from the addition of the overtone series from a fifth above and below the original fundamental (the dominant and subdominant, respectively) (Schoenberg, 1978).

This concept enabled Schat's exploitation of proximity, or "note-mobility", because at "the time of Rameau, the natural triad had achieved an *abstract existence* of its own, such that variations in its note-order did not affect its essential unity, its basic tonal nature" (Schat, 1993, p. xv). Schat would redefine the word *triad* through giving the chromatic triads this abstract existence. He would find only twelve possible three-note combinations (without note repetition) to which "all other triads conceivable can be reduced to" (Schat, 1993, p. 57). These are his "twelve tonalities", forming the twelve hours of the TC:

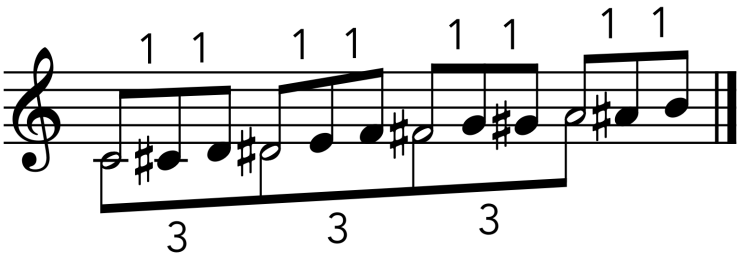
Fig.8: The TC hours (Schat, 1993, pp. 57-58).



The presentation of the hours by Schat is worth examining, both for their striking visual representations (as shown when discussing Hauer) and their demonstration of how Schat perceived the TC in general. Each hour is presented as a representation of the full chromatic. Schat found each hour triad could be multiplied to "fit four times into the

module of the octave", thereby creating a secondary intervallic structure from the interaction between these four triads (Schat, 1993, p. 58):

Fig.9: Schat's Hour I form and steering
(Schat, 1993, p. 58).



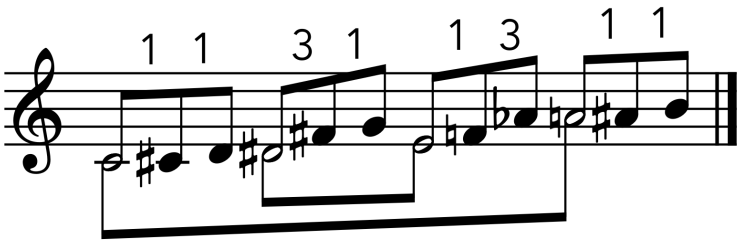
The four Hour 1 (1-1) triads are *steered* by an Hour X tetrad (333) (Schat, 1993) (Fig.10). Some hours have the possibility to be steered by different hours, while still fulfilling chromatic saturation without tone repetition: for example, Hour III can be steered by Hours V and VII (Schat, 1993). Unlike his earlier conceptualisation of steering, he now saw it as another level of TC structure, an interval pattern of the same theory and defined by the same concepts, but at a deeper level of musical structure. The recursive nature of Schat's theory had been realised, and is something I took great interest in exploring in my compositional work.

It is worth considering a few key elements that Schat alludes to in his TC essays, that are either mentioned in passing and not elaborated on, or were not fully developed by him. In 1987, Schat met McLeod at a conference in Kentucky, and as well as producing her translation of his writings and her extension to the TC, she would write her first essay on the TC in 1990 (Schat, 2002, VI). This draws into question whether some of the theoretical ideas mentioned by Schat (if they appear in essays after meeting McLeod) were the result of a complementary creative interaction between the two composers, especially since several are key elements in McLeod's TC extension.

While Schat's focus is mostly on the relationship between pairs of hours, one on the surface structural level, and the other on the steering substructural level, he does acknowledge the combination of multiple hours into the surface. These, however, are not

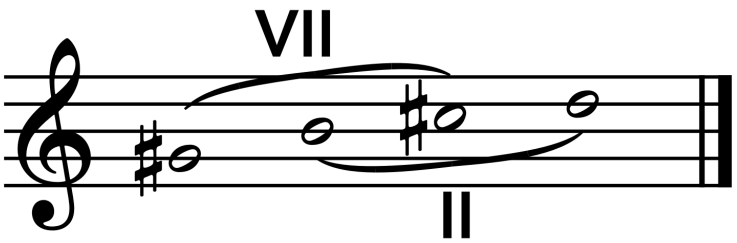
treated with much depth in this first TC essay (*Toonklok* (1982) (Schat, 1993)), as they are depicted in a way that doesn't accept the resultant steering pattern of these combinations. One example of this is the depiction of the combination of Hour I and III, where two beams separate the hours (Schat, 1993, p. 59):

Fig.10: I and III hour-form (Schat, 1993, p. 59).



Schat also only briefly mentions the concept of hour blending (which was expanded upon by McLeod), and in a throwaway fashion where its significance and potential is vastly unrealised. He discusses possible steerings of Hour XII, where he describes the interval pattern of 321 as VII+II (Schat, 1993, p. 71), implying this view of the set:

Fig.11: Implied hour-blending of VII and II
(Schat, 1993, p. 71).



This appears to be the only specific discussion of hour blending, or interval groupings of more than 2 intervals, by Schat. He does, however, briefly mention their use in the analysis of his piece *Symposion* (1989) (Schat, 1993, p. 125). McLeod would discuss and develop this idea in her extension, and I explore the properties of these multi-hour interval patterns through my extension of this concept–'halftone'–in both *Seven studies in interaction* and *An Exequy*.

The use of multiple steering levels is also briefly discussed by Schat in *Chromatica* (1989-90), where he describes the possibility of creating a "logically connected network" by letting a "chromatic DNA-molecule grow" up to third-level steering (Schat, 1993, pp. 90-91). This appears to be the only mention of this concept in Schat's theoretical writings, and the extent to which he explored the relational possibilities it could foster is impossible to say. Even in analyses of late-period pieces, such as *Genen* (2000), where Ibarz (2015) postulates the possibility of these deep structures, he admits that Schat "did not exploit its potential to generate further material or to unify the piece in any way" (Ibarz, 2015, p. 71). He also admits that his analysis of this piece is what he believes to be "the most convincing interpretation" and that there is nothing in Schat's sketches of the piece to suggest one unifying deep steering pattern (Ibarz, 2015, p. 71). As I found in my analyses of McLeod's use of the TC in her piano pieces (see Barker, 2020), multiple interpretations are always possible in a TC view of music, and the more complex a piece is tonally, the more this potential for interpretation increases.

Finally, the concept of minor and major hour expressions is something which is inherent in the base structure of the non-equal-interval hours. Just like in tonal harmony (which is reflected in the structure of Hour XI), it is understood that in a triad in its simplest ascending form, if the smaller interval is first and the larger second, it is minor (3-4), and vice versa for major (4-3) (McLeod, 1994). Schat clearly saw both forms as a reflection of the same hour, as when presenting his twelve-tone multiplications of the hours in his original *Toonklok* (1982), both min and MAJ forms are used indiscriminately. In his later *Chromatica* (1989-90), he implied that this concept can be applied to the TC, but he only mentions this in relation to tonal harmony (Hour XI) (Schat, 1993). It is only in his piece analysis essay *Symposition* (1989) that he makes explicit use of this terminology in relation to hours other than Hour XI (Schat, 1993). Much like the concept of hour blending, this min/Maj concept was further developed and solidified by McLeod in her extension, and because of how

intrinsic they are to her work (and Schat's adoption of this terminology long after meeting McLeod), these can be considered her own developments, despite being briefly mentioned or implied by Schat. The extent to which these later tone clock concepts are used and are recognisable in analyses of Schat's work is something that would benefit from further research.

Schat can be placed in a similar position to Schoenberg, a semi-revolutionary whose theories at first seemed like a drastic departure from what came before, but were in reality a direct continuation of past theoretical developments. Unlike Schoenberg, however, his work was not widely disseminated outside of his native Netherlands. Even after McLeod's adoption of his theory and translation of his writings, the TC was–and is–still relatively unknown. McLeod even wrote to Boulez in 1988 asking for his help, as Schat's funding from the Dutch funding committee was going to be cut completely on the grounds of his "disappointing development as a composer" (McLeod, 1988, MS-Paper-7349-133). His theory also faced criticism of not being a "post cartesian logic of sounds", i.e., that it is not representative of musical perception and experience (Boehmer, 1997, p. 171)–an accusation I refute. Both compositionally and as a framework to understand music, Schat's TC is a theory overflowing with untapped potential. Unlike those before, his theory was a representation of the musical perception of tonal colour, instead of a synthetic structure applied to the twelve tones.

His theory, as revolutionary as it was, retained limitations of past thinking. The preoccupation with chromatic 'saturation', evident in a lot of his theoretical output, is an obvious leftover from past serial theory and its maintaining of the precious 'atonalness' of atonality, controlled by his steering principle. Additionally, in his later writings, he would propose ideas for the further development of TC theory, fleetingly and not expanded on–at least until McLeod and myself. His links to Hauer are now very clear, and Schat's theoretical output was intrinsically entangled with his 'cosmic' philosophy and relation to colour and

mood, as can be seen in the poetic descriptions of each hour. He would see triads in every part of life, and it clearly deeply affected the way he saw music, where he describes musical life as a division of "the Executive (the performers), the Legislative (the composers) and the Judicial powers (the critics)" (Schat, 2002, VII). His ethos is perfectly summed up by this statement: "Art is no science–there is nothing to prove" (Schat, 1993, p. 58).

Language, Analysis, Structure, *Gestalt*

Many attempts have been made to find a holistic method of understanding music through analysis–a holistic musical 'language'. Each have drawn their own conclusions about the structure of music and how we perceive and group its structures, but a compositional perspective of how these structures can be controlled is often ignored. Before beginning to discuss McLeod's developments of the TC, and in doing so setting up my own continuation of her work and TC theory, a short discussion of these attempts at giving definition to musical structure, analysis and perception is needed.

Before proceeding, the term 'language' and its usage in this research requires unpacking. Notable attempts have been made to connect the term 'language' with music in a very literal sense, assigning elements of linguistics to musical processes as if they function in the same way. Some linguistic concepts are not entirely incompatible with music and present opportunities for important interdisciplinary connections between the two disciplines. This can be seen, for example, in the approach of Lerdahl and Jackendoff in *A Generative Theory of Tonal Music* (1983) (abbreviated GTTM) and its continuation by Lerdahl in *Tonal Pitch Space* (2001), where processes of Chomsky's generative grammar are adapted.

However, it is generally unhelpful to theoretically conceptualise music in the same way as linguistics. I agree with the sentiment presented by Lerdahl & Jackendoff (1983, p. 5)

that it is futile to "point out superficial analogies between music and language" as "whatever music may 'mean,' it is in no sense comparable to linguistic meaning". It is true that human language and music are both forms of communication, but while the former has mostly exact or inherent functions in how it expresses meaning through semiology, music has a far looser and more interpretive connection to expressed meaning. This is an idea that was deliberated by the SVS; Webern states, "a human being wants to express ideas in this [musical] language, but not ideas that can be translated into concepts–*musical* ideas" (Reich, 1963, pp. 42-43). Schoenberg "went through every dictionary to find a definition of an 'idea' but he never found one", as musical ideas are not representative of linguistic concepts; if musical language was to be properly defined, it had to be through the music and its perception (Reich, 1963, p. 43). The word language, therefore, needs to be separated from its connections to linguistics. When talking of a musical language, it is the structures and interactions in and between musical continuities that create "matrices of information" for listeners to perceive and interpret individually (Epstein, 1979, p. 23). Music is always multidimensional and interconnected; it is a "fundamental fact of musical language" as Boulez states, "that each element depends on every other one" (Boulez, 2018, p. 37).

Understanding music and its construction should therefore be considered from the perspective of perception, and through a probing of the connections that form these matrices, as the connection between things is more important than the things themselves. This idea is shared by both Schat and McLeod. If, as Webern states, "music is language" (Reich, 1963, p. 42), then it is very easy to ask: is there a holistic musical language? Or is there at least a universal way of approaching the understanding of musical language? These questions are not new to music pedagogy, but as of yet remain unanswered, and to some just a utopian dream. Schat (1993, p. 92) would postulate a similar universal language in music to Chomsky's "deep structure" concept of human language, stating: "since music is a

language, then such an invisible/inaudible deep-structure will be present here also". For him, McLeod, and myself, the TC was and is the first step towards this holistic musical language.

Two approaches to the analysis of tonal music

The expression, or conceptualisation through analysis, of multiple levels of musical structure is difficult to assign an origin to. As Schat astutely expressed, throughout the history of Western classical music, composers presented the natural deep structure of diatonic tonality, expressing their reverence for the system through the naming of pieces (Prelude in A Minor, Symphony in C Major, and so on). Bach–or 'Mr C Major' as Schat affectionately calls him–would provide a perfect example of the expression of the deep structure of diatonic tonality with his *Well-Tempered Clavier*. Two full expressions of the twenty-four minor and major keys purposely explore the "well-tempered" system, or the full chromatic, long before Schoenberg's emancipation. Each chromatic step is explored equally, forming a secondary twelve-tone deep structure. It would be Schoenberg who would bring this equalisation of the twelve tones to the musical surface and remove the constraints of diatonic tonality. Two contrasting methods of analysing music written through diatonic tonality–Schenkerian and Generative Theory of Tonal Music–illuminate what I believe to be natural and unavoidable truths of musical structure, which therefore also apply to TC theory. These are that music always has multiple levels of structure, whether intentionally constructed by the composer or as unintended consequences of their decisions, and these levels of structure are recursive in their theoretical construction. Austrian music theorist Heinrich Schenker would propound one of the most widely recognised approaches to the analysis of tonal music in the late 19th and early 20th century.

Schenkerian analysis proposes that all tonal music can be distilled through various structural levels, separating the musical 'foreground' from the 'background' through various

'middleground' distillations of the musical surface. This is distilled into what Schenker termed the "*fundamental structure* (*Ursatz*)", of which there are only three possibilities that all tonal compositions can be reduced to (Forte & Gilbert, 1982, pp. 131-133). In many respects, Schat's method for representing steering, which superficially resembles Schenkerian analysis, reveals how he conceptualised the TC as having possibilities for generating similarly stratified structures. The TC surface can be seen as an expression of the TC *Ursatz*, or deep steering patterns. However, the TC is only a representation of the tonal fabric so far, whereas Schenker's analyses are formed from the distillation of the diatonic tonal fabric through its rhythmic expression. Furthermore, his process is always a downwards process towards a deep structure, of which he states there are only three possibilities. The TC has an innumerable number of ways in which TC structures can interact, both on each level and between each level. It is a lens through which to view music and a generator of structures (in contrast to a purely analytical approach), which means that the directionality of structural significance is flexible. I may write a piece with only the surface being consciously organised by the TC, leaving the substructure to emerge unconsciously, or I may create my TC *Ursatz* and then extend its influence upwards to the surface. As will be shown in Chapter 3, both processes, surface-down and substructure-up, are explored in my compositional work.

Another approach to the analysis of tonal music stems from the fusing of generative linguistics and *gestalt* psychology as an interdisciplinary work between linguist and musicologist. *A Generative Theory of Tonal Music* (Lerdahl & Jackendoff, 1983), like Schenkerian analysis, conceptualises musical structures into multiple recursive hierarchical levels. Generative-transformational grammar, espoused by linguist Noam Chomsky, proposes that there is an innate 'universal' grammar in the human subconscious that enables the 'generation' of sentences. While others had tried to apply generative linguistic methodology to music before, GTTM tried to correct the over-formalisation that came with

"literal" musical linguistic overlap (Lerdahl & Jackendoff, 1983, p. 5). Their goal was to use formal principles from generative linguistic theory in combination with psychological perspectives, especially that of a listener's perception defined by *gestalt* principles, thereby "specifying a *structural description* for any tonal piece", or the "structure that the experienced listener infers in their hearing of the piece" (Lerdahl & Jackendoff, 1983, p. 6). No two listeners or repeat listenings will ever be perceptually identical, but GTTM works on the presupposition that a listener familiar with the idiom will have a more predictable listening experience (Lerdahl, 2001, p. 5).

Lerdahl and Jackendoff propose four hierarchical components of musical intuition: "grouping structure", "metrical structure", "time-span reduction" and "prolongational reduction". Other elements that are not defined as hierarchical, such as timbre and dynamics, are still incorporated but not treated formally. 'Grouping structure' is the separation of the thematic landscape into smaller units of "motives, phrases and sections" (Lerdahl & Jackendoff, 1983, p. 8). This aspect's structural paradigms are understood partly through *gestalt* psychology's grouping principles (Lerdahl & Jackendoff, 1983). In addition, the partitioning of the thematic landscape has significant theoretical overlap with Schoenberg's *grundgestalt* concept and its development in his *Fundamentals of Musical Composition* (1967). *Gestalt* grouping principles form important parts of my work, where they are used as a tool to conceptualise aspects of the compositional process, and will be elaborated upon later. Importantly though, grouping structure is defined as "recursive", or able to be "elaborated indefinitely by the same rules" (Lerdahl & Jackendoff, 1983, p. 16). This concept of structural recursivity is inherent in the TC, and is something that I explore in the majority of my compositions.

The other three hierarchical components of GTTM are less relevant to my work, as they approach pitch in a similar way to Schenkerian analysis, where pitches are assigned structural importance in the context of the metrical/rhythmic structure through the strictures

of diatonic tonality. Lerdahl and Jackendoff briefly discuss the possibilities of extending their work to contemporary music (not defined by tonality), but this isn't fully explored until Lerdahl's (2001) continuation of their work. Schenkerian analysis also underwent later adaptations in an attempt to apply it to non-diatonic music, but suffers from the same issue of trying to rectify analytical structures formed from tonal analysis instead of taking atonal music as a starting point. In addition, both apply the preponderant atonal analytical concept of the time, Forte's 'set theory', which has many inadequacies for a holistic musical understanding, as will be discussed. Both of these analytical edifices are largely unconnected to the TC and my exploration herein, but they do show that music is multi-leveled with deep recursive structures, and that our experiences of these structures are formed by perceptual principles. This is all highly important to the understanding of the TC and its continuation, as it forms a key part of a holistic musical language.

Set theory

One method of understanding atonal music can be found in Allen Forte's monolithic 'set theory', as presented in *The Structure of Atonal Music* (1973). Its focus is on pitches and their relations in classified groupings, and comes from a theoretical standpoint with a purposeful isolation from tonal or twelve-tone compositional theories. In its earliest conception, each pitch is understood as an integer from 0 to 11, called a "pitch-class" (or "PC"), with C being 0, C♯ being 1, and so on (although a moveable system would emerge later) (Forte, 1973, p. 2). A group of PCs is a "pitch-class set", which if classified as an "ordered" set is uniformly presented in a "normal order prime form" created from various requirements (Forte, 1973, pp. 3-4). This produces the most mathematically compact rising form of a PC set, a process which if uniformly applied to any ordered set allows atonal music to be understood through various mathematical transformations making them uniformly comparable (Forte, 1973). Sets used in a piece can therefore be identified and

compared as unique name sets or as varied related expressions of the same set that are transpositionally or inversionally related (Forte, 1973). Intervallic content is only partly considered, with the six possible "interval-classes", or "IC" (1, 2, 3, 4, 5, 6), used to define the total intervallic content of a set through arrays called "pitch-class vectors" (Forte, 1973, pp. 13-14).

Finally, all of the mathematically possible PC sets formed from the twelve tones are classified and listed with their intervallic content in Forte's table of "Prime Forms and Vectors of Pitch-Class Sets", in effect mapping the whole chromatic (Forte, 1973, pp. 179-181). The importance and influence of Forte's theory from an analytical standpoint cannot be understated, although many issues arise from its theoretical construction and the viewpoint it takes of the chromatic system, which will be later addressed through the discussion of McLeod's incorporation and correction of Forte's theory. The main issues lie in the esoteric and unrelenting streams of integers and mathematical equations as a way of understanding music. While it is not burdened by originating from adaptations of tonal analytical understandings, it is burdened by its lack of connection to the actual musical surface. It may be useful for applying an analytical framework to atonal music and its structure, but it ignores the 'why' and 'how' of the compositional use of pitch and its resultant structural and tonal perceptual effects that come from compositional decisions and listeners' hearings. Its focus on the PC and lack of focus on the IC (showing only the total intervallic content, not its structural nature), clearly stems from previous atonal theory, but this obscures any relational structures it attempts to describe, thus making groups difficult to differentiate between (McLeod, 1994). Therefore, set theory is unsuitable and overly complex as a compositional theoretical construct, as Schat would agree, stating that Forte's "'operations' are too bureaucratic (like the old Darmstadt serialists), and very uncompositional" (Schat, 2002, VIII). Nevertheless, its attempt at unifying the understanding

of atonal music is an ideal that should be striven for, and was something that McLeod was greatly influenced by.

Gestalt theory

As previously alluded to, the visual and sonic realms share a connection in both trends of artistic expression and the way we perceive these expressions. The early 20th century saw not only great change in the perception of musical material (the equalisation of the twelve tones and the continued separation of musical continuities and dissection of sound), but also a move towards greater levels of abstraction in visual art. This period would also see psychologists in Germanic Europe begin to probe the functions that define human visual perception, forming the foundations of *gestalt* psychology. *Gestalt* is a concept that defines much of my compositional thinking and, as will be discussed, much of McLeod's later TC thoughts. It should be noted, however, that my use of this concept is as a tool to help conceptualise aspects of the compositional process. Newer cognitive theories have superseded this older theory, but because of its importance to McLeod and to the way I have composed, it will be referenced often.

Christian von Ehrenfels, an Austrian philosopher, was the earliest to propound ideas of *gestalt* with his 1890 essay "On *'Gestalt* Qualities'", which questions "what complex perceived formations such as spatial figures or melodies might be" (Smith, 1988, pp. 11-12). It is interesting to note the significant influence music had on the earliest formation of *gestalt* ideas as well as its later developments. Ehrenfels was a "passionate musician" and took composition lessons from Anton Bruckner (Smith, 1988, p. 12). Consequently, his work on perception was not limited to the visual, with "spatial shapes, melodies, chords, and complex tastes" being defined as "first order Gestalt qualities founded on given elementary sensations" (Smith, 1988, p. 16). While the influence of music was always present in the theories of the *gestalt* psychologists and some of their experiments extended

into the sonic realm, their theories mostly focused on visual perception, with later scholars extending the concepts to music and sound. Ehrenfels' early expounding of *gestalt* ideas in lectures was heard by Max Wertheimer who, along with Wolfgang Köhler and Kurt Koffka, would later exemplify the *gestalt* school of psychology (the "Berlin school") in the early 20th century (Smith, 1988, p. 12).

The underlying assertion of this school is that in sensory organisation "dynamic distributions are functional wholes", or that the visual field is dependent on and formed from "segregation rather than uniform continuity" of sensory "atoms" (Köhler, 1992, pp. 136-137). More simply, organising elements into groups is a natural truth of perception and is more important than the elements themselves. Already we have a striking similarity to the construction of the TC: the interaction of PCs (intervals and TC triads) is more important than the PCs themselves. *Gestalt* psychologists would make similar observations, such as Koffka's (1935, p. 460) recognition that a melody "played in G by an orchestra" would sound the same even if "hummed in F or B or C Major", implying that "all the sounds are different, and yet the memory effect is clear". The mental representation of music isn't just a collection of pitches; it is the relationship between pitches that defines them, as a group's "pattern is as much of a reality as their material" (Koffka, 1935, p. 461).

A significant part of *gestalt* psychology, then, is what causes perceptual groups to form, a topic which influenced several musical analytical theories including McLeod's later writings. Underlying all perceptual principles is a veridical interpretability: the perceived *gestalt* "is dependent both upon the experiencing subject on the one hand and upon the autonomous formation on the other" (Smith, 1988, p. 47). Applying this to the use and perceptual experience of the TC, as well as the multifaceted interpretability of intervallic sets (autonomous formations), individual listeners (subjects) themselves can individually interpret the TC fabric. Obviously, this is also affected by factors such as how the TC fabric is expressed and temporally spread, as well as the composer's intentions and decisions.

Nonetheless, the point is clear that the perceived *gestalt* is a non-specific result of many factors—most importantly, perspectives. The principles of grouping are best discussed while exploring McLeod's later writings, as they form a core component of her later theoretical thoughts (p. 83). However, the simplest concepts that define perceptual grouping are those of similarity and proximity (Bregman, 1990, pp. 18-20).

A *gestalt* approach to understanding music has been undertaken several times, but most were only towards a singular aspect of music. GTTM's adoption of *gestalt* grouping principles as a way of approaching the temporal musical field was a direct adaptation of the rhythmic theory of Cooper and Meyer (1960). However, the spectral and temporal dimensions of music, both together and as separate but interacting elements, have been approached far less. To fit within the confines of this research, my work follows Schat's thoughts on musical hierarchy, which states "the top is pitch, and immediately after is rhythm. They are very connected. And then timbre" (Dufallo, 1989, p. 370). Pitch and its perceptual *gestalt* through the TC is the main focus of my work, but as rhythm is so closely aligned with this element, both the spectrality and temporality of music must be considered to understand musical structure. There have been two main attempts at a full *gestalt* understanding of music: McLeod's unpublished TC materials and Bregman's (1990) "Auditory Scene Analysis" (or ASA). Both their approaches differ quite drastically, with McLeod approaching from a compositional, musical perspective and Bregman a more psychological, formal perspective.

As stated, the school of *gestalt* psychology is mainly a theory of visual perception, so Bregman's ASA was an attempt to fully understand the perceptual principles in the sonic domain. The perceptual *gestalt* groupings are understood as "auditory streams", as sound's temporal dimension is just as important as its spectral (Bregman, 1990, pp. 9-10). Unlike visual information, "acoustic information tells us about physical 'happenings'"—for example,"the wind blows, an animal scurries through a clearing"—and these 'happenings'

are defined as auditory streams that can contain multiple sounds and events (Bregman, 1990, p. 10). ASA's division of the auditory *gestalt* field into spectral and temporal domains, as well as how our perception can be affected by how these domains interact, forms a large part of how I approach the analysis of my compositional work.

It should be addressed that principles of *gestalt* in music long predate all of the above theories, even if it was not explicitly stated as such. We must return to Schoenberg and his theories, divorced from his twelve-tone method, to understand this. The bridge between the structures of the diatonic world and Schoenberg's new compositional technique, his twelve-tone method, was created through his concept of *"grundgestalt"* (Epstein, 1979, p. 17). The emancipation of the dissonance resulted in more than just a dissolving of diatonic hierarchy. The inherent functions that helped define motivic and structural expression in diatonic music no longer guided the compositional process. Instead, composers had to find new ways of creating structure. At the loss of an integrated structural system, branching structural continuities could be explored individually, and interactions between them could be far more diverse and controlled. Rhythmic structure could be composed completely independently from pitch and each have independent journeys across the temporality of a piece, "the two functioning in tandem without harm to the individuality of either one" (Epstein, 1979, p. 23). Schoenberg's twelve-tone method was a personal attempt at giving back inherent structures to the equalised chromatic field, and also enabled the later serialists to expand this structure independently to each component of music in integral serialism. This concept expanded the musical world from a linear unfolding of hierarchy, defined by long ingrained musical cultural pedagogy to something far freer, moving towards an understanding of music defined by the structures of the chromatic and musical perception.

Schoenberg's *grundgestalt*

"Great works of art present us with matrices of information–on many levels, via many perspectives", which "are perceived only partly at any one hearing" (Epstein, 1979, p. 23). Every aspect of music forms threads in musical matrices and each aspect is for the composer to control if they so choose, but this raises similar issues to those found in the free atonal period, that of coherence. Consequently, Schoenberg expounded the concept of *grundgestalt*–or "basic shape"–privately within his circle, which "denotes the fundamental concept underlying a musical work, the features of which influence and determine specific ideas within the work itself" (Epstein, 1979, p. 17). Schoenberg considered this great unifying force to define all aspects of the music, with every element of a piece being "varied representations of this underlying concept" amounting to an expression of the "primal motivation" of the composer (Epstein, 1979, p. 17). This compositional philosophy can be seen as the highest order of musical *gestalt:* the full and abstract shape and colour, or perceptual form, of a piece from the composer's perspective. The listener's perspective would amount to their perceptual translation of the composer's (and performer's) expression. Schoenberg's *grundgestalt* is akin to what Boulez (2018, pp. 36-37) refers to as the composer's "responsibility".

Schoenberg would never explicitly use the word in any of his writings, even though its concept characterises his *Fundamentals of Musical Composition* (Schoenberg, 1967). Here he defines and categorises the elements that form musical structure, from the smallest structural "molecule" of "the phrase", which contains the smaller subatomic units called "motives", up to large-scale structures (Schoenberg, 1967, pp. 3-8). Schoenberg outlines a system which defines musical motivic construction as recursive, and is understood through *gestalt*. Motives are meant to be constantly repeated throughout a piece, but "repetition alone gives rise to monotony", thus "monotony can only be overcome by variation" (Schoenberg, 1979, p. 8). He details various ways in which related "motive-forms" can be

derived from the original motive through various transformations, both exact and less so. In doing so he conceptualises motives by their fundamental *gestalt*, where a motive-form is seen as related to the original motive even if, for example, the same rhythmic pattern is used with different intervals, or all the rhythmic values are doubled in length while retaining the intervallic structure (Schoenberg, 1967, pp. 8-15). This functions on the *gestalt* grouping principle of similarity, whereby varying degrees of connection can be maintained to the original motive through the use of *gestalt* aspects. While *grundgestalt* is an interesting exploration of a *gestalt*-related conception of composition–one which influenced how I think compositionally–as a term, it is contested. Additionally, my use of *gestalt* is only a tool, not an advocation for its value as a theory of cognition. Therefore I have chosen not to use *grundgestalt* even when discussing parts of my process that align with its definition.

McLeod's TC

McLeod tentatively defined her work on the TC as an expansion but, as we will see, her work was far more than this and constitutes an original and nuanced theory. Her initial expansion on TC theory, *Chromatic Maps I & II* (McLeod, 1994), already takes the TC and contextualises it in a larger sphere of musical understanding by viewing other pitch organisation theories through the lens of the TC. In addition to redefining TC structures and the way we understand them, McLeod had taken the first step in trying to find a holistic musical language through which all equal-tempered music could be understood. Though this was obviously limited only to the understanding of pitch, specifically that of twelve-tet music, her unpublished materials show that she was attempting to address this and take the TC's theoretical structures beyond its original context to begin to chart a complete map of musical understanding. For the most part, I will deal with her published and unpublished materials separately, as the latter feels like a development after the writing of *Chromatic*

Maps I & II (1994), though the unpublished materials are not dated. In addition, while reading the unpublished materials of McLeod, I realised that it would be out of the confines of this research to fully catalogue and analyse them, and if attempted would only do them a disservice. A full cataloguing of her writings, as well as a full continuation of the work she had begun to form, is something I believe to be of great importance and is one of my future goals.

McLeod is difficult to categorise as a composer. She would take many varying influences and compositional directions in her work, as well as having long periods away from the music world, which she "felt was necessary if she was to identify a new and fruitful direction for herself" (Meehan, 2023, p. 241). While music was an ever-present feature of McLeod's early life in Levin, New Zealand, it wasn't until attending Cambridge summer school in 1960 that she was introduced to 20th-century composition (Shieff, 2002). She states of this time: "that summer just blew wide the doors for me. As far as I was concerned, I'd stepped into paradise and I had no intention of leaving it" (Kerr, 1988, p. 8). Returning to New Zealand in 1961 to enrol in the music programme at Victoria University, she studied under Douglas Lilburn, whose encouragement resulted in several pieces such as her *Cambridge Suite* (1962) and *Little Symphony* (1963) (Shieff, 2002).

Despite this, she "didn't think of [herself] as a composer", something which she would maintain throughout her life (Kerr, 1988, p. 8). McLeod's exposure to Messiaen's *Quartet for the End of Time* (1941) stirred something within her, stating "whoever this Messiaen character was I had to get there", and she subsequently went to Paris in 1964 to study with him (Kerr, 1988, p. 9). After this, McLeod would stay in Europe to study with other Darmstadt figures, Boulez and Stockhausen. This culminated in her piece *For Seven* (1966), which reflected the influence of these figures. Composed in a mathematical fashion on graph paper, it was performed at Darmstadt with Bruno Maderna conducting, but this was not an easy process for McLeod, stating "it just about killed me" (Kerr, 1988, p. 9). On

her return to New Zealand and taking up a lectureship, in contrast to *For Seven*, her piece *Earth and Sky* (1968) would be McLeod's first steps in understanding her own compositional style. A setting of Māori creation poetry, and performed theatrically by children, this piece is full of Webern-inspired symmetricality and intervallic groupings (comparable to the TC) long before her meeting with Schat (Meehan, 2023, pp. 116-117, 245 and Croft, 1993, pp. 19-20).

McLeod was aware of Schat as a student of Boulez and "knew he was some kind of serialist"–in meeting him at a conference in Kentucky, she was fully "prepared to dislike his ideas from the outset" because serialism was a "complete no-no" for her (Meehan, 2023, p. 242). This meeting however would prove to be one of the most important of her musical life. As can be seen in her sudden departure to study with Messiaen, as well as teaching herself Dutch to read Schat's TC materials, her description of herself as a "bulldozer" is extremely apt (Kerr, 1988, p. 9). She was completely self-motivated and was always firm in her personal interests and convictions, a level of confidence in one's sense of self that I aspire to and that guides my research and composing. In reading Schat's materials and spending time with him in Amsterdam, she proclaimed:

> Of course, I fell passionately in love with Peter Schat, at the same time I fell for his ideas and his music. This took some getting over. But he's basically gay–story of my life. Yet we are two sides of the same coin–have more in common than I'd ever believed philosophically and musically"
>
> (Meehan, 2023, p. 243)

Once the revelation of Schat's TC had given form and clarity to the definitions of McLeod's own musical language, she would nurture and expand it far beyond its original context, allowing it to be understood and used to reframe wider chromatic theory. McLeod's

extension can be divided into two revolutionary parts. Her expansion would recontextualise the TC within a larger chromatic world and allow chromatic understandings to be incorporated into TC theory, thereby taking one step closer to a holistic musical language. In addition, she would deepen the understanding of this chromatic world by redefining TC concepts and incorporating new concepts, giving the theory a unified terminological framework.

Her redefining is extremely important in how we both understand chromatic structures and how they can be exploited by the composer. Just as Schat took the concept of the triad from tonal harmonic theory and recontextualised it into a chromatic understanding, McLeod astutely recognised that the concept of 'minor' and 'major' is inseparable from this triadic understanding. This "logical extension from, as well as a subsuming of, the old meanings of minor and major" can be understood as the proportional difference between the first and second interval (McLeod, 1994, p. 9). Where the smaller interval is followed by the larger, the chromatic triad can be understood as minor (later abbreviated to min or m). For example, an Hour II minor triad–or IIm–would consist of the intervals of 1-2; major (Maj or M) is the opposite construction, where the larger interval is first (2-1 or IIM). This also applies to larger intervallic constructs: for example, an Hour II minor tetrad (indicated by superscript 4) would consist of the smaller interval followed by the larger, then the smaller again, creating a 121 interval pattern (or IIm^4), while its major counterpart (IIM^4) creates a 212 pattern (McLeod, 1994, p. 9-10). This notation means that minor and Major interval groups are indicated through either a lower-case 'm' or upper-case 'M' respectively. This abbreviated notation allows for a quick and clear definition of interval patterns, just as tonal harmony does, and these abbreviations will be used throughout my analyses of my compositional work. While already implied in McLeod's work, I would add one more definition to this concept, that of a neutral interval pattern. Some hours (I, VI, X, XII) only consist of one repeated interval, so the concepts of

Major and minor are not applicable here; I would suggest calling these neutral interval patterns, indicated in the abbreviated notation with the absence of a 'm' or 'M'. Thus, I will show the range of intervallic poles through abbreviations: minor/Neutral/MAJOR, min/Neut/MAJ or m/Neut/M.

The extension of the concept of minor and major from tonal harmony is not just a mere holdover or adoption of a familiar concept; I would argue that it is the illumination of a powerful audible fact. Western classical music is predicated on the aural comparison of minor and major harmony–or min and MAJ forms of Hour XI in TC terms–with the major or 'perfect' chord as the root of this system and derived from the harmonic series. It would be easy to say that the TC hours (excluding XI) present a more subtle form of this audible relationship, as they are not directly derived from the harmonic series (although some can be, as explored in my piece *Form gulping…*), but I think this issue is more complex than that. The 12-tet system is already a synthetic skewing of the intervals derived from the harmonic series, and the minor chord does not naturally appear either, as it is derived from inversion. Their dominance is founded upon centuries of Western classical musical theory, which reached its breaking point at Schoenberg's 'emancipation'. There is a powerful audible difference between a larger and smaller interval and the order they are in. Each hour is a representation of this interaction, but non-traditional min and MAJ forms have had less exposure and have not been developed as an integral part of a system of tonality for centuries. I believe the use of the TC's min and MAJ needs to be explored more to illuminate its compositional possibilities. While it can be used in a similar way to tonal harmony, it presents an opportunity to create a far freer and more complex system that can act on the musical surface but also at macro levels of musical structure.

When analysing McLeod's *24 Tone Clock Pieces* (2013) in my MA Dissertation, I found that she was clearly experimenting with this concept of deliberately changing the tonal colour without changing the Hour, as can be seen in bb. 9-28 of her *Piece IX* (McLeod,

2013, Book 1, pp. 26-31) (See also Barker, 2020, p. 30). As can be seen in my analysis of these bars, she experiments in various ways with how min and MAJ can interact, both temporally and spectrally–the former of which can be seen in bb. 9-16, where a four-bar field of min Hour IV triads (bb. 9-12) is followed by a four-bar field of MAJ Hour IV (bb. 13-16) (Barker, 2020, pp. 54-55). In bb. 24-25, she contrasts min and MAJ spectrally, with the RH having a min Hour IV and the LH hand having a MAJ Hour IV field below it while playing in rhythmic unison (Barker, 2020, p. 55).

This deliberate experimentation with how min and MAJ can interact in musical space inspired my *Seven studies in interaction*. It is also clear from analysing these TC piano pieces that maintaining chromatic saturation was no longer a necessity in the generation of TC fields and, in addition to a completely free control of the TC surface, it is possible there were other non-chromatic structures that she was implying (like Messiaen's Modes and larger symmetrical structures) (Barker, 2020). This isn't to say that both chromatic saturation and steering level structure were disregarded, it just shows McLeod exploring the TC to its full potential and using these two concepts as tools rather than prerequisites. Norris (2006a, p. 75) also acknowledges the varying level of "sophistication and complexity in the application of tone-clock theory" in her piano pieces, each presenting an individual use of the TC.

In expanding the TC, the twelve triads had to be contextualised in a larger chromatic framework of the rest of the mathematically possible PC sets. As already discussed, Forte's table of "Prime Forms and Vectors of Pitch-Class Sets" is wholly unsuitable as a framework for a compositional or perceptual understanding of the chromatic world (Forte, 1973, pp. 179-181). For what it illuminates, it does so in an esoteric and unwieldy way, so far removed from the actual music that many facets of the structures of these sets are lost in a haze of mathematical intricacy.

In McLeod's exploration of the chromatic world through "Schat's tone-clock theory and Messiaen's modes, and [her] own extrapolations from these", she would independently arrive at the same map of the chromatic as Forte (McLeod, 1994, p. 4). Her "Chart of Intervallic Prime Forms," or IPFs, views the whole chromatic through the lens of the interval and the structures of the TC, creating a map that both catalogues and illuminates the perceptual intervallic colour fields and previously hidden symmetries in sets. By using interval notation instead of PC integer notation, we can instantly see the relation of one set to another, as the system is uncoupled from the strictures of transposition. Even the "so-called 'fixed-*doh*' and 'moveable-*doh* notations," which "are a more recent innovation addressing this," still suffer from the same complexities that will always occur when pitch is the focus rather than the interval: relationships between transposed sets are obscured, and comprehensibility of a set's identity becomes compromised (McLeod, 1994, pp. 4-5). The aforementioned sets outlining the three diminished seventh chords–[0,3,6,9], [1,4,7,10], [2,5,8,11]–can all be identified in a much simpler way as IPF 333. McLeod brought the chromatic map back to the musical surface, so that the way of notating chromatic structures is actually representative of the tonal *gestalt* each set creates at any transposition.

In addition to the unintentional translation of Forte's list of prime forms and the inclusion of her newly defined interval patterns, McLeod creates connections to other chromatic understandings, such as Messiaen's modes and Xenakis' Sieves. Both are included as alternate identities of IPFs in the chart, and even groups that are an incomplete subset of Messiaen's modes (sometimes multiple) are shown too (McLeod, 1994).

McLeod, just like her forebears, places particular and justifiable importance on symmetry. PC sets in their best normal order may present the most compact form of that set, but that doesn't mean that they display the simplest form they can take, nor one that displays their unique structural qualities. In addition to the two criteria for determining the best normal order, as stated by Forte, McLeod adds two more. Firstly, symmetry is more

preferable than asymmetry in choosing the form of a group, because it will always be inherently simpler due to it having no inversion (McLeod, 1994). Secondly, the form of a group with the smallest number of unique interval classes is preferable over forms of the same group with more, as it is simpler and more recognisable. For example, the tetrad 144 is preferable over its non-symmetrical forms 431 or 314 (both permutations) (McLeod, 1994). The IPFs chosen are to aid in comprehensibility, with her main criterion therefore being "simplicity of structure", since the "simplest possible form of a chromatic group is the form in which that group is most readily stored in the subconscious" (McLeod, 1994, p. 17). This is why McLeod often lists alternate identities for groups in the IPF table. IPFs as a concept are merely a convenient way of giving a lexicon to the chromatic map to aid in memorability, but each identity of an intervallic group from an abstract point of view is an equally valid reflection of its intervallic *gestalt*.

The composer can think of the group in a particular way, or the way a group is expressed musically (both temporally and spectrally) can affect the listener's perception of the group's colour (McLeod, 1994). This is especially true with larger interval groups which, unless plainly used in a way which outlines their exact form, can often be interpreted as groupings of smaller IPFs interacting with each other. This, and the interpretable nature of the IPFs themselves, does not detract from the conscious use of the TC, but rather shows that the chromatic world is a vast and multifaceted hall of mirrors where our perception of tonal colour is far more complex than it first seems. This can be succinctly illustrated by looking at the full twelve tones or "12-note mother-group", which can be seen as both "the chromatic scale (the first hour) and the scale of fourths or cycle of fifths (the ninth hour). The pitch classes are the same, the interval classes are different" (McLeod, 1994, p. 18). A composer's intentions, the subsequent results of a composer's decisions, and the individual perception of each listener (and the interaction of all three) will all affect the expression of the chromatic colour world.

As the TC was extended past its previous triadic and tetradic limits, larger and more complex intervallic patterns had to be given definition and triads themselves had to be contextualised within the larger chromatic world. Groups of any size that "can be interpreted as a single chromatic hour" can be defined as an "hour-group", which is indicated with a Roman numeral (McLeod, 1994, p. 9). These will only ever consist of two unique interval classes, and while some only contain atoms of a singular chromatic hour, others will be a combination of two, but their interpretation and splitting (indicated by a hyphen) occurs under specific conditions.

Repetition of a single interval class past the limits of the triad is indicated by a superscript number attached to the roman numeral, to indicate the number of PCs that form the group, i.e., I^5 represents IPF 1111. These form-extended elaborations of the symmetrical hours can, with the exception of Hour XII, form a group larger than a triad. Elaboration of some of the non-symmetrical hours through repetition of their two interval classes in the same pattern can form what McLeod calls "Oedipus groups". This is because the alternation of the unequal intervals makes their elaboration "limp along" (McLeod, 1994, p. 10). These are, with some exceptions, subject to the same intervallic dichotomy as the non-symmetrical hours' triads, with both min and MAJ forms. Take for example the two forms of an Hour II Oedipus pentad:

Fig.12: min and MAJ Hour II oedipus.

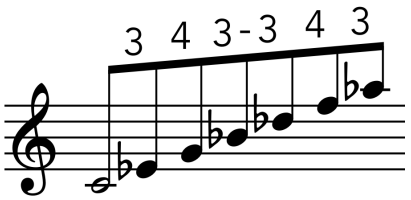
The exception to this can be found in what McLeod terms 'subscales'. These are defined as "chromatic groups whose interval pattern if continued simply repeats the same notes though the octaves", and the min and MAJ forms of hours II, III, V, and VIII oedipus groups form these (McLeod, 1994, p. 10). I say this is an exception because, due to the cyclical

nature of these patterns, whether a set presents as min or MAJ becomes entirely contextual. This means that both min and MAJ can be seen to be being expressed at the same time, creating what I term a pseudo-neutralisation of a previously non-symmetrical hour, which is a concept I experimented with in *Seven studies… IIIm–IIIM*.

Non-symmetrical hours can also form particular hour-groups that are not constructed from a simple alternation of interval classes as in oedipus groups. Oedipus pentads can be seen as a union of two overlapping same-pole triads with a single PC fulcrum at the centre, i.e., two triads of min Hour II (1-2) join to form 1212. If the poles of the two triads are opposing, for example the union of min (1-2) and MAJ (2-1), a symmetrical pentad of SPIIm or IPF 1221 is formed; if the dynamic is reversed and MAJ is followed by min, then a SPIIM or IPF 2112 is formed (McLeod, 1994). I explore this concept and its perceptual implications in *Seven studies… IVm–IVM*.

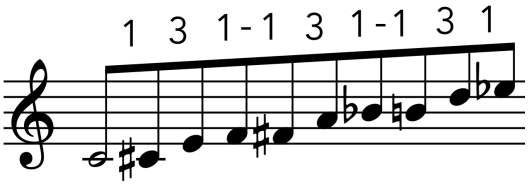
Other larger hour-groups are also defined by McLeod and are either built from the overlapping of tetrads or from SPs, with a PC fulcrum at the centre, where both min and MAJ forms are possible. A gemini group is formed from two overlapping tetrads of the same intervallic pole, for example a XIm[7] gemini (Fig.13).

Fig.13: XIm gemini.



A gemini triplet is similarly formed except there are three overlapping tetrads of the same intervallic pole, for example a IIIm[10] gemini triplet (Fig.14).

Fig.14: IIIm gemini triplet.



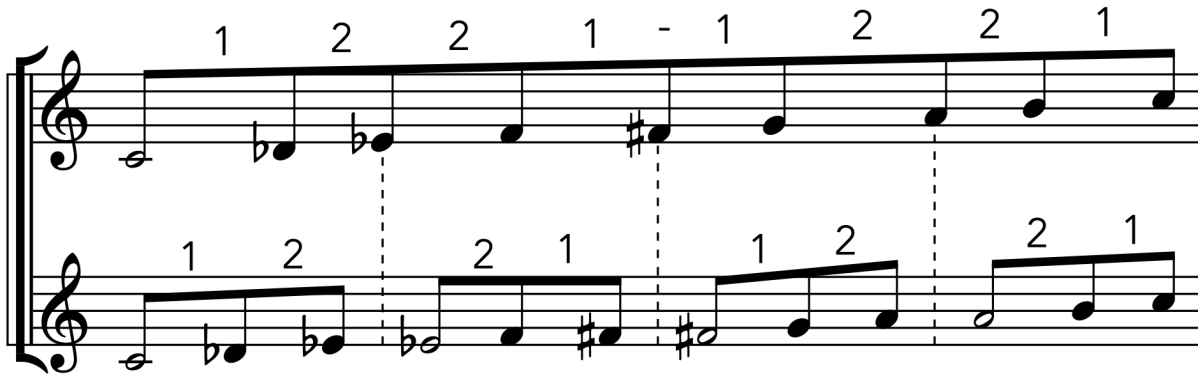
McLeod also names two more large structures: the greater gemini and the oedipus twin, both of which show recursive structural properties (McLeod, 1994). The oedipus twin,

which is formed from two overlapping oedipus pentads of opposing poles, can also be interpreted as a reflection of four overlapping triads with a mirror point through the middle:

Fig.15: Analysis of recursion in oedipus twin.

This forms a same-intervallic pole interaction to form the pentads, and an opposing-intervallic pole interaction at its larger structural level between each pentad. The greater gemini, however, presents the reverse of this recursive relationship in its structure, built again from two overlapping pentads but this time specifically from intervallically identical SPs. The pentads are built from an opposing intervallic pole interaction, whereas the larger structural level presents the same-pole interaction between the two pentads while additionally forming multiple mirror points:

Fig.16: Analysis of recursion in greater gemini.



As can be seen in many of these larger hour-groups, as well as other IPFs, some groups can show elements of multiple chromatic hours. McLeod's definition of multiple-nature

hour-groups only incorporates the groups whose various forms can express different chromatic hours (i.e., the same pitch classes but different interval classes), an example being the IXm^4 or IPF 252, which can also be interpreted as VIIm^4 or IPF 232 (McLeod, 1994). This doesn't consider the effects of either non-alternating interval class interval patterns, as well as groups which have more than two unique interval classes (both of which include asymmetrical groups).

The second chromatic map–the "Chart of Array Steerings" (McLeod, 1994, pp. 80-98)–solves part of this issue but, as with other discussions in the appendices, doesn't delve into the compositional and perceptual ramifications of this fully. *Chromatic map II* is a supplementary chart for *map I* (IPF chart); the interval array and triad array in map I "tell us how many, and what classes of, intervals and triads are contained within a chromatic group" (McLeod, 1994, p. 68). These references are only an indication of quantity, not identity, so these can then be cross-referenced in map II to find out the transpositions of a group's intervals and triads and the intervallic poles of the latter. It therefore shows "what the steering-groups are for the intervals and triads contained within each chromatic group" (McLeod, 1994, p. 69).

These can be overlapping and exist in a more distant perceptual level of the tonal field (unless separated through compositional choices, e.g., textural separation). While I have purposely explored this dynamic in *Seven studies… VIIIm–VIIIM*, I believe a more surface-level, perceptually focused viewpoint is needed. My extension to this, therefore, helps the composer see complex interval patterns as built from singular triadic atoms of colour. McLeod touches upon this, where in discussing SPIIM or IPF 1221, she talks of it being a blending of Hour II and a central atom of Hour VI, but ultimately the former is the defining colour due to its dominance in the set. This dominance can shift, for example in the set of 12221 where there is an equal blending of two Hour II triads bookending two central atoms of Hour VI (McLeod, 1994). This is the extent to which this concept is

discussed by McLeod, but the implications of this perspective are, I believe, very important for a compositional understanding of TC theory.

McLeod's work on the TC did not end with her chromatic maps. By looking at her unpublished materials, we can see the beginnings of her development of the TC and her musical philosophy. Her continuation of TC theory after *Chromatic Maps* is a shift to a more contemplative approach, dealing with issues of her musical philosophy and perception. The same ethos that defined her previous approach to TC theory is also evident in these writings. Musical theoretical structures are defined and categorised, and inhabit an increasingly wide scope, unifying other understandings through her beginnings of charting a holistic musical language.

Apart from references to selected other manuscripts, a large part of what I draw on here is a collection of undated writings (from an estimated period of 1980-1995) seemingly in preparation for a book, with chapters titled *Structure I, Structure II,* and *Aesthetics* (McLeod, 1980-1995, MS-Papers-7349-050). These writings are not explicitly defined as a continuation/extension of TC theory, but extend past her *Chromatic Maps I & II*. Contained in this file, separate from McLeod's typed documents, is an annotated scan of the "Synopsis of Categories" from "Roget's International Thesaurus". Its exhaustive list of "semantic domains" obviously sparked some inspiration in McLeod, as she had copied out parts of the list and attempted to apply a similar categorisation to musical domains under the heading of "Forms of the Field" (McLeod, 1980-1995, MS-Papers-7349-050). *Structure I*, subtitled "The Field" is, therefore, McLeod's subsequent exploration of its definition and form. She states:

> Generally speaking, a field has a beginning and an end, a highest point and a lowest point: that is, it has a vertical [spectral] and a horizontal [temporal] aspect (if it exists

> in time and space), and it has limits in every direction. But a field may also be empty, or partly empty–in which case the 'silence' has limits.
>
> A field, moreover, as well as existing in 'musical space', also exists in a performance space.
> (McLeod, 1980-1995, MS-Papers-7349-050)

Additionally, a field exists in time and space, the former being the temporal partitions of a piece (a beat, a bar, a phrase, a section etc) and the latter being the spectral patterns of a piece (frequencies, frequency bands, the twelve equal-tempered tones, groups of tones, all the way up to the totality of the "sound-continuum (or white noise)") (McLeod, 1980-1995, MS-Papers-7349-050). Fields may be constant or be subject to a "process of change" (which "Boulez refers to as the 'diagonal' dimension"), or divided into "sub-fields" and combined in various ways (McLeod, 1980-1995, MS-Papers-7349-050). McLeod's definition of the form of the field (which I have only scratched the surface of) is a rich and deep investigation of the nature of composition, an exploration of the realm composers inhabit and the realm their art inhabits. Her all-encompassing use of the word 'field' "has the virtue that in a single concept one encompasses the idea that music exists simultaneously on a number of different but interrelated levels, from the 'smallest' to the 'largest'", an approach I have taken to my definitions (McLeod, 1980-1995, MS-Papers-7349-050). Referring back to Roget's 'categories', McLeod believed that her notion of field "could be used to describe the structural foundations of all forms of art" and even "all human thought" (McLeod, 1980-1995, MS-Papers-7349-050). However, between each composer, and between an individual composer's works, there will be varying levels of conscious control of the deeper structural levels. McLeod then begins to suggest that any field (of any type and size) can be structured through the TC and through steering. This revelation is very reminiscent of the

extension of serialism to all musical parameters that occurred at Darmstadt, a parallel which she also recognises (McLeod, 1980-1995, MS-Papers-7349-050).

Another document, also called "Form of the Field", contains her handwritten workings out of adapting the TC to rhythm. A combination of exact and simplified notation of various rhythmic groupings was used by McLeod to try and find a similar concept of hours for duration (McLeod, 1980-1995, MS-Papers-7349-050). Here, ratios are used to begin conceptualising rhythmic hours, each of which can be understood in an abbreviated and inclusive notation with combinations of 'shorts' (S) and 'longs' (L). This abbreviated notation, which can be seen in the appendices of her *Chromatic Maps*, where it is applied to pitch (See McLeod, 1994, p. 103), allows the innumerable possibilities of durational combinations in a rhythmic TC to have collective groups to be categorised and unified in. Her approach to the application of the TC to aspects of music outside of pitch is unfortunately beyond the scope of this research, but is something I want to explore further. The conceptualising of rhythms through ratios has, however, helped me to develop my concept of hour-ratio. In using ratios, McLeod thereby creates a moveable system to understand durational relationships, just as Schat's TC interval notation does. However, Schat's theory and intervallic structures are defined by and confined to the twelve tones, so while its patterns are moveable in this system they are not applicable to other equal divisions of the octave. McLeod's use of ratio to understand rhythm is not as frequently applied to pitch in the documents I have seen. She implies this relationship through stating that the TC could be expanded to any equal division of the octave and only the "common unit" need be decided, whether that is by 24 divisions or a dividing of the octave through cents (McLeod, 1980-1995, MS-Papers-7349-002). This is a strand I take up in my continuation of TC research (see p. 141).

In *Structure II: Principles: Number, Nature & Process*, these general outlinings of the form of the field are defined in more detail to classify the nature of the field and how its

various elements interact with each other. McLeod divides them between two fundamental concepts: "Number (or quantity) and Nature (or quality)" (McLeod, 1980-1995, MS-Papers-7349-050). 'Number' refers to the makeup of the overall field: its pitch (and groupings), its durations (and rhythmic patterns) and its "textures, tone-colours, [and] performers" (McLeod, 1980-1995, MS-Papers-7349-050)–it is the individual and collective musical material. This implies multiple levels of structure–steering–which is also part of McLeod's 'number' concept.

'Nature' (and process) refers to how these 'number' materials *interact*, and it is this interaction that interested me during my research. McLeod begins to categorise various ways in which fields can interact under the heading "Connecting Relationships" (replacing the crossed-out heading "Modes of Connection"), but notes that it isn't exhaustive (McLeod, 1980-1995, MS-Papers-7349-050). This concept, which I redefine as 'interaction', defines much–if not all–of my compositional work. The *Aesthetics* part of this file connects her work on the field and its interaction to the principles of *gestalt* psychology. She outlines the four main principles of perceptual grouping:

> 1. Elements that are closer together, as opposed to those that are further apart (the principle of proximity)
> 2. Elements that are alike (the principle of similarity)
> 3. Elements that follow one another in any particular direction (the principle of 'good continuation' - we shall ignore the implied value-judgement)
> 4. Elements moving simultaneously in the same direction (the principle of 'common fate')
> (McLeod, 1980-1995, MS-Papers-7349-050)

These principles define how the interaction amongst elements of the field occurs, and by extension how the TC functions in general. The control of the field is also the control of tension and release, an aspect being the use of the TC and its audible effects. The TC controls musical tension and release in a very different way to traditional harmony. With none of the harmonic functionality of the hierarchy of tones, the composer must find control in other ways. Even so, there are analogous concepts between the uses of the TC and tonal harmony, such as harmonic rhythm. The temporality of harmonic change, whether derived from tonality or from TC hours, functions in much the same way. It is an exploitation of relative musical stability and instability that creates fluctuating structures of tension and release. A stable harmonic rhythm provides musical stability, while a changing harmonic rhythm creates relative tension. This concept can also apply to harmonic or hour purity, where dense harmonies or superimposed expressions of TC material create a tension or impurity. In tonality this is usually resolved in specific ways, but with the TC it can resolve in many ways, or even remain unresolved. The vast matrix of interrelated elements and interactions that form a composition is guided by the composer's choices to create tension and release. The purposeful exploration and exploitation of these principles and McLeod's defining of the field and its interaction have guided my approach to composing and helped me to redefine how I think about the TC. Only a fraction of McLeod's unpublished materials have been discussed here, with many folders I have not yet read. So, what is presented here is a fraction of a fraction of the full materials of McLeod. The cataloguing and interpreting of the rest of these documents is something I would like to continue after this research.

Important connections

'Kindred spirits': this would be the best description of Schat and McLeod, two composers whose connections in personality and compositional background defined the TC. Both were

highly individualistic and self-determined, and each spiritual in their own way (with Schat's cosmic thinking being more overt). McLeod left her post as a lecturer in 1976 and went on "a spiritual walk-about" with the Divine Light Mission, saying "you never met such an intensely spiritual person as I was then" (Meehan, 2023, pp. 176-180). Similarly, Schat set up a commune in his house in the late 1960s (Schat, 2002, VII). Both composers would experience Darmstadt and serialism–studying with Boulez, Messiaen, Stockhausen and others–and both would later reject it. This musical world was equally revolutionary and suffocating to Schat and McLeod. Footprints of the developments of Darmstadt are clear to see: the dissection of sound and the equalisation of the temporal and spectral domains. Equally, however, Schat and McLeod were revolutionaries against serialism's focus on the pitch-class, and strove for a theoretical understanding of music more representative of the actual structures and perceptual expressions it created.

Chapter 3: Commentary

Pre-commentary

As I have sought to demonstrate above, and taking the lead from McLeod, the concept of the TC can be seen as functioning through the principles of *gestalt*. Interaction is far more important than individual elements in our perception, just as the interaction of tones is more important than the tones themselves. Consequently, the TC and its purity of expression function through the *gestalt* grouping principles. Hours create distinct colours, irrespective of the order in which the tones come temporally (even though order can be used as a tool to create concrete expressions). Obviously their purity can be strengthened or weakened by how we use them through aspects of composition, including register, voice-leading, articulation and texture (affecting their perception), which is why analysing music written with the TC will result in multiple possible interpretations of the TC fabric (as can be seen in my analysis of McLeod's piano pieces, see Barker, 2020).

One question, therefore, unifies my research and compositional pursuits herein–what kind of control does the element of *gestalt* inherent to the TC afford the composer? In exploring this question, I was interested in the ways the TC can function as a *gestalt*, i.e., define a particular set of interactions. The first section of the following commentary 'Compositional and Physical Space' grapples with this idea of gestalt-defined interaction as well as its effect through the field, from the compositional level all the way to physical spatialisation in performance. I therefore define *gestalt*-level interaction as a connection between fields in the larger collective field. Part of my extension to TC theory is the adaptation of the visual analogy of "halftone". This concept was a development in visual reproduction and printing, where 'continuous tones' of colour and gradient were translated into 'tiny dots' (Beegan, 2007, p. 46). This optical illusion functions through the *gestalt*

principle of proximity, whereby atoms of colour that are significantly close (or overlapping) trick our perception into seeing the blending of the two, rather than separate entities. In applying this concept to the TC, we can now view multi-hour groups as functioning through this process, where close or overlapping atoms of TC hour-colour are blended into more complex hues. This is similar to McLeod's more analytical concept of "12-note dual tonalities," which defines every possible hour that an IPF can present, whereas my halftone concept is like the TC itself, a lens with which to view both the sets themselves and the perceptual effects they produce in composition (McLeod, 1994, p. 24).

The exploration of the TC from a *gestalt* perspective inherently means exploring the concept of structure, and how multiple levels of structure (each defined by the same principles) can interact in deep structure networks. This is discussed in the second section of my commentary: 'Deep Structure and Recursion'. The final grouping of my compositions, 'Ratio and Translation', deals with the pieces where I have attempted to apply the TC to a non 12-tet context through its inherent *gestalt*-defined nature. As I will show, this was made possible by applying my new classification of the TC which was inspired by McLeod's unpublished materials. Schat recontextualised the triad to create a movable system to understand the interaction of the twelve-tones. McLeod would expand his theory exponentially, facilitating its unification with other twelve-tone conceptualisations, and in her unpublished materials, beginning to position the TC as a concept with the potential to form a holistic musical language. In developing the TC, I have defined a higher-level structure, which so far has only been implied in TC pedagogy, "ratio". Three tones create two intervals (an hour), and two intervals form what I call an hour ratio. Schat's TC is a moveable system within a 12-tet division of the octave, but is only applicable within this framework. However, by extracting how the TC functions, I position the hour ratio as a movable system applicable to all equal tempered divisions of the octave. Schat would say that "Musical experience has shown that not every arbitrary octave sub-division produces

an immediately coherent tone-system. Hába's quarter-tone division, for instance (with which Ives, amongst others, also worked), was a stillborn child" (Schat, 1993, p. 15). Whereas, I have shown, McLeod believed any equal division of the octave to be fertile ground for applying the TC. I have calculated the possible hours and hour ratios of every equal division of the octave from 3-tet all the way up to 24-tet in APPENDIX 1 (pp. 174-175) , therefore establishing my use of the 24 quartertones in *Sikah*. I have also written out the full range of hours possible in 24-tet in APPENDIX II (p. 176).

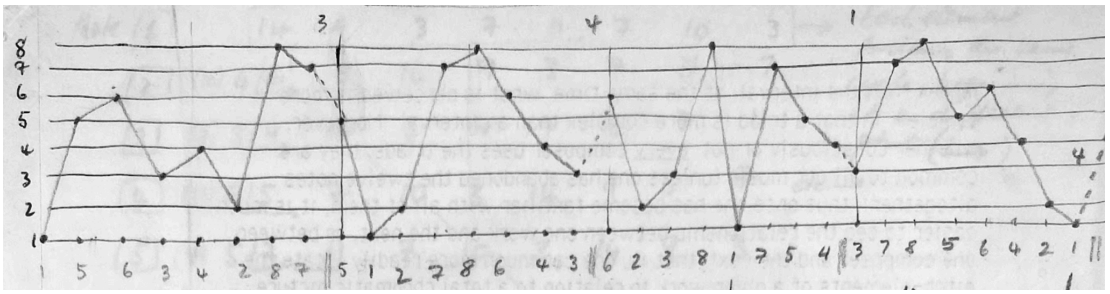
The following commentary aims to illuminate the '*gestalt'* interactions that I encapsulate in each piece of the portfolio in turn. As well, each commentary aims to sketch out the philosophical concerns that I brought to each exploration, and to deep structural networks and adapting the TC to a non-12-tet context.

In analysing my pieces I have taken a unified but then branching approach. Each piece for the most part will have a temporally accurate (as in, the proportions match those presented in the music like a scale model) structure diagram built around a line. Below this central dividing line, the general thematic structure is presented on one or two levels; the capitalised letters (A, B, C, etc) representing sections, and the subdivision of these sections into motivic areas being shown with lower-case italicised letters (*a, b, c,* etc). Above the dividing line, the field structure is shown, whether that's the TC interval patterns or unifying interaction areas. I have chosen to omit the conventional 'b.' or 'bb.' preceding bar numbers to save space, however to keep these distinguishable from TC triad designations (i.e., bb. 1-2 could be confused with hour 1-2), bar numbers always appear as non-bold text, whereas intervallic structures are always in bold.

I have also sporadically made use of McLeod's '*gestalt*' notation (See Fig.17) in my analyses. These can be seen in the file named *The Gestalt* (McLeod, 1980-1995, MS-Papers-7349-048). These are defined as a representation of a "continuum", where the modules of each plane are defined to produce a graph-like diagram showing the shape or

gestalt of a field. In this research, I only use them with pitch on the x-axis, and duration on the y-axis.

Fig.17: Example of gestalt notation (McLeod, 1980-1995, MS-Papers-7349-048).



Compositional and Physical and Space

The use of the TC as a structuring principle, through which compositional space and its subsection–physical space–can be explored and controlled, constitutes probably the most important part of my compositional explorations, as it defines how I think compositionally. Just as McLeod probed the form of the field, here I sought to illuminate fundamental interactive properties of the field. In doing so, I hoped to gain a better understanding of my own compositional proclivities, but more importantly lay the ground for a *gestalt*-based conceptualisation of composition born from the TC and McLeod's continuation of it.

In beginning this exploration of the interaction of the field, I first sought interactive possibilities within the compositional space to control the TC fabric (tonal field)–which led to my adaptation of halftone–and as well as larger structural and textural fields. This enabled a greater and more purposeful control of the gradation of the TC colour. With these interactions occurring in the temporal and spectral domains, what structural effects do these interactions afford the composer? What perceptual effects do the interactions and their resultant structures create? I began to also extend these interactions outside the compositional space, into the realm of physical space, creating spatialisations of both TC

patterns, and the temporal and spectral interactions. What extra level of control does the spatialisation of these structures impart on the composer and how the listener perceives their work?

These give rise to fundamental questions about how the TC functions, one key aspect being perception in relation to written structure. Use of the TC spectrally often defines harmonic density, whereas temporality defines harmonic rhythm. As with most of these pieces, some aspects are controlled and some are left to inspiration or the results of other compositional decisions. However, both are always in effect during a composition, and the continuity that forms the temporal harmonic rhythm is in effect functioning as it does in tonal music, but with the TC instead of traditional alternations of major and minor harmony. Also, the way TC structures are used will affect the purity of their hour colour, a feature that I often control to create structural moments of tension and release. Use of the TC without considering the control of this will automatically result in these ebbs and flows, which can also be seen in some of these pieces. However, the varying uses of the TC and interaction present a detailed exploration of the functional effects this concept affords the composer, where the increase in harmonic density can often be linked to TC impurity and therefore an increase in musical tension.

Seven studies in interaction

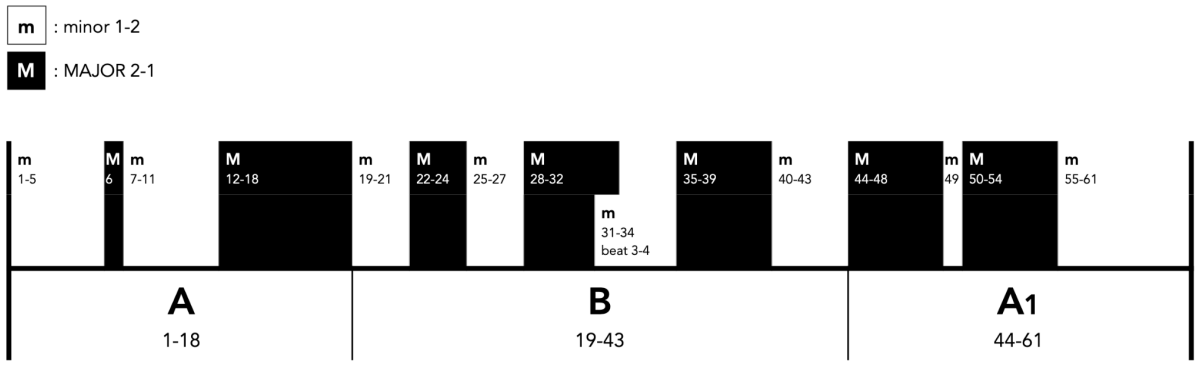
During the earliest stages of my research, I became interested in the potential for exploring interactions in single hour-colour fields. *Seven studies in interaction* is a collection of small-scale piano pieces that explore specific possibilities of the interaction of TC structures, and how this can be expanded beyond the element of pitch to larger musical and structural fields. As discussed, the TC hours can be expressed as a ratio (e.g. 1-2 and 2-4 can both be expressed as 1:2), producing three categories of intervallic relationships: minor–Neural–MAJOR. The concept of this piece is an exploration of the contrast between

min and MAJ structures. This criterion applies to seven hours of the twelve (II, III, IV, V, VII, VIII and XI). Each piece explores this in different ways, some focusing more on the temporal (horizontal) dimension, and others on the spectral (vertical) in their expression of the interaction of min and MAJ. These studies, for the most part, were written consecutively, showing the development of my approach to this interaction and creating a thread of continuity through them all.

IIm-IIM (1–2|2–1):

The first study of this collection focuses on Hour II, with its use of min and MAJ forms expressed as temporally separate fields with minuscule overlap. The interaction between these therefore occurs consciously at the surface level of the TC structure, and the change between the min and MAJ fields is purposely sudden to emphasise their colouristic contrast. This resulted in a piece with clear and audible harmonic rhythm of stable and pure Hour II TC structures, functioning in effect like the alternation of major and minor chords in tonal harmony. A clear visual representation of this audible harmonic rhythm can be seen by the alternating blocks of black and white in the structure diagram (see Fig.18).

Fig.18: *IIm-IIM* structure.



When composing this study, my focus was entirely on this surface; any deeper levels of the TC structure specifically, were left to the subconscious. It was a happy accident to later find a deeper recursive structural element, which I will discuss later. In addition to the interaction

of the TC fields, the abstract concept of min/Neutral/MAJ bleeds into the control of the overall structure of the study. The use of the TC presents a constant alternation between min and MAJ fields; the two far poles of intervallic ratio. The study is separated into an ABA structure, clearly marked by the fermatas placed at the end of each section.

The opening A section is mostly dominated by IIm forms, especially the first 11 bars, where there is only a one-bar interjection of IIM in bar 6. While the IIm dominates the realm of pitch, structurally the opposite is being implied. Bars 1-11 can be seen as a temporal representation of a MAJ structure, where five bars of IIm are followed by one of IIM, followed by another five bars of IIm. If McLeod's adaptation of TC principles to rhythm can be extended to larger rhythmic constructs like metre and their expression though bars of information, we can see this structure as an LSL (long-short-long) relationship, or as a ratio of difference of 5:1:5. This therefore creates a mirroring interaction between the expression of pitch, and the temporal structure.

The temporal expression of min and MAJ in bars 19-27 form a Neutral temporal representation, where each takes two bars, therefore forming a 1:1:1 ratio. In the following bars, these fields extend in length slightly, however this does not apply evenly to IIm and IIM, and the equalisation is gradually lost. From bar 28 onwards, the IIM fields begin to dominate over the IIm fields, which acts as a transition to the temporal structure of A1.

The alternation between min and MAJ in bars 28-34, occurring at the midpoint of the study, deviates slightly from the established temporal separation of min and MAJ, where the two overlap for a bar resulting in a slight obscuring of these two fields. The placement of this structural blurring at the midpoint of the piece can be seen as the furthest point in which this study will explore; a breaking of the established structural paradigm, where min and MAJ are not felt as opposing entities for a short moment. This however is only very brief, and couldn't be explored in this study, so it becomes the premise of the second study of this collection (*IIIm-IIIM*).

In B, the equalisation of the relationship between min and MAJ in bars 19-27, creates tension through the increase in TC harmonic rhythm, with the encroaching dominance of IIM in 28-43 providing momentum toward the release and resolution of A1. B therefore acts as a structural bridge between the two A sections, a transition between the flipping of min and MAJ poles.

In A1 the exact temporal structure of A is used, as well as the exact motivic expressions. However, the min/MAJ relationship has been reversed; where there was once a field of IIm, IIM is now mapped to that expression and vice versa. This slight change in intervallic structure, and the reversing of the temporal dominance of min and MAJ has a large effect on the tonal *gestalt* and its musical effect. An audible and clear colouristic delineation of the structure is therefore produced through the TC. Additionally, the study presents an interaction between the spectral field and the temporal field, whereby the tonal field's dominant pole is reversed over the course of the study, from min to MAJ, realigning with the MAJ LSL durational ratio.

The composition of this piece was formed mostly from my own improvisation at the piano, and subsequent compositional schemata or processes were derived from my own playing instead of being drawn out beforehand. Interestingly, my use of the piano and my motivic material highlights how much the concept of the piece affected my playing. The pedaling in the two A sections especially, with the long washy atmospheres of four or more bars reverberating together, is punctuated frequently by the changing between min and MAJ. This serves only to further emphasise the temporal interaction between them, where the control of tension is controlled by the release of the pedal. These areas of washy articulation were originally longer and pedalling only occurred at the change of hour, but after playing through them at a grand piano and also feedback from pianist Rolf Hind, I decided to add more rearticulations of the pedal to help with coherence.

The motivic material and its relationship to the TC were also mostly left to inspiration during improvisation, with areas where the motivic processes form their own independent thread of structure. The stepped gesture of the opening in both A sections (bb. 1-5 and bb. 44-48), is contrasted with the comparatively busy interjection in b. 6 and b. 49, both of which are played in the opposing hand to the antecedent they respond to. While unintentional, the effects of the piece's concept of min/MAJ separation influenced my use of simple TC structures even in how I improvised with these Hour II materials. After I had formed the opening phrase (bb. 1-6, one alternation of min and MAJ) through improvisation, the developed repeat of these bars which immediately follows was created through the use of simple processes like inversion and permutation. To further enliven the rhythmic and dynamic qualities of this repeat, two simultaneous permutations are applied to the stepped gesture. The three rhythmic/dynamic paired expressions of this initial gesture are permuted once to begin with the quaver rhythmic unit (originally in b. 3), and once in the opposite direction to now begin with the *mp* dynamic indication (originally in b. 5). These simple processes created a new, distinct expression of the original gesture, as well as extra layers of musical structure to interact with the TC harmonic rhythm.

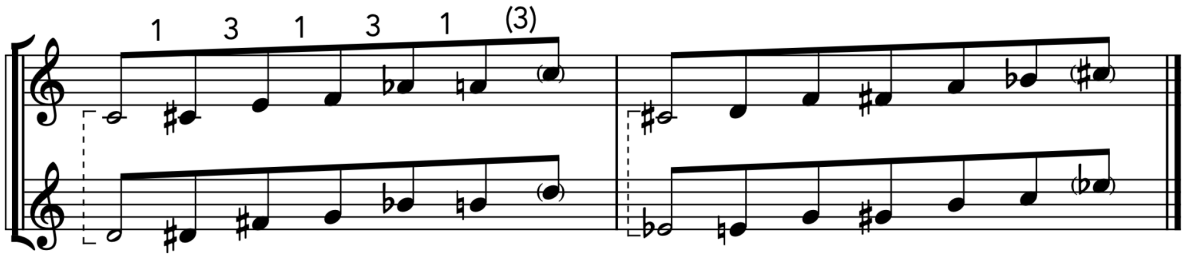
IIIm-IIIM (1–3|3–1):

Hour III's study is a deeper exploration of the small moment of the overlap of fields in *IIm-IIM*, as well as a continuation of the study of temporal separation of min and MAJ. Again, the temporal separation of min and MAJ created the fabric of the TC surface, and deeper structural levels were left to the subconscious. The small moment of overlap in min and MAJ fields in *IIm-IIM*, inspired me to want to find a more focused way of obscuring the separation of these two poles.

Instead of the sudden alternation as in the previous study, a more gradual transition between min and MAJ is achieved through the use of Hour III's possible larger cyclical structures forming subscales. Hour III can be expanded into hexad Oedipus subscales

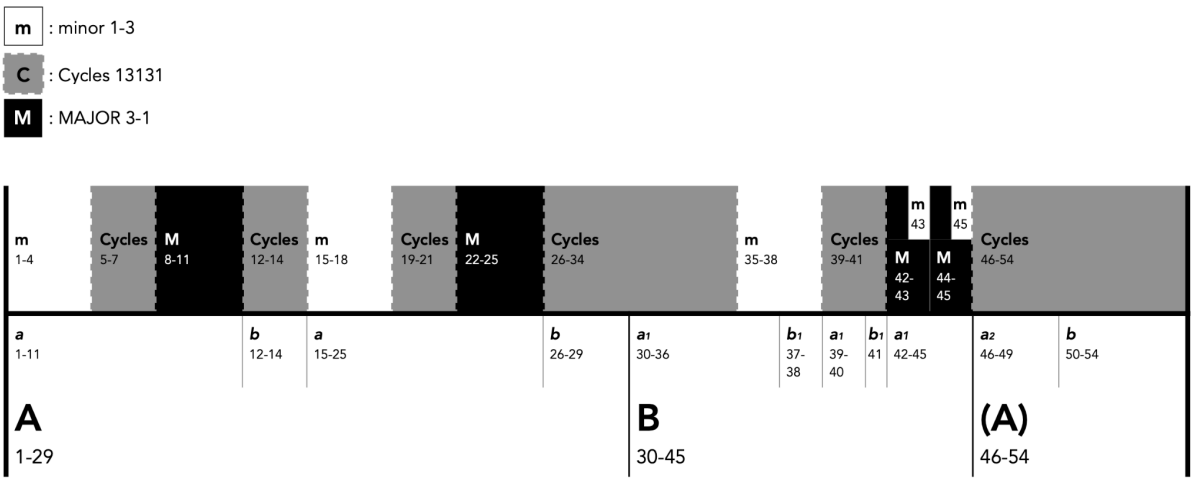
(13131, or hexatonic scale), which are cyclical and transpositionally limited. Only four unique transpositions are possible, which form two pairs of chromatic complementation:

Fig.19: The four transpositional levels of the Hour III oedipus cycle. The dotted brackets indicate chromatic complementation.



These cycles are explored as an intervallic space between min and MAJ in this study. Because of the inherent nature of a cyclical two-interval structure, the concept of min and MAJ becomes entirely contextual, as there is no fixed starting point, similar to the structural properties of Hour IX. While this isn't the same as a Neutral hour form created from one repeated interval, it creates a pseudo-neutralisation of Hour III, where min and MAJ are completely interlocked and expressed at the same time. This is because these groups are inversionally symmetrical and both min and MAJ forms share the same IPF, similar to the octatonic scale (II(8) or Messiaen's Mode 2). The alternation of min and MAJ is separated by fields of cycles to blur the boundaries between tonal *gestalts*.

Fig.20: *IIIm-IIIM* structure.



Unlike *IIm-IIM*, here the motivic material and the TC fabric are slightly more independent continuities. The study follows an increasingly truncated AB(A) structure, where the Oedipus cycles gradually dominate over the min and MAJ (Fig.20). Each section of the AB(A) structure is roughly half the length of the last (29, 15, 8 bars respectively, creating a durational ratio of 4:2:1), which provides a structural accelerando to build towards the final climax of the study. The first A section is the most structurally consistent part of the study in its use of the min-cycles-MAJ transition and their relation to the motivic material. Similar temporal expressions of these fields creates a pendulum-like dynamic where the two far poles of its swing where it comes to rest can represent min and MAJ, and the cycles as the swing between them. Two full expressions of this occur in A, with the last cycle field (of min-cycles-MAJ-cycles) always being taken by the *b* motivic material.

The larger B section and its use of the two motivic ideas (*a* and *b*) becomes completely uncoupled from the TC fabric's structure. In the final *a1* motivic material of B, the established blurring of min and MAJ with mediating fields of cycles is abandoned for a similar moment of overlap to the one in *IIm-IIM*. Here however its separation is far more defined, where min and MAJ fields are presented with a clear spectral and temporal interaction. The LH and RH of the piano become two continuities; the former plays two fields of MAJ (in bb. 42-43 and 44-45, which can be seen as one larger field of MAJ across both), while the RH alternates between MAJ and min every bar. The exploration of multiple TC continuities occurring and the separation of these fields between hands is explored further in the next study, *IVm-IVM*.

The cyclical nature of these Oedipus groups can be understood as analogous to the *gestalt* principle of "closure", where "closed lines" are perceptually "stable organisations", with the circle being particularly stable as "each piece of it contains the principle of the whole" (Koffka, 1935, 151). These therefore create tension and release, where the movement through the circle creates directionality and resolution upon its completion. I

exploited this concept to define the *b* motivic area; always used with the cycles, it texturally presents a musical expression of reaching around the circle with both an ascending and a descending pattern, examples of which can be seen in bb. 12-14 and b. 41.

Just like *IIm-IIM*, this piece was formed at least initially from improvisation, with the first TC structural unit of bb. 1-14 (min-cycles-MAJ-cycles) being entirely formed before thinking of larger structural ideas. Again the piece's concept and the TC structures themselves affected my improvisational language, this time with the min and MAJ being motivically congruent and similarly articulated, but the cycles being used as the contrasting consequence to their antecedent. See for example the expression of min in bb. 1-4 and MAJ in bb. 8-11 in comparison to the cyclical Hour III expressions in bb. 5-7 and 12-14, which are presented as heavily pedalled gestures widening and emerging from an initial dynamic contrast (for example b. 12). The blurriness of min and MAJ in the theoretical construction of the cycles is interpreted through articulation, with the pedal blending these areas. These gestures are more loosely interpreted in an almost visual way, where only the widening motion or the alternation between lines separated in space is retained for passages such as b. 37 and b. 41.

The motivic material all originates from the opening idea, which itself can be seen as a stark and simple exploration of the metre, where the alternation of *two* and *three* is at the forefront of the piece's motivic character, something I revisit in *Vm-VM*. These ideas occur on two strict temporal levels throughout the piece, the first used in the opening statement with a crotchet and dotted crotchet (b. 1), and the other being half the temporal spread of a quaver and dotted quaver (b. 31). At first these are used as separate entities, but are later superimposed, for example in b. 35. The 5/8 metre interested me as potential metrical/rhythmic exploration of min and MAJ, where both *two* then *three* as well as *three* then *two* could represent each of these poles respectively. The majority of the B section changes to the MAJ metrical division before returning to min just before the final A section,

thereby creating an interesting fluctuation in metrical feel to further emphasise the structure while also being congruent with the concept of the piece.

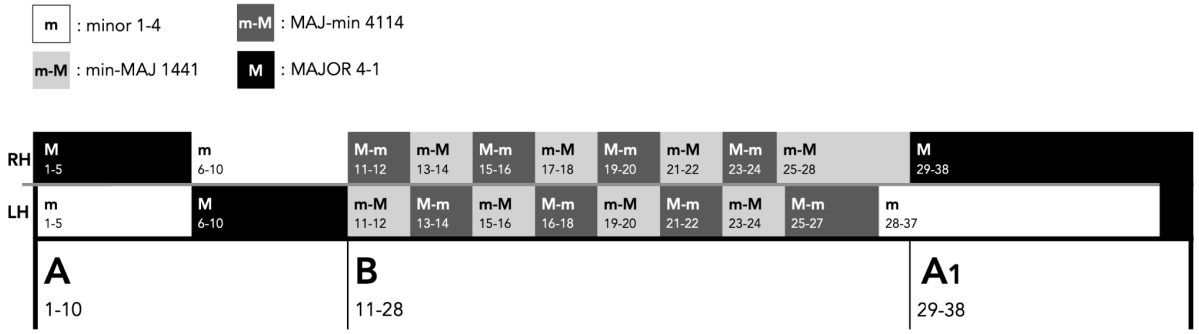
The TC structures of this piece helped to steer my compositional language, affecting both the motivic construction and their use and articulation throughout the piece. Often, however, the overall structure and the use of TC concepts in the metrical and rhythmic realms are unconnected from the realm of pitch and the TC, each providing a separate continuity with which the TC can interact. Separate but interacting continuities create a more nuanced *gestalt,* and a deeper level of structural interaction, where tension gradually builds as the TC continuity slips out of alignment with the motivic structure. This is resolved by the second half of B where they realign temporally but now with the cycles still dominant, and the fast TC harmonic rhythm of bb. 42-45 being the last crescendo of tension to the release of the final A section.

IVm-IVM (1–4|4–1):

IVm-IVM will be discussed in more depth later where its recursive deep structure can be analysed. However, as the *Seven studies…* piano set was a continuous process, where each study was a natural progression from those before, the exploration of its position in the set and its exploration of *gestalt* and compositional space are needed. The study in Hour IV presents interaction between min and MAJ in multiple ways, and in multiple simultaneous continuities occurring both in the spectral and temporal dimensions. Compared to the previous two studies, the complexity of the interweaving expressions of the min/MAJ interaction is far more controlled and purposeful.

Structurally the piece is very similar to *IIm–IIM*; following a simple ABA structure where A and B both signal different motivic ideas as well as distinct audible TC colours, creating a parallelism between the tonal and structural continuities:

Fig.21: *IVm-IVM* structure.



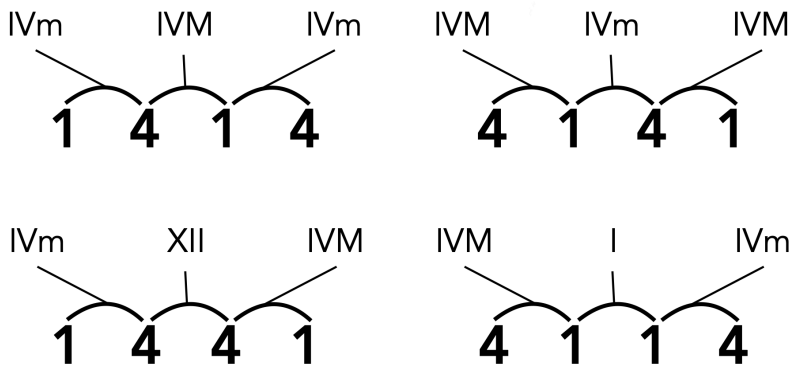
The A sections present crystalline expressions of min and MAJ, with Hour IV tetrad oedipus patterns being consistently used. These however, while presenting a simple expression of the Hour, were constructed as an interaction around a fulcrum PC, a concept that is used to create the multi-hour sets of the B section. The tetrad sets used in this study are created from a fusing of two Hour IV triads overlapping over a central PC fulcrum, a union which produces both simple single-hour tetrads, as well as multi-hour nature composite tetrads which will introduce my adaption of the concept of halftone.

Four possible interactive dynamics are possible from this two triad union depending on the use of min and MAJ and whether they fill the upper or lower part of the fulcrum:

Fig.22: Hour IV fulcrum interactions.

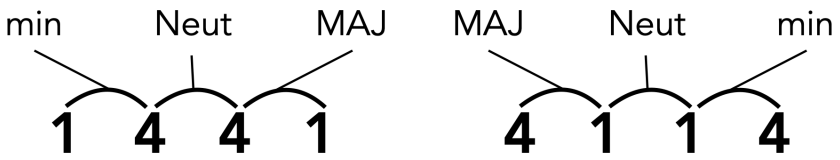
The composite of min-min and MAJ-MAJ unsurprisingly produces simple single-hour oedipus pentads of 1414 (min) and 4141 (MAJ) respectively and are the strongest audible representations of the intervallic poles. Whereas, when min and MAJ are fused in this way, the pentads formed are not only representations of Hour IV (both min and MAJ), but also Hour XII (in a min-MAJ union: 1441) and Hour I (in a MAJ-min union: 4114). These groups are called symmetrical pentads SPIVm and SPIVM by McLeod:

Fig.23: TC analysis of fulcrum interactions.



McLeod (1994, 18-20) talks of and catalogues these "multiple-nature hour-groups", showing that in addition to them showing multiple hours in their construction, they (and many other groups) are capable of being interpreted as completely different hours. For example, while I have defined the min-MAJ union as 1441, it can equally be seen as a 3443 or SP XIm. Thus creating an intervallic translation of min/Neut/MAJ (and its retrograde):

Fig. 24: min/MAJ analysis of fulcrum interactions.



This is entirely contextual: while, from an abstract perspective, both are equally accurate representations of the group, their use within the study often highlights the 1 and 4 intervals as can be seen in the right hand of the end of bar 12 and beat 1 of bar 13.

As I have discussed, the idea that interval groups can imply multiple hours due to being a blending of multiple different hour-colour atoms, led me to adapt the visual perception concept of halftone (which in itself is an expression of the law of proximity from *gestalt* psychology) to the sonic realm. Here the constituent intervals of Hour IV (1 and 4) are multiplied to create a new hour-colour atom within the resultant tetrads, creating a new tonal colour blended through halftone. Additionally this raises the question of whether multiplying intervals, thereby producing new atoms of symmetrical hours from the

constituent intervals of non-symmetrical hours, would perceptually be related to the original non-symmetrical hour. Additionally, can we also interpret the multiplied middle interval as just a prolongation or extension of that section of its colour while retaining its *gestalt*, where, for example, min-MAJ can be seen as a stretched form of a min Hour IV tetrad (141). This is something I explore further in *An Exequy*.

In addition to its halftone interaction, the piano as an instrument defines the min/MAJ interaction across the piece. As shown earlier, McLeod experimented with the simultaneous expression of min and MAJ split between the hand separation of the piano. Therefore, in *IVm-IVM*, a spectral interaction between the hands is in constant affect, where the hands always express opposition poles of min and MAJ, also of min/MAJ fulcrums. In the first A section, this means that where the RH expresses MAJ in bb. 1-5 then min in bb. 6-10, the LH expresses min in bb. 1-5 and MAJ in bb. 6-10. For the B section where multi-hour nature pentads are used, this means that each hand uses the opposite fulcrum interaction–where the RH has MAJ-min, the LH has min-MAJ.

The interaction between min and MAJ therefore occurs temporally where each periodically swaps between hands (i.e bb. 1-5 and bb. 6-10), the rate of which increases in the B section. Additionally min and MAJ interact spectrally in three separate ways; firstly through the halftone blending, secondly through the opposing of the hands, and finally through its multiple recursive steering levels which will be dealt with later. The spectral interaction between the LH and RH continuity also needs to be discussed from the perspective of the interpretive nature of the TC, and how these two parallel sonic fields could be perceived differently when interpreted as one simultaneous field.

In contrast to the previous two pieces of this set, the composition of this piece was less defined by long sections of improvisation, instead following a strict structure with only brief moments of improvisation having influence on the piece's composition. A predefined and written-out structure, as well as multiple levels of TC structure and substructure, was

fully formed before starting to compose the surface of this piece. This, just like for any other composition I have done with predefined structure, changes my compositional process slightly.

For the A section, after improvising with a continuous stream of notes in the LH, this pattern proved an easily adaptable template that I applied the Hour IV oedipus sets to, therefore only a choice of what sets I needed to use to express the deep structure was needed and was decided through experimentation and what sounded right to me. Creating a melody on top took slightly more forethought, but again only small motivic atoms were used. After the first bar and the use of the dotted quaver and semiquaver rhythm acting as an anacrusis to the melody, the last semiquaver of the bar is retained as a repeated rhythmic touchpoint and the dotted quaver which precedes it, is also often used. I again used simple processes like inversion to create a continuation after the first melody concludes in b. 5, with the melody in bb. 6-8 being a loose inversion of the original melody. This motivic change aligns with a min/MAJ polarity change in the TC surface.

The motivic material of the B section was created from small atoms of previous motivic material that inspired me in the moment while playing back my written A section. The crossrhythmic alternation between the hands created by the ending semiquavers in the majority of the RH's bars, interacts with the tuplets of the LH. This inspired the rapid alternating descents used frequently in B, and also resonates with the hand separation formed from the piece's concept. The responses to these descents were formed from exploring the dotted quaver and semiquaver rhythm which define the end of each bar in A, in B, however, these are explored as pairs with the use of retrogrades of the pattern, see for example b. 11 (both retrograde), b. 12 (first of pair retrograde), and b. 13 (second of pair retrograde). These motivic interactions present an analogous shape to the fulcrum interactions, and the section as a whole presents a significant motivic and textural change to emphasise the shift in tonal *gestalt*.

The choices I made when composing the surface of my mapped-out TC structure had a large impact on the way each hand expresses the TC, and in turn the way min and MAJ are presented during the piece. In A, the LH's constant stream of tuplets meant I could move through far more TC material in comparison to the RH slower melodic gestures. The LH moves through exactly double the amount of Hour IV pentads in the first A section (see APPENDIX IV p. 178), creating an interesting spectral and temporal imbalance where min and MAJ spend periods of being represented very differently both motivically and in TC harmonic rhythm. The tension created by this imbalance resolves in the same way as in *IIm-IIM*, where the B section presents a balancing of min and MAJ, before the relationships of the original A section are reversed in the altered repeat. Like *IIm-IIM*, temporal comparison of TC materials is shown to be a powerful composition tool, but the constant parallel spectral interaction between hands creates a more complex musical tonal surface.

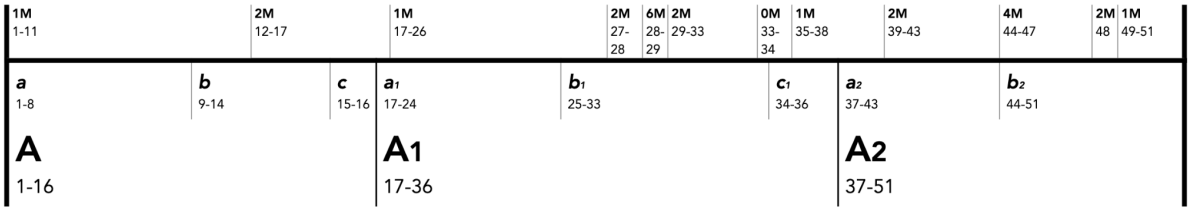
Vm-VM (1–5|5–1):

In Hour V's study, the interaction of min and MAJ is based solely on the fundamental idea that these two far poles of intervallic ratio are equal and opposite–they are inversions of each other. The interaction between them in this study was therefore focused on the spectral domain, whereby horizontal mirror points are constantly in effect, with the amount of these used controlling the tonal complexity/density as well as Hour V's purity.

The study's overall structure is a continual variation of established motives, where three repetitions of the A section of the same order of motivic material (*a*, *b* and *c*), are used with increasing amounts of motivic development:

Fig.25: *Vm-VM* structure.

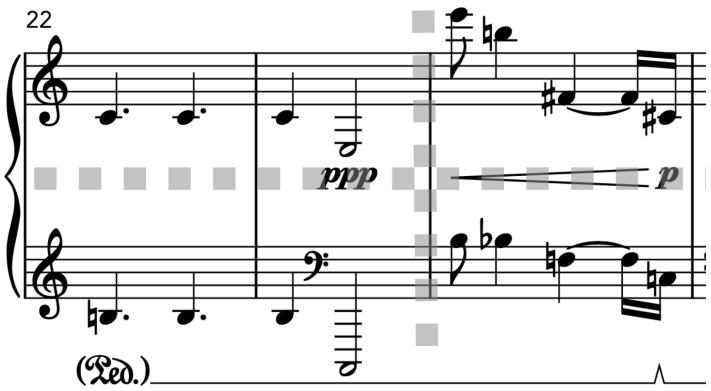
M = Mirror



Like *IIIm-IIIM,* the overall structure is mostly disconnected from the structure of the TC fabric, although there is a purposeful correlation between increasing mirrors (and therefore tonal complexity/density) and the progression of the A sections, with each starting back at 1M.

Overall, this study was inspired by the separation of min and MAJ between hands in *IVm-IVM*. Here, however, the patterns created by the mirror points are not separated by hands, only by horizontal planes reflecting each other. The strictness of the reflections' effect on the texture fluctuates through the study, creating two ways in which the mirrors are used. Firstly, as can be seen in bb. 1-11 (*a* motivic material), the texture and the TC expressions on both sides of the mirror around middle C initially are almost exact reflections creating stability in the expression of the TC colour. The mirror interval (distance between the reflections) increases in b. 9 to a semitone, and then to a minor 3rd in b. 11, before the mirror begins to divide. As the mirrors increase, so does their effect on the texture of the musical surface, whereby they only fulfil the function of the generation of TC relations, so that textural variety can be more freely explored. The purity of Hour V's expression is weakened while the tonal complexity and density increases, contributing to the musical tension. In addition to the horizontal mirrors' effect throughout, I texturally explore moments of a combination of loose combinations of horizontal and vertical mirrors to create a retrograde-inversion of the contour, as can be seen in bb. 23-24:

Fig.26: Mirrors in bb. 23-24 of Vm-VM.



This piece was formed from improvisation, with a particular focus on how these mirror points act both in the aural and visual world during performance. The concept of a mirror used like this (whether horizontal, vertical or a combination of the two like in Fig.28) is as much a visual pattern translated to the sound world, as it is a musical expression creating a visual shape. Additionally, by means of simply following the score, the performer is directed to move their hands and arms in mirrored forms, creating a congruent visual experience for the listener. In composing with this in mind, I was interested in the changing congruence of the visual and sonic experiences, with areas where Hour V's shape is presented clearly, and others where its shape is obscured while its colour remains. This is a consequence of the fact that increasing the mirror points meant sacrificing the comprehensibility of their basic shape. This shape shows the isomorphism between the min and MAJ Hour V forms, clearly presenting their intervallic make-up with a simple presentation in musical space. In contrast, when these mirrors are used less strictly, the intervals–and therefore shape of Hour V–disintegrates, becoming a background generator. This dichotomy therefore becomes an exploration of how tension and release can be controlled by the TC harmonic density. Similarly to *IIIm-IIIM*, this piece is defined by a simple and unobscured rhythmic exploration of the alternation of duple and triple metre, where a limited number of small atoms formed in improvisation are taken forward for development to build the rest of the piece.

In presenting an analysis of the mirrors used in this piece, I have experimented with adapting McLeod's *gestalt* notation, which gives a very clear image of this visual pattern expression through sound, as well as illuminating the patterns used in areas where mirrors only generate TC relations. To clearly show the relationships/interactions created by mirror points, the temporality of the *gestalt* notation is removed, allowing blocks of mirror patterns to be expressed how they were generated, and the connections between these blocks can be seen more clearly.

Rules were obviously needed to show the expression of the Hour V triads, and which side of the mirror they will be interpreted as. This is because a min ascending triad with its descending MAJ inversion generated through a mirror point, is the same Hour V field even if the MAJ ascends and the min descends:

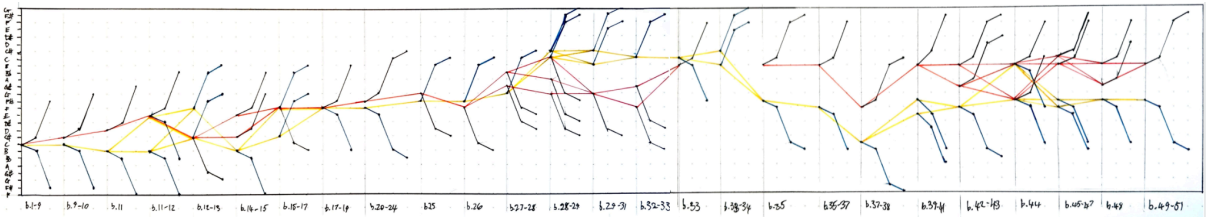
Fig.27: Inversional relationship of min and MAJ.

Where the musical expression clearly outlines the TC fields and the mirrors they revolve around, there is no issue in interpretation while notating its *gestalt* (e.g. bb. 1-9, where it is interpreted as starting on C and not F♯). In areas where the mirrors were only used to generate material and not explicitly defined as the prime set or a reflection, it becomes more flexible. The analysis produced is therefore an attempt at creating a consistent interpretation, to either its benefit or detriment, and further investigation is needed to develop *gestalt* analysis and notation. Either way, this *gestalt* depiction of the TC structures of this study was an interesting experiment, and created a visual image of the TC fabric congruent with how I thought about it while composing–as branching and continually tangling and untangling veins of intervallic colour.

The first rule I applied is that the smallest possible spread of the reflections is preferred, echoing the IPF rules. The next is that the smallest overall movement between mirror fields is preferred. Finally, the transparency of these structures in the score is considered; moments where the TC expression is clear, this interpretation was used. The

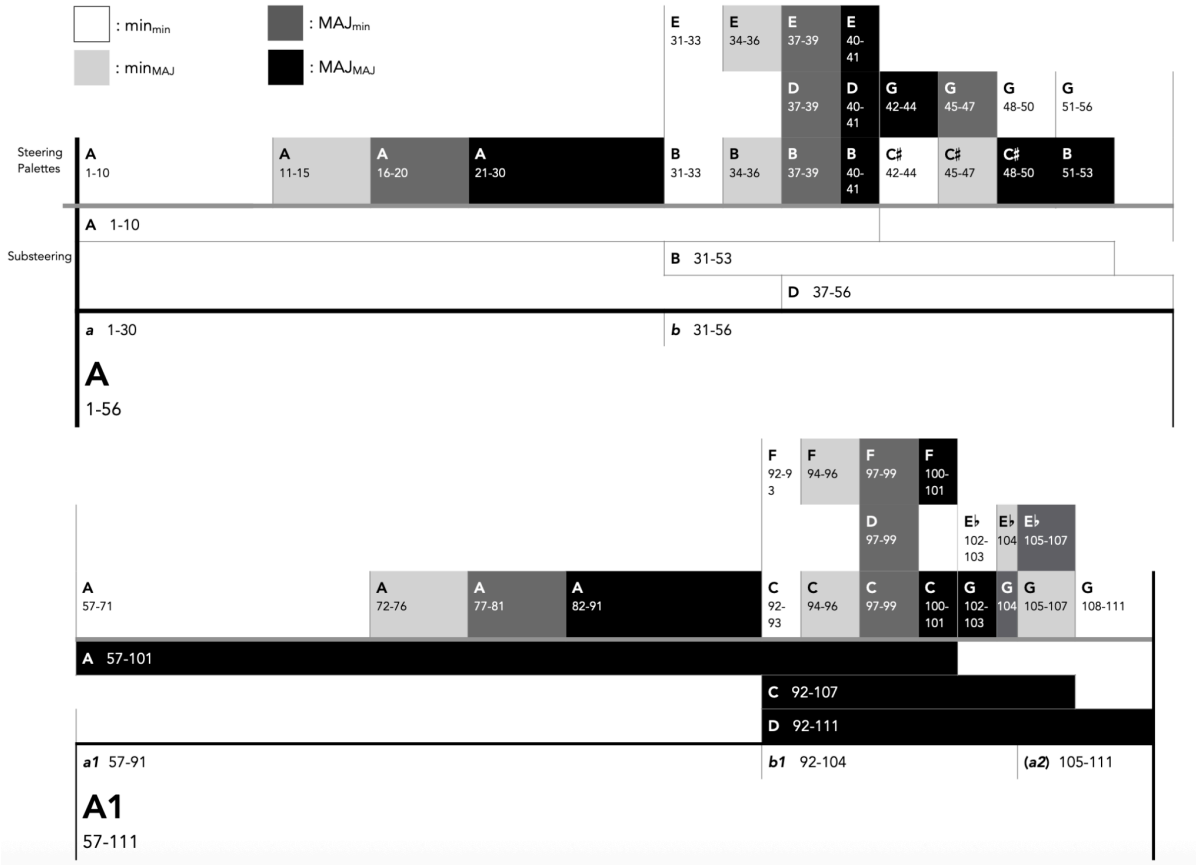
red line connects the minor continuity, the yellow connects the MAJOR, entangling and interacting to show the veins of this study's TC fabric:

Fig.28: Gestalt analysis of *Vm-VM*.



VIIm-VIIM (2–3|3–2):

Fig.29: *VIIm-VIIM* structure.

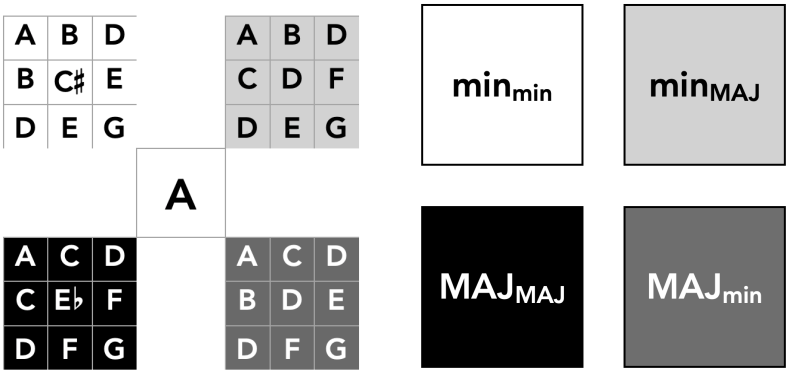


In *VIIm-VIIM*, the interaction of min and MAJ is expressed through controlling another of the building blocks of TC language–the interaction between surface and steering. Like *IVm-IVM*, this study's discussion will be split between here and later when we approach deep structure and steering. However, the effects of the changing dynamic between surface

and steering are important to discuss from the perspective of their interaction, as well as how the motivic expression can be influenced by these structures. The structure of the study is two repetitions of similar A sections (A and A1), which can be divided into *a* and *b* thematic material (see Fig.29)

Similarly to the tetrad fulcrums constructed in *IVm–IVM*, there are four possible interactions which will be referred to in this format: "$Surface_{Steering}$". These can be more simply visualised as four matrices by stacking the three steered triads into a block 'palettes', where the TC triad extends horizontally and the recursive steering extends vertically below it (see Fig.30)

Fig.30: $Surface_{Steering}$ Palette



Traditional steering relationships in Schat and McLeod's TC writings tend to be both a different hour and different set size to the steered material. However, my steering palettes are completely defined by themselves and the interaction of min and MAJ–they are therefore 'self-steering'. The min_{MAJ} and MAJ_{min} interactions are the same as the harmonic rotation relationship used serially by Krenek and Knussen (Anderson, 2002) (Krenek, 1960). Each type of $Surface_{Steering}$ interaction presents its own slightly different recursive expression of Hour VII atmosphere, each a different hue of the same base colour. This creates a tetrapartite gradation of the recursive Hour VII colour field, which has subsequently been modulated through to create gestural colour shifts through the study. Both *a* motivic areas present the dynamic very clearly, where a single transpositional level of the colour gradient is temporally spread over bb. 1-30 and bb. 57-91, progressing from min dominant hue to MAJ dominant hue. This same gesture from min hue to MAJ hue is used

prominently in the study, with the first half of both *b* motivic areas both following the same pattern on three transpositional levels (bb. 31-41, and bb. 92-101).

Similarly to *IIIm-IIIM*, the intermediary field between min and MAJ, creates a pseudo-neutralisation of the TC field. While this effect is less in this study as the surface still has a clear min/MAJ identity, the changing $Surface_{Steering}$ dynamic provides a blurring of the boundary of the two ratio poles.

The second half of each *b* motivic area can be seen as a deconstruction of this gesture, where two transpositional levels move in opposite directions along the colour gradient simultaneously. The interaction between these two transpositional levels blends opposing hues, thereby canceling each other out and creating a pseudo-neutralisation. The C# (and then B) transposition proceeds in the established directionality of this colour shift, progressing from min hue to MAJ hue (excluding MAJ_{min} palette) over bb. 42-53. The G transposition presents a retrograde of the colour shift gesture, moving from MAJ hue to min hue, missing out the min_{MAJ} palette.

While I have tied structures of the TC fabric and the motivic structure together in previous studies, here the expression of the steering structure is a direct influence on the motivic use. The motivic material was constructed as representation of the conceptualisation of the substructure; the visualisation of triads stacked into matrices, is expressed musically through the constant superimposition of similar motifs in canon-like counterpoint. This can be seen in the *a* motivic sections, for example the simple and solo expression of bb. 1-10 is then developed through the canonic stacking of the motivic material in bb. 11-21–each entry being tied to one level of the hue palette. The steering structure is therefore very clearly outlined by the motivic use of the TC surface.

The original motif presented in bb. 1-6 was the result of improvisation, but the increasingly complex stacking was similar to how I composed *IVm-IVM*, where the simple motivic patterns could be coloured with different Hour VII transpositions as needed to form

the predefined substructure. Unlike *IVm-IVM*, the stacked steering palettes were a direct influence on the use of this motivic material, guiding the canonic textures to form a metaphorical overlap between the TC construction and motivic development. Like in *Vm-VM*, the increasing complexity of the TC material runs in parallel to the complexity of the use of this material, where the density of the stacking obscures its actual canonic nature and becomes something new. Tension and release is therefore controlled by both motivic density and TC hour purity, both that are at their most complex during heavily stacked sections. However, because of the extreme repetition of the motif and the attaching of Hour VII's colour to it, the TC purity is less affected than in *Vm-VM*. See for example bb. 37-41, which is the peak of TC density in section A, where *three* palettes are stacked, and the motivic use of them is the product of superimposition at four different spectral levels and two temporal levels:

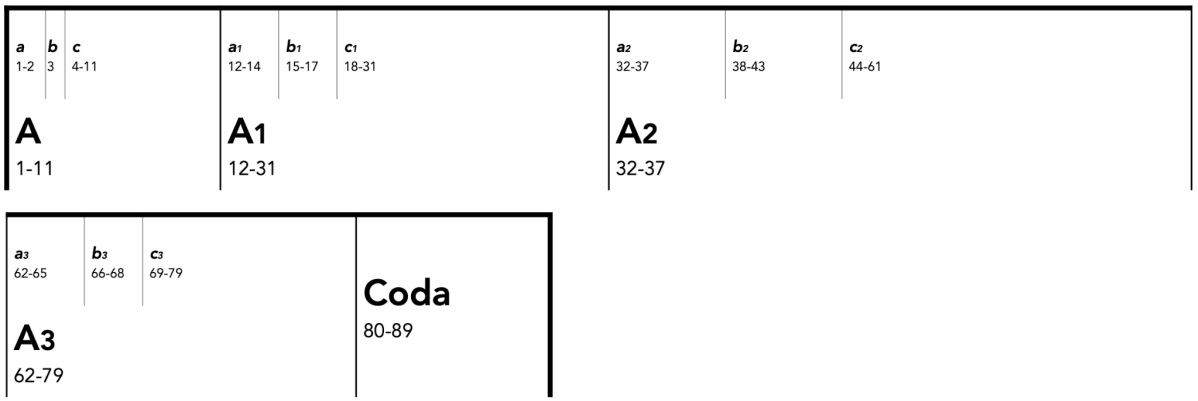
Fig.31: Motivic stacking in bb. 37-38 of VIIm-VIIM.

VIIIm-VIIIM (2–4|4–2):

For Hour VIII's study, interaction crosses the boundary between the pre-compositional and actual compositional space, resulting in a fluctuating mosaic-like exploration of the bounds of Hour purity and streaming of TC surface. Taking inspiration from *IVm–IVM*, and its

overlapping triads to form larger intervallic constructs, here this triadic integration is fully explored in the pre-compositional space. Pairings of min and MAJ Hour VIII triads are initially superimposed, before then undergoing a transpositional phasing process to generate new intervallic structures. The study is constructed from a drifting between fields of clear Hour VIII use and fields of the intervallic structures acquired from the phasing process. Due to the nature of use of this concept, the purity of the expression of both Hour VIII and the concept in general, is fluctuating, and invites the discussion of the interpretive nature of the TC.

Fig.32: *VIIIm-VIIIM* structure.



Due to this, the structure of the TC fabric will only be discussed in key moments instead of being shown in the structure diagram. Similarly to *Vm–VM*, the structure is a continual elaboration on the same repetition of themes, where three A sections of the same order of motivic material (*a*, *b* and *c*), are used with increasing amounts of motivic development. The study closes with a reprise of the *a* motivic material in the Coda (see Fig.32).

The superimposition of a min and MAJ Hour VIII triad can produce twelve distinct transpositional interactions and thus twelve unique IPFs. This pattern repeats through all octaves creating a cyclical collection of new intervallic colours, some of which still display Hour VIII's colour (or parts of it), and some of which are representative of other Hours and halftone combinations:

Fig.33: Phasing interactions of min/MAJ Hour VIII triads.

While I placed no restriction on which of these sets could be used, the study has a clear emphasis on those produced through a transpositional interaction at intervals of Hour VIII–i.e major second (2), major third (4), and tritone (6 or 2+4):

Fig.34: Recursive phasing interactions of min/MAJ Hour VIII triads.

The result of the emphasis on these IPFs, however, as can be seen by their intervallic makeup, results in either larger cyclical forms of Hour VIII, or Hour VI sets. We can view the use of these Hour VI sets as a halftone prolongation of one of the constituent elements of Hour VIII–the major second interval (2). This recursive transpositional interaction does not produce a level of recursive steering, but does mean there is a recursive and consistent relationship almost throughout, even when Hour VIII colour undergoes halftone prolongation.

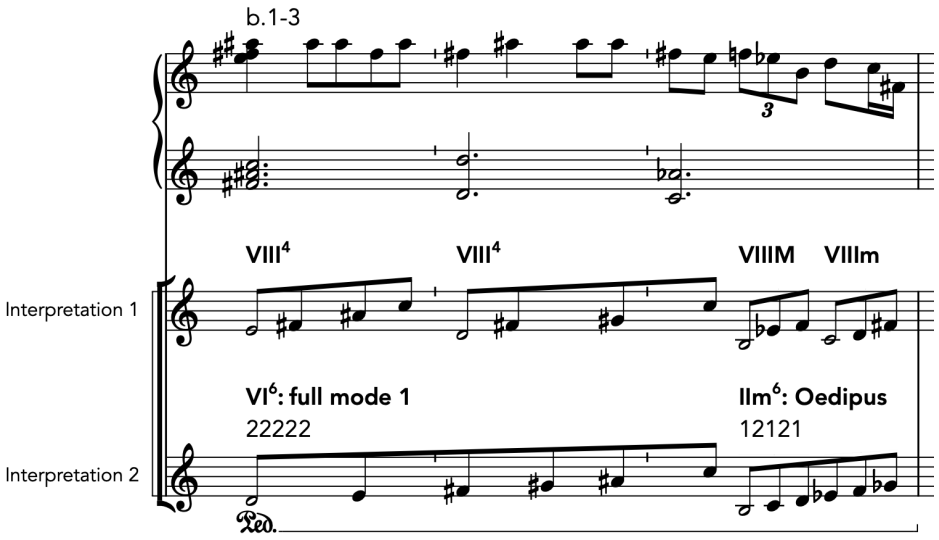
As I found in my analysis of McLeod's *24 Tone Clock Pieces*, the incorporation of more temporal space into the analysis of a particular field will obviously change the interpretation of the identity of the field. It is a natural part of the TC as a concept and of music in general to be interpretively different both between different listeners, listenings, and between what the composer intended and the resulting creation. While many other aspects go into why certain interpretations may be preferred, this interpretive quality is something this study embraces. Bars 38-40 express an overlapping temporal comparison of

min and MAJ, where both forms are presented as one gesture–a descent in MAJ, an ascent in min using one of their shared PC's as a fulcrum. But this raises the question of whether we interpret this as two separate entities, or as a union of the two which forms an Hour VI tetrad:

Fig.35: Analysis of b. 38 in *VIIIm-VIIIM*.

Bars 1-3 (see Fig.36) also clearly show this flexibility in interpretation. Two transpositions of VIII[4] (F#, and, each a result of min-2-MAJ/MAJ-4-min interaction themselves, can be interpreted as temporally separate intervallic entities. The major third (4) intervals of these sets are clearly defined with the opening rolled chord's upper and lower range bookended by them, creating a mirroring formation reminiscent of those in *Vm–VM*. However due to the overlapping nature of the two sets (sharing F# and C PCs), and their proximity, these two may be audibly interpreted as a larger set of VI[6], or Messiaen's full mode 1 (whole-tone scale). This is only enhanced by the use of the piano pedal which is left open for these 3 bars, creating a wash of mode 1 colour, which can either be heard as Hour VI, or with its clear use of major third intervals, as a halftone prolongation of the major second interval.

Fig.36: Interpretations of bb. 1-3 of *VIIIm-VIIIM*.



This raises two discussions: firstly that in normal use of the TC, where it is more complex than a simple outlining of triads, will always yield multiple interpretations. Secondly, that the piano (and by extension, other instruments which can sustain multiple pitches at once), creates another level of complexity of interpretation as a consequence of the cumulative superimposition of sounds. Do we see the intervallic structures as separate entities in time, or does the wash of the pedal aid in a perceptual blending of those structures to create something from their union? In a way, this piece was an attempt at deconstructing the effects of freely using one TC Hour colour, and the resultant intervallic atmospheres.

This piece was mostly formed from long areas of improvisation, where I took the first A section and improvised with each motivic area to create new extended versions to form the continuation of the piece. That being said, there are a few features that were very deliberate and predetermined in their construction. At this point in my research, I was beginning to think about conceptualising the TC through ratio, thereby creating a connection between Hour VIII (2-4) and Hour II (1-2) with the ratio of 1:2. While I had yet to fully form my idea of hour-ratios, I did want a connection between *VIIIm-VIIIM* and the earlier piece *IIm-IIM*, which ended up being shown through the *c* motivic area. The stepped rhythmic permutation motif in *IIm-IIM* (bb. 1-5) was used to create the opening of that piece's B section, where each of the three rhythmic patterns are superimposed with their retrograde to create palindromic patterns in bb. 19-21. In *VIIIm-VIIIM*, in bb. 6-8 a simple sequence of three rhythmic units–semiquaver, quaver, crotchet–is used to punctuate the opening of each bar in the LH. The palindromic patterns created from the result of superimposition with their retrograde are also used, where the beginning and the end of the bar will have this rhythmic unit. I originally conceived of this pattern being stricter than it ended up being, and remnants can be seen in the second *c* motivic area in bb. 19-21, where the retrograde of the original pattern (bb. 6-8) is used. However, I ended up using

this mirroring often, but not strictly, as I merely wanted it to help form the rhythmic *gestalt* of the piece, but improvisation to guide the composition. As a result, some bars will only have the rhythmic unit at the beginning or end of the bar, like in b. 9, or where the rhythmic units are mixed to create new rhythmic interest, as in b. 57.

The idea of palindromes produced from retrograde superimposition also influenced the development of the *b* motivic area too, and would create a representation of the phasing patterns which created the TC material of this piece. The min/MAJ gesture in the last two beats b. 38 (see Fig.35, p. 114) is repeated in the RH through the next two bars, while its retrograde is repeated in the LH and phased a beat later. Two palindromic bars are formed: bar 39 with the triplet rhythms bookending the semiquaver hand interaction, and bar 40 where the opposite is formed.

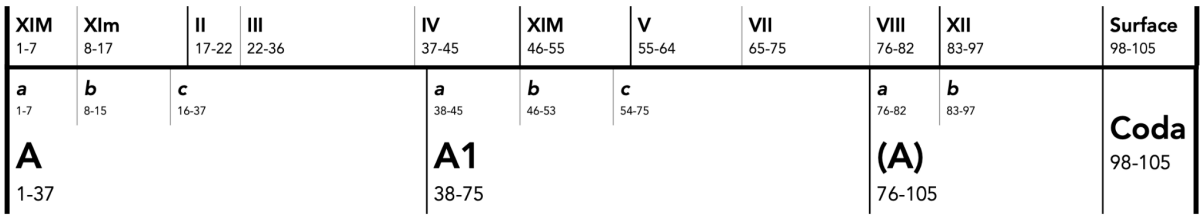
As this piano set continued to develop, so did my understanding of my own compositional language, creating a coherence and connection between all of these pieces. While it was abandoned in favour of a looser approach, I realised during this piece that small, often recurring motivic units subjected to simple processes, are a structural element I am drawn to, and are explored in *Form gulping after formlessness*. Symmetry also played a large part in the motivic construction of this piece, where it acts on the temporal plane usually. In addition to all the sets produced by the phasing process being symmetrical, there are moments where this quality is presented in the spectral domain of the piece (akin to *Vm-VM*), like in the opening chord where each hand presents an inversion of the other a major third apart.

XIm-XIM (3–4|4–3):

The seventh and final study was difficult to write and underwent many changes in the compositional process. From the start of writing these studies, I wanted the final one to take all those before and unify them into one singular study displaying the themes and hours from all the other pieces. I quickly realised that this may have been a difficult union that

might have compromised the coherence of the piece or would have been far too long and created a power imbalance between this study and the collection as a whole. Therefore, this study did not need to explicitly present the musical ideas of those before; it could freely use the various methods of interaction to then explore Hour XI with the same amount of focus the other studies did for their respective hours. Again like *IVm–IVM* and *VIIm–VIIM*, the recursive steering element (which is a large part of this study) and the issues that arise from that will be discussed later. However the various interactive elements from the previous studies will be highlighted. Similarly to *Vm–VM* and *VIIIm–VIIIM*, the same repetition of motivic areas–*a*, *b* and *c*–are continually developed to form repetitions of structural area A:

Fig.37: XIm-XIM structure.



The separate temporal comparison of min and MAJ as I first used in *IIm–IIM*, is present both at the surface, and also at the macrostructural scales. At the surface level these moments are so prevalent that it would be difficult to find areas where they do not occur in this study. In the first two beats of bar 1, A XIm is outlined over an A pedal point; this is immediately contrasted with A XIM(4) for the remainder of the bar. Echoing similar uses of this TC gesture from *VIIIm–VIIIM*, the pedal and proximity of these two Hour XI colours on A give this field a shade of a IIIm(4) oedipus group, before the pedal cuts out, leaving the fundamental A pedal to resonate over bar 2. This min/MAJ interaction is further clarified in bb. 87-98, where same transpositional uses of Hour XI triads and tetrads are delineated in the temporal space, the spectral space (and by hands as in *IVm–IVM*), and through their articulation. Expressions in the RH (whether min or MAJ) are played legato with use of the pedal, then the LH immediately answers with the opposing min or MAJ pole at the same

transpositional level but lower in the spectral space, played staccato with no pedal. Various interactions occur at and between steering levels also, for example the opening 17 bars first steering level (S1) where A XIM in bb. 1-7 is then temporally contrasted with A XIm in bb. 8-17 (see APPENDIX III on p. 177 for the full steering diagram).

Spectral interactions also occur in both the first steering level (S1) and also the first substeering level (S2). At S1, two continuous steering continuities occur from bb. 17-45 and bb. 55-82 (S1a and S1b), where each consistently presents opposing poles of intervallic structure, one displaying min and the other MAJ, just as the deep steering pattern in *IVm-IVM* does. Their use and constant expression at the surface fluctuates, however. At some points these two continuities are simultaneously expressed as in *IVm–IVM*, whereas at other points they take turns exerting themselves creating a superimposition of the two producing integrated intervallic structures like the surface uses of Hour VIII in *VIIIm–VIIIM*. The movement between these two concepts is free and fluctuating.

This shows itself at the surface as well, with the use of the interlocking motif taken from *IVm-IVM* (which can be first seen in b. 11 of that study), which results in new intervallic structures from the alternating of PCs used from multiple triads. For example in bar 17, where the G XIM triad in the LH (from S1b) is interlocking (both temporally and spectrally) with the E♭ XIm in the RH (from S1a). These are also used without the hand separation, and the new intervallic structure completely takes over, as can be seen in the patterns subsequent use in b. 18, where the A XIm(4) (from S1b) is interlocked with D♭ XIM (from S1a)

At S2, these two steering continuities temporally present a formation reminiscent of the mirrors of *Vm–VM*, where min and MAJ forms simultaneously ascend and descend from a single PC. However this is only loosely adapted, firstly because each continuity is presenting a different hour, so an intervallic mirror cannot be exact. Secondly, there is a period of distortion to the pattern around the central steering point in bb. 46-55, where in

bb. 22-45 and bb. 55-64 both the mirroring gesture and the opposition of min and MAJ is lost. This will be discussed in more detail later.

Interactions between surface and steering as in *VIIm-VIIM* are in constant effect due to the multiple recursive steering levels, however a focused and pure expression isn't in effect in *XIm-XIM*. Instead more complex interactions are freely used, for example the A XIm structure of S1 (bb. 8-17) is built from various alternations between min and MAJ at the surface.

The piece finishes on a union of min and MAJ, an acceptance of the interpretable nature of the TC. Both A VIIm and VIIM are expressed together in the last 3 bars of the study, where the temporal comparison of them in the beginning of b. 103 disintegrates into a spectral blending of the two for the end of the bar. Here the A and E of the LH, is ambiguous contextualised by the C and C# of the RH, presenting both min and MAJ Hour XI triads at once, but perceptually creating a MAJ Hour III tetrad. The ambiguity of these two pitches is submitted to as the piece concludes, where they are restated by the LH in the final bar.

Just like *IVm-IVM* and *VIIm-VIIM*, the deep steering structure that defines this piece was predetermined, and had a large effect on the motivic construction. The repeated and continuous stream of semiquavers was a deliberate choice enabling the easy application of different Hour VII sets needed to move through the deep structure. Additionally, these are also a symptom of a sprawling structural network that requires either time to unfold, or to be moved through quickly, which affects the purity and clarity of both Hour XI and the deep structure. This is further emphasised by the overlapping and integrated use of sets, especially in the *c* motivic area, where Hour XI sets positioned in a confined range echo the phased sets of *VIIIm-VIIIM*. An example of this can be seen in the overlapping of C XIM and C♯ XIM at the end of bar 18, which can be heard as a 13121 set. Other extraneous TC structural elements are also picked out using spectral separation when I felt they added

something to the pieces without distracting from its already quite busy texture, for example the C XIM set implied by each use of the staccato octave bass gesture in b. 16, 17, 21, 24, and 26.

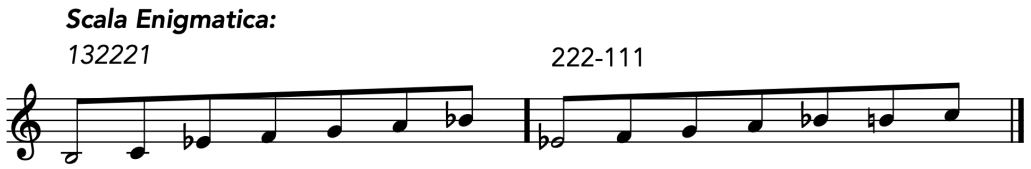
This piece presents a unification of all other pieces in the set, where elements of each piece all come to coalesce within its TC use, or its motivic surface. These pieces as whole were an experiment that gradually became larger than anticipated, which I feel can be felt by the end of the collection, where it is structurally and conceptually bursting at the seams by the last piece. Additionally, the piece's extremely focused concept meant many aspects of my own compositional language came to the forefront, unobscured in the collection's compositional language and allowed me to better understand the way I compose.

An Exequy

While some of my piano studies had halftone effects as a byproduct of their intervallic construction, *An Exequy* was the first purposeful exploration of the concept during my research. Inspired by the poem of the same name by Peter Porter, which was written about his experiences after a traumatic loss. Therefore, this piece's concept is a representation of recovery after a traumatic loss, where the tonal and textural continuities throughout the piece present a rebuilding from fractured atoms of colour to sanguine expressions of larger intervallic structures. I say 'rebuilding', instead of 'evolving' or 'growing', because while the defining interval pattern was the starting point in the compositional process, it only emerges halfway through the piece. Porter (1978, p. 1840) makes a few musical references through the poem, but it is the line "O *scala enigmatica*" - which interested me. This can be translated in two ways; from Latin to mean "O enigmatic stairs", which alludes to the stairs to the attic where Porter's wife died, or from Italian to reference the "enigmatic scale" (Porter, 1978, p. 1840). This scale was presented as a harmonisation challenge in the

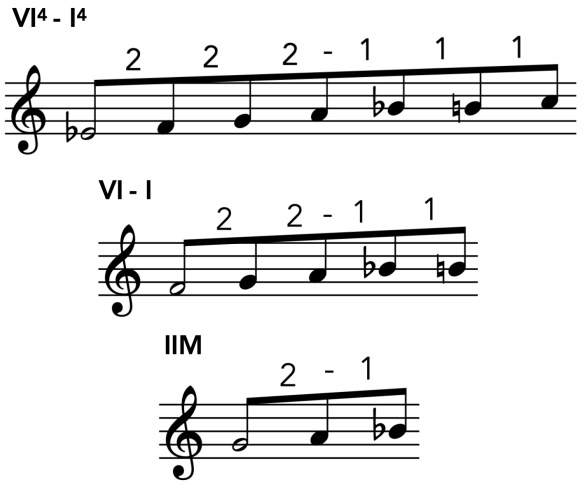
Gazzetta musicale di Milano in 1888, which would inspire Verdi's *Ava Maria*, and possibly the opening to Puccini's *Tosca* (Burke, 2015). It was presented in a 132221 arrangement, but when permuted, its IPF is revealed as 222-111:

Fig.38: Scala enigmatica



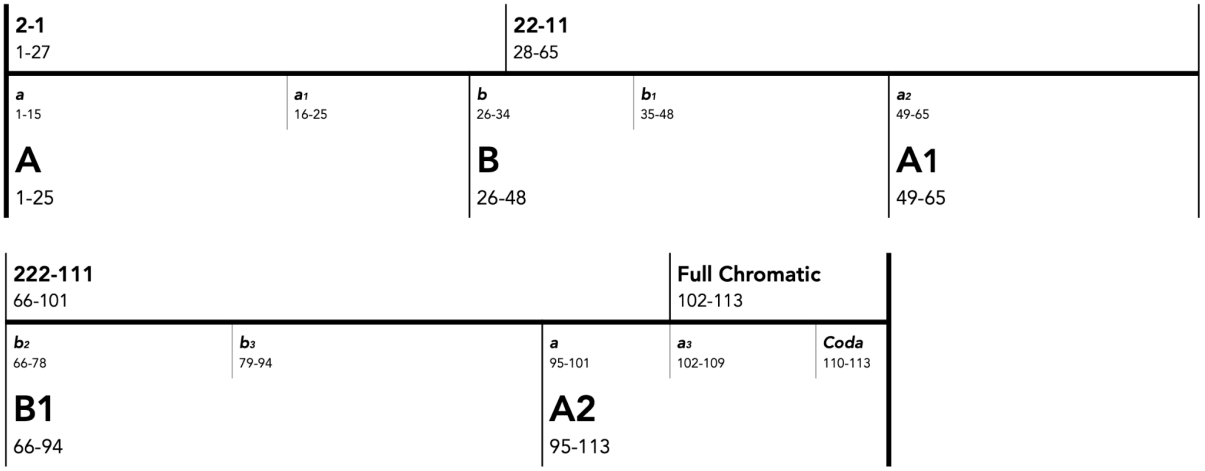
Seeing this pattern's clear interval-class partition between tone and semitone instantly struck me as a dynamic I could explore. What at first seems like two overlapping pentads of Hours VI and I with a central Hour II fulcrum, through my adaptation of halftone, can be interpreted as a larger magnified form of Hour II where its constituent intervals (1 and 2) are elaborated upon into larger connected atoms of colour. To further solidify this interpretation as well as create the rebuilding concept of the piece, this pattern's interval magnification can be undone, thereby creating a progression from an Hour II triad to the *scala enigmatica* (Fig.39).

Fig.39: Scala enigmatica halftone reduction.



The tonal magnification occurs over an ABABA structure defined through economic motivic use (Fig.40). Each section is divided into two statements of the same motivic areas (with the exception of the central A section), with the second expression being a development of the first. The A sections present more fragmented material and timbral exchanges, while this is contrasted in B sections with more unified melodic and harmonic movements. Each *a* motivic area presents a fractured melodic expression as its antecedent

Fig.40: *An Exequy* structure.



(bb. 1-9, 16-20, 49-61, 95-98, 102-105) and a fragmented melody divided into a larger group of instruments, which builds into a harmonic suspension of this melody, as its consequent (bb. 10-15, 21-25, 62-65, 99-101, 106-113).

The main motif (first half of motivic area *a*) of the piece is a clear expression of fragmentation, where a IIM triad is presented as a timbral exchange between three instruments (one for each tone of the triad), like Schoenberg's '*Klangfarbenmelodien*'. The first use of this occurs between oboe, flute, and clarinet in bb. 1-3, before being texturally transferred to horn, bassoon, harp and viola in bb. 5-7, with this transition occurring through a timbral phasing between the oboe and horn in b. 5. This highlights another feature of this piece; instruments are often 'coloured' by each other, creating continuously varied timbral interactions to enhance the fractured textural expressions. As can be seen in b. 6 where the cymbal colours the bassoon, and the harp colours the attack of the viola. A looser form of this colouring can be seen in b. 35 where the rising arpeggiated harp chords are accompanied by an outwards scraping on the cymbal to echo its gestural quality. I would expand on this concept of timbral groupings and exchanges more rigorously in *The flood on which all move and wish to move*. As the intervallic field magnifies, these timbral expressions become more complex, where contrary motion gestures are grouped through directionality of movement, for example the oboes and trumpets in b. 60 and the clarinets

and violins in b. 61. The gradual increase in tonal complexity occurring over the piece, defines the continuity of tension (and eventual release), and progresses in the opposite direction to the motivic and textural structure which begins fragmented but gradually gets more coherent. This creates an interesting opposing interaction between the TC structures and how they are used.

The first *b* motivic area of each B section starts with a use of the main *a* motif before moving to a non-fragmented melody which clearly presents the interval pattern in one voice, for example 22-11 in the piccolo (bb. 30-34), and 222-111 in the oboes (bb. 74-78). The second *b* motivic material of each B section only focuses on this melody, for example the piccolo's 22-11 is continued in bb. 35-38, and passed to the flutes and oboes from b. 39. The B sections therefore function as a way of solidifying the new intervallic halftone magnification (the derivation of larger structures from smaller ones, here through halftone prolongation), and explore it through the same melodic contour and motivic expression, but recontextualised by the rebuilding tonal world. This is a representation of the rebuilding aspect, where a life broken through grief is gradually repaired. The final A section presents an addendum to this narrative, where acceptance of change and grief is achieved at the end of this rebuilding. The whole narrative and halftone magnification process of the piece is recursively restated over the second *a* motivic area (bb. 102-109). The 2-1 triad (G A B ♭) is expressed in b. 102 in half of the flute, oboe, and clarinet sections (as at the start of the piece), with the sudden addition of the rest of their sections after a quaver playing F and B to transition to 2211 (F G A B ♭ B). A transitory area occurs in bb. 103-105 where an IPF of 112-221 is implied. This distorted permutation-like IPF resolves in b. 106, where the *scala enigmatica* is spread across the orchestra. From here the intervallic world finally resolves, and for a singular moment in b. 108, the full chromatic manifests itself across the orchestral timbral field. This tension dissolves over the coda (bb. 110-113) until only the 2-1 triad (G A B ♭) is left.

As with all my pieces, whether predefined structures are followed or not, the smallest motivic atoms are always formed from improvisation at the piano. The opening motif–shared by the oboes–flutes and clarinets was formed this way, and then strategically divided between the orchestra. It is no coincidence that the oboe begins with a long sustained A note: this pitch, used for tuning at the beginning of a concert was chosen to instill a sense of familiarity to the motif, and in turn the TC set which is attached to it, for the listeners. This A pitch is used throughout the piece, creating a pedal point that the rest of the TC structures interact with. I explore this concept in *The flood…*, and in hindsight, I believe this came from my increased exposure to Hindustani music and the sound of the tanpura from my playing in an Indian music ensemble.

While I only got to hear small fragments of this piece played in a workshop, I loved the way the fragmented orchestration, defined by the piece's concept, sounded both in terms of colour but also their placement in physical space. As I was sitting near the conductor during this workshop, I was very aware of the movement of not only sound, but colour in physical space while listening to motivic area *a* in bb. 1-15. The two repetitions of the opening motif in bb. 1-7 were especially striking to me, and opened my mind to future possibilities of allowing the TC to be spread in physical space, and also help bring structure to this space. This concept would be further explored in *The flood…* and my song cycle *Auguries of Innocence*.

Here I feel it is important to highlight my concept of halftone being as yet unresolved. I found it interesting theoretically as a way of maintaining a triadic understanding of larger and more complex intervallic fields. However, I did not get to explore it as a compositional tool for the control of the progression of the TC surface, or a *gestalt* modulation framework. *An Exequy* only acknowledges the concept and explores magnifications of intervallic structures, which obviously in turn creates a movement between one intervallic colour field to another related but more complex field. However the only

atomic part of this structure made explicit is the starting Hour II atom. I therefore began composing a piece to resolve this idea, where after larger intervallic structures were generated through magnification, the constituent atoms of colour they formed (in *An Exequy* this would be Hour VI and I), could break off into fields of overlapping fields of triadic use. This process could be continually elaborated, introducing different intervals into a field as affecting atoms, and letting them grow before they divide into new atoms of colour and the process begins anew. The piece I intended to do this in never reached fruition; the concept was to compose a piece with three movements, the first for solo oboe presenting a similar magnification process as *An Exequy* (but with a three-interval interval pattern), then the following movements each introducing a new instrument (ending with a trio) and this modulation concept being explored in each. Only the first piece was finished, and I ultimately wasn't satisfied with it as the starting point of this larger concept, so I would like to return and explore halftone more extensively in the future.

The flood on which all move and wish to move

If *Seven studies…* explored interaction in the compositional (and pre-compositional) space, following my discoveries in *An Exequy*, *The flood on which all move and wish to move* translated these interactions into the actual physical space. This piece was inspired by the poem *Meiosis* by W. H. Auden (1933, p. 125) and takes its title from its last line. The poem is about reproduction and, as the title suggests, the cell division process when life is created. Translating this concept of cell division into the musical and physical space was directly influenced by the intended ensemble and performance situation. The piece was written for a workshop with Ensemble 360, in their circular performance venue where the audience surrounds the central stage at the Crucible in Sheffield. The intended staging of the piece was created to take full advantage of this non-standard performance situation, whereby the performers are positioned in a circular cell, each facing out to the audience to

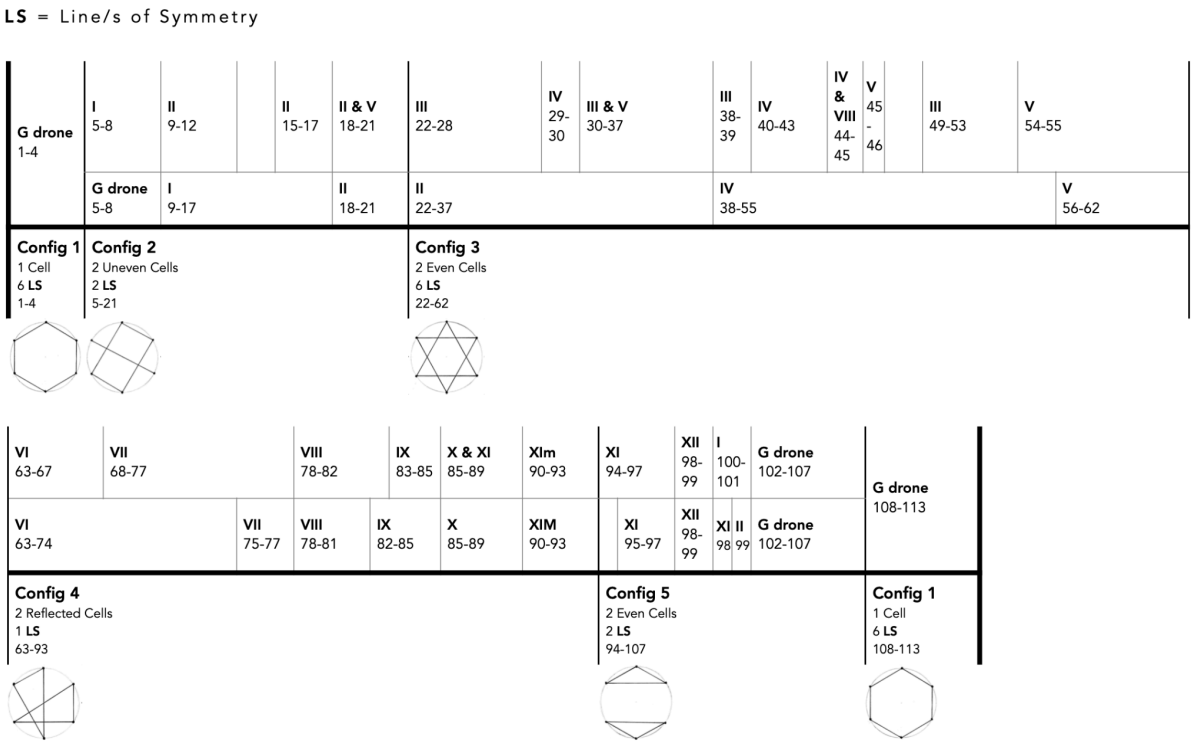
enhance the effect of their position. The intervallic structures and interactions between changing instrument cell groupings create a physical manifestation of cell division for the audience. Chance decides how each audience member experiences this physical translation of the music, with their seating position around the circle of performers affecting their perception of both the TC fabric and the timbral cells.

As in the process of meiosis, the structure of the piece is defined entirely by the journey from single cell to two separate cells. The structure of the piece, therefore, wasn't constructed with traditional sections and motivic patterns in mind. Taking influence from Elliott Carter's use of instruments as 'characters' (Schiff, 1998), each instrument has a particular mode of expression, repeated motifs, or intervallic preferences. The structure is then defined by the cells these characters split into, and finding different ways to collage these motivic ideas–both as blended individual expressions of them and the passing of them between instruments in a cell. The characters of the instruments are as follows:

Instrument	Charateristics	Example Passages
Oboe	- Pedal pulsations moving from detached to legato articulation - Eventually developing into a reaching gesture away from the pedal.	- Pedal pulsations: bb. 10-11 - Reaching gesture: bb. 14-19, bb. 26-29
Horn	- Long held notes with a crescendo to a key interval, usually a descending minor 3rd.	- bb. 10-12, bb. 15-17
Violin I	- Fragmented with frequent timbral contrasts. - Frequent use of staccato and pizzicato.	- bb. 14-29
Violin II	- Frequent use of tremolo	- bb. 10-21
Viola	- Metrically detached, with avoidance of the beat (frequently by a quaver or semiquaver). - Sustained drones.	- bb. 10-14
Cello	- Fluctuating intensity of vibrato.	- bb. 9-11

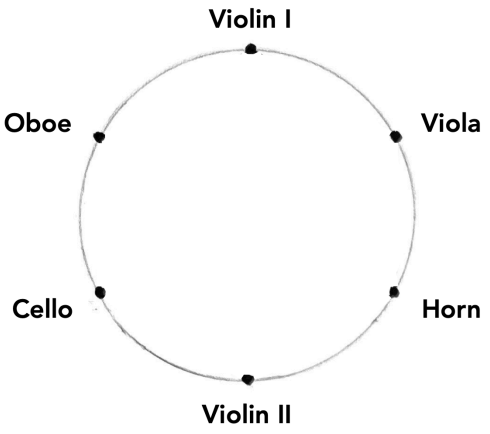
Consequently, sections are not defined by motivic material, but by cellular configuration and timbral/tonal combinations therein. This forms six distinct sections defined by cell division type:

Fig. 41: *The flood…* structure.



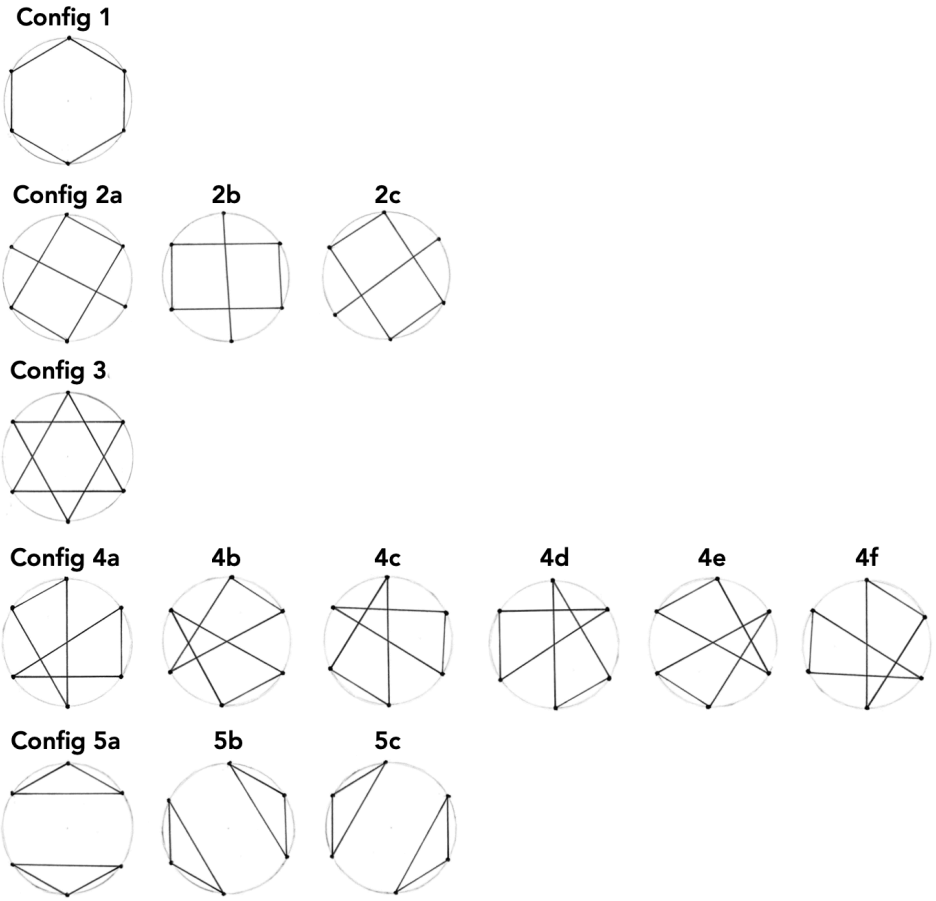
Five cell division configurations are used through the piece, their order representing a splitting of a single cell into two, and then the cycle beginning again. Taking influence from both Hauer's and Schat's geometric depictions of the tropes and the TC respectively, we can visualise the ensemble's cell configurations as bird's-eye views of the staging presented as geometric circle diagrams (Fig.42).

Fig.42: Circular spatialisation in The flood…



Three of these are able to be rotated around the circle to produce different instrumental groupings allowing further timbral combinations to be explored:

Fig.43: Spatial cell configurations.



These cells and their various transformations not only served the concept of the piece, but also enabled me to maximise the combinational variation of timbral, textural and motivic expression not only in the cells themselves, but also in the interaction between the cells. As can be seen in the structure diagram (see Fig.41), the cell division continuity runs parallel to a loose rotation through the TC hours. The TC fabric follows a gestural widening to enhance the feeling of growth and cell separation. Beginning from a single tone and expanding through the hours in a clockwise motion starting from Hour I, gives the feeling of widening intervals over the temporality of the piece. This is achieved through a reaching motion by the two cell continuities; when one evolves into its next hour, the other races to reach and then surpass it. This directionality in the tonal movement isn't always strictly sequential, with

jumps forwards and backwards occurring frequently, but the overall movement of the tonal *gestalt* is the same for both cells. This creates a sort of tonal heterophony across the temporality of the piece.

The piece begins with a single cell of a unison G drone which is passed anticlockwise around the single cell of Config 1, each instrument presenting protoforms of their characters yet to emerge. The physical spreading of sound is perceptually at its most transparent, each voice is succinct and the G drone is clearly passed around the physical space in a circular motion. This is further strengthened through the natural symmetries of the configuration which present 6 bisecting lines of symmetry (LS) (indicated with dotted lines) in the field's spatialisation (see Fig.44)

Only one cycle of the single cell occurs over bb. 1-4 before the first division in bb. 4-5. Here the timbral groupings define an uneven cell division of winds and strings in Config 2a (see Fig.45). The splitting into two groups unified by timbre felt like the first natural cell split before more diverse instrumental groupings could be explored. The wind-cell is the first to expand the tonal field with the introduction of F♯ and A in b. 5 which, with its interaction with the string-cell continuation of the G drone, creates a close Hour I atmosphere. The combination of an uneven cell division, and the reduction to only 2 LS, helps in

Fig.44: Lines of symmetry in Config 1.

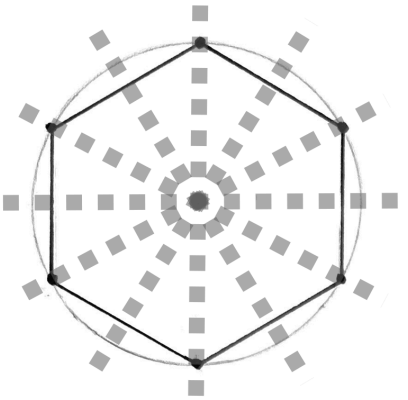


Fig.45: Lines of symmetry of Config 2a.

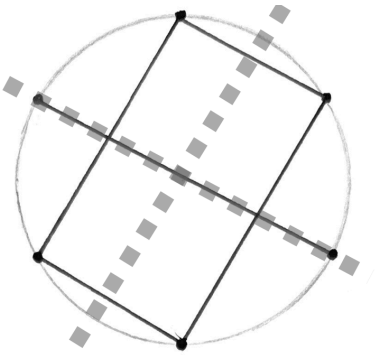
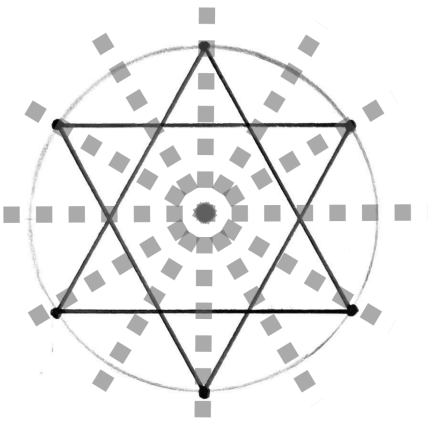


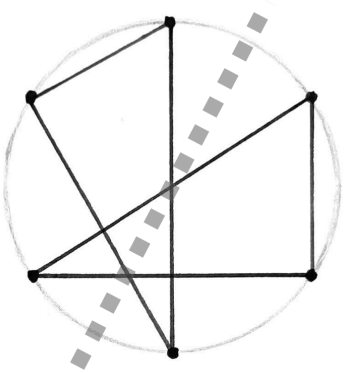
Fig.46: Lines of symmetry of Config 3.



creating an underlying structural tension in the physical space, emphasising the beginning of the cell division. With its proximity to the anticlockwise rotation of the first single cell, Config 2a retains part of this motion in the string cell expression over bb. 6-17, before then causing the cell configuration to spin to Config 2c in b. 18. Stability in the division of the cell returns with the shift to Config 3 in b. 22, which presents two interlocking even triangular cells, which again presents 6 LS (Fig.46)

At first this division is mostly tonal, where the Vc+VlnI+H cell stably presents Hour II as the Ob+Vla+VlnII cell fluctuates between Hours III, IV, and V. However, these cells also are transparently presented in textural isolation, where each leads a small section; the Ob+Vla+VlnII cell dominates in bb. 38-46, and the Vc+VlnI+H cell dominates in bb. 47-62. This means the anticlockwise shift is lost from here onwards, and creates something akin to a *gestalt* oscillation; like the alternating colour flashes of binary paired star Capella. The cell division process again undergoes a shift in b. 63, changing to Config 4a. Not only is this the halfway point in the widening intervallic journey, but it is also the halfway point of the cell division. This is consequently where the most structural tension lies, with only one LS dividing the physical space (Fig.47).

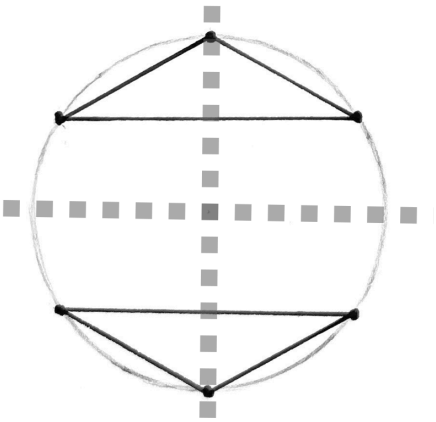
Fig.47: Lines of symmetry in Config 4a.



This is because it is also the only configuration that presents no rotational symmetry, meaning if rotated its exact shape only appears once. This is partly due to the fact that unlike the rest of the cells and cell divisions, the two parts of Config 4 do not have any lines of symmetry individually, therefore as mirrorings of each other, when rotated they will always be opposing (this is why refer to them as reflected cells). This heightens the sense of two individual cells gaining autonomy, meaning the cell division process is almost complete.

An example of the individual influence of a voice over a cellular grouping can be seen in the use of Config 4e in bb. 77-83, where the sharp staccato expression of Vln.I forces its timbral and motivic character upon the Ob. and Hn. The two cells make their final split in b. 94 to Config 5a. Here they are finally non-overlapping, dividing the physical space into two halves, and stability returning with the increase to 2 LS (Fig.48).

Fig.48: Lines of symmetry in Config 5a.



All three rotations of Config 5 are used very clearly and in an accelerating fashion, with 5a used in bb. 94-103, before shorter expressions of 5c in bb. 104-105, and 5b in bb. 106-107. The anticlockwise rotational shifts return, and in addition to the temporal acceleration of these shifts, serving to build to the restarting of the cell cycle, implying one of the new cells is focused on to then itself divided in two. The single cell Config 1 returns at the end of b. 107 and fully starting b. 108, and instead of beginning on the cello, the new cell starts on its opposing instrument, the viola.

As set up during the opening of the piece, the G drone plays a consistent role that serves to give the piece a thread of coherence through fluctuations in timbre, texture, and motivic expression, while also acting as an interaction element. This builds on the unintended use of the A drone in *An Exequy* which I believe was inspired by my exposure to Hindustani music and the tanpura. The first TC expressions emerge from the opening G drone; with the addition of A ♭ in the horn and F♯ in the oboe both in b. 5, Hour I emerges. The use of the G drone as part of the intended TC construction after the opening, is fluctuating with many expressions purposely having it as part of their structure. However others have no connection to the G, creating an element of interpretability that functions throughout the piece; does the addition of the G always affect the perception of the tonal

gestalt, or is it perceived as a separate continuity. I would say that it acts as both at different times, weaving its way through the piece as a connecting thread having varying interactive effects on the tonal and textural fields forming the *gestalt* of the piece. McLeod would also make use of similar pedals in *Piece XXIV* of her *24 Tone Clock Pieces*, where an A pedal point frequently recontextualises the TC fabric (Barker, 2020, p. 43)

Composing this piece felt like collaging due to the instruments' predetermined modes of expression, and as a result, no unified theme or melody is dominant other than the results of their superimposition and moments when I allowed them to join or mimic each other. This was a structurally interesting concept for me, as it felt loose and improvisational in a different way than how I had been composing. Also, regular changes in instrumental cells exerted a strong influence over the structure of the piece, resulting in waves of differing textural density with little resolution tonally or motivically, and felt to me like a living organism whose growth was shown by the widening TC hours. In contrast to previous pieces composed as part of my research, the TC's structure had a similar looseness, where only a general directionality through the hours of the TC (starting at Hour I) was followed. Resolution came from the completion of the circle at the end of the piece, where all the hours had been moved through, and the cell division had completed, resulting in the calmness of the circle of G drones with which the piece opened.

I was fortunate enough to hear a singular uninterrupted performance of this piece by Ensemble 360 in the intended staging and venue it was written for. It was unfortunately not recorded due to an error with the audio recorder at the venue during that workshop, but my experience as the listener during that performance was very interesting and stimulated the development of the TC in physical space. Due to this being a singular workshop (lacking multiple rehearsals), to aid in maintaining the connection between the performers to keep in time with each other, they faced inwards into the circle–but did say that the outwards facing would be possible with time–with all other aspects of staging maintained. They also

played it slightly slower than my original tempo marking, but this worked better for the flow of the piece so I changed it to match their performance after this workshop. From the first bars where the G pedal is passed around the circle, I was struck by the rotational movement I could hear, and how much the hexagonal arrangement is heard as a circle, akin to Stockhausen's *Carré* (1960) where he would "square the circle" (Trochimczyk, 2001). However, what was more interesting was the moments of disruption where the cell configuration changed. The first shift in cell configuration causing the separation of the wind instruments from the strings (beginning in b. 9), was particularly effective as it was also the introduction of their character and unique motivic expression.

Because of the individuality of the instruments, and the use of the TC being an additional separate continuity which I freely attached and detached from these characters, the resulting spatially presented cells were results of this interaction. This led me to want to explore how the TC's structure could not only be presented in physical space, but also how it could be used to control it and listeners' experience of this physical space. This is a thread I would explore in my song cycle *Auguries of Innocence*.

Deep Structure and Recursion

With the TC being a recursive concept, steering levels could theoretically be infinitely elaborated creating a substructural infinity mirror. Even when composing at the surface without concern for deeper structure, these fractal structures are always there and form the connective tissue of tonal progression. Therefore, I was interested in exploring these depths and their potential for nuanced control of the musical field, but also the consequential effects of consciously structuring them.

The first consideration of deep structure and how it applies to the compositional process is that of directionality. McLeod's discussion about the level of structure a composer

consciously inhabits is extremely relevant here: do we consider the musical surface to be a resultant structure of a deep underlying form (Substructure-Up)? Or are the substructural levels (either conscious or subconscious) the result of a distilling of the surface (Surface-Down)? I have taken both of these approaches in my composing. I was also interested in the potential for structural levels and their fields therein to meaningfully interact to create cross-level connections. One significant facet of this is the exploration of recursive structures: what are the compositional and perceptual effects of focused self-defined elaborations of hour fields into the substructural levels (hours steered by themselves)?

The largest consequence of consciously controlling multiple levels of deep structure is the effect the compounding level of information has on the size and density of a piece. This "amount of content", as McLeod calls it, will increase exponentially with each level of structure consciously controlled, possibly affecting the perceptual qualities of the structures (McLeod, 1980-1995, MS-Papers-7349-050). How does this amount of content affect the compositional process and the resultant gestalt of the piece?

Seven studies in interaction

IIm–IIM (1–2|2–1):

As already mentioned, *IIm–IIM* was composed at the surface, without any concern for the deeper levels of structure. It was very interesting to then find a secondary recursive structure that exists in dividing the spectral streams. The temporal stream can be seen as the piece as a whole with each section following another, or a horizontal/temporal interpretation of the auditory stream. This isn't the only way in which the structures of the piece can be interpreted; clear areas of min and MAJ Hour II fields alternate in a consistent pattern, and can be separated into spectral categories which can then be connected through stream

analysis. If we delineate the min and MAJ TC fields into two separate but parallel temporal streams, grouping them through the *gestalt* principle of similarity, two concurrent but opposing pole steering patterns emerge. The minor field stream presents a MAJ Hour II subscale steering of 212-21212, while the interlocking MAJ field stream presents an min Hour II subscale steering of 12121-121:

Fig.49: IIm-IIM recursive steering.

Not only does this create an opposing $Surface_{Steering}$ interaction (min_{MAJ} in the min stream, and MAJ_{min} in the MAJ stream), as explored in *VIIm–VIIM*, but it creates an opposing min/MAJ interaction between the two streams also.

IVm–IVM (1–4|4–1):

The recursive steering structure in *IVm–IVM*, in contrast, was very intentional. A steering-up process was taken, whereby the deepest levels of the intervallic structure were written first, and then upper levels to the surface were elaborations of this substructure. Two opposing min and MAJ pentads form the deepest structural level, the substeerings (S2), with the LH presenting a IVm^5 oedipus (1414) and the RH presenting the opposite of IVM^5 (4141). The pentadic form of the substeerings is magnified through all levels of intervallic structure, with varying degrees of strictness to the piece's concept being adhered. The opposing min/MAJ interaction between the hands is not maintained on this level, while expressing Hour IV pentad oedipus fields. At the surface, the spectral min/MAJ interaction between hands is maintained, the B section however deviates from the oedipus patterns in favour of more complex Hour IV hues with its halftone implication. Therefore, throughout the study, Hour

IV is presented on all levels of intervallic structure, from surface to steering to substeering (see APPENDIX IV, p. 178).

This diagram shows the tonal make-up of *IVm–IVM* and its recursive steering levels. While the rest of my diagrams depict the steering as the lowest level, here the RH's surface level is at the bottom to situate it next to the LH's surface. Therefore, the steering levels radiate outwards from the central grey line. Additionally, as this piece was formed around the concept of a central fulcrum governing the pentad's construction, they have been labelled by their fulcrum tone. For example, a G m pentad represents a min-min interaction (1414), G M represents a MAJ-MAJ interaction (4141), G mM represents min-MAJ (1441), and G Mm represents MAJ-min (4114). The IV prefix to these is omitted as all fields represent it in this study.

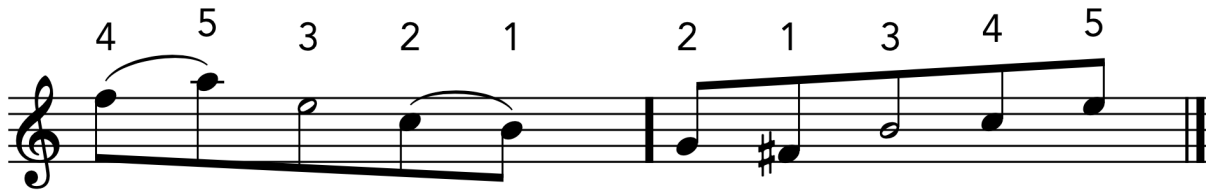
I wanted to emphasise the far-reaching influence the substeering can have on the other levels of intervallic structure, even more so than just creating a pure recursive expression of Hour IV. To do so, I utilised the concept of serialisation; discarded by Schat's in his formation of the TC, it can be seen as just a solidified manifestation of the exploitation of proximity, purposefully controlling the way the tonal field is expressed. If the ascending tones of a pentad intervallic field can be numbered from 1-5, the RH's substeering (RH S2) use order is 35421 (Fig.50).

Fig.50: RH S2 use-order.

This pattern is recursively passed to the RH's steering (RH S1) level in bb. 15-23 (G♯ m) and bb. 23-28 (D♯ M), so each expresses the substeering's (RH S2) use order. The LH substeering (LH S2) use order is 45321, which is again recursively passed to the neighbouring steering level (LH S1) in bb. 30-32 where the B M oedipus is outlined as D♯ m, E m, B m, B ♭ m, F♯ m simultaneously, the RH steering (RH S1) over bb. 29-36 presents a related use order of (21)3(45)

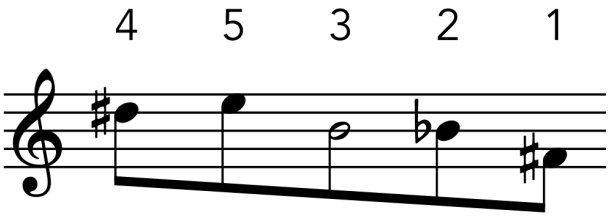
(G–F♯–B–C–E) generated through rotating the dyadic shells of the LH's use order around its central fulcrum:

Fig.51: LH S2 use-order, and its rotation.



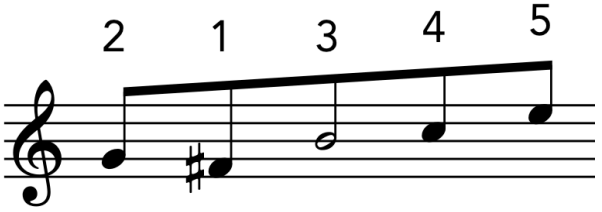
The 45321 order of the LH, and the 21345 order of the RH over the final A section come to coalesce by the end of the study and are recursively passed to the surface (S) levels of structure. In bb. 34-38 both hands interact around a central B fulcrum pedal point, and by bb. 36-28 present a melodic formation which is both recursive to the lower structural level and a cross-continuity interaction between hands. The RH plays D♯–E–B–B♭ –F♯, which is an exact presentation of the steering of the LH (LH S1) in bb. 30-32, and by extension the use order of the LH substeering of 45321 (LH S2) (Fig.52)

Fig.52: LH S2 use-order.



The LH surface (LH S) melodic formation of G–F♯–B–C–E in bb. 36-38 however, exactly outlines the steering of the RH (RH S1) in bb. 29-36 (Fig.53)

Fig.53: RH S1 use-order in bb. 29-36.



The substructural levels therefore become more than just undercurrents in the intervallic atmosphere, allowing them to reach upwards through the structural levels, even to the surface, and assert their shape and colour. Ending the piece on this pure

representation of recursion and a distillation of the study's intervallic explorations as a whole, gave a heightened sense of resolution, almost cadence-like in function.

VIIm–VIIM (2–3|3–2):

The deep structure being an influencing element on construction, helping shape and interact with each level of structure that defines the tonal makeup, is something that I also explore in *VIIm–VIIM*. Instead of serialisations crossing steering levels, here the visualisation and construction of recursive steering structures defines the thematic textural use of the TC fabric. The $Surface_{Steering}$ palettes visualise the relationship between the TC surface and its steering level as a stacked palette, which itself can form a constituent element of a larger substeering palette. This creates a tetrapartite gradation of a non-symmetrical hour's potential recursive field, which can be infinitely elaborated, a small subsection of which I have drawn out (see APPENDIX V, p. 179). This subsection shows its potential atmosphere to the substeering level, where the smallest palettes represent the musical surface and its recursive steering pattern as discussed earlier (see p. 108). Each of these forms a part of a larger 3x3 substeering palette, which themselves form part of a tetrapartite gradation of the substeering level. Only the left two substeering palettes are used in *VIIm–VIIM*, the min_{min} and the MAJ_{Maj}, firstly to emphasise the piece's concept (the interaction of min and MAJ), and secondly for reasons of practicality.

While recursive levels of steering can technically be infinitely elaborated, the expression of infinity is obviously impractical. The deeper the steering pattern, the more the expression or length of the temporal field is affected, causing an increase in the tempo of tonal expression or a lengthening of the piece. It could also mean the density of the spectral field is affected, through either the increase in the tempo of tonal expression, or through simultaneous use of TC structures to get through a larger area of deep structure in a smaller space. Whether this density is desirable, either for smaller moments or for a whole piece, is a composer's personal preference. Another effect of using recursive steering

structures like these in *VIIm–VIIM*, is that the surface TC fabric is nearly always inherently expressing the same as the deep structure, as the use of an A VIIm triad at the surface is exactly replicated in both the steering and the steering structure. This interconnectivity was also explored more purposefully in *IVm–IVM*.

The use of just the min_{min} and MAJ_{MAJ} substeering palette was nevertheless purposeful and defined the overall structure of the study. Two similar A sections form each temporal half, and at the deepest level of tonal structure, a temporal interaction of min and MAJ (as in *IIm–IIM*, but here in the substeering). The first A section (bb. 1-56) moves through the min_{min} substeering palette, and the second (bb. 57-111) through the MAJ_{MAJ} substeering palette. Each is expressed in almost the same way, both in terms of temporal spread, and in their connection to the motivic structure. Both *a* motivic areas (bb. 1-30 and bb. 57-91) explore a gradual min-to-MAJ shift in hue over the static suspension of the fundamental A substeering atmosphere. The *b* motivic areas are denser and present the rest of the substeering pattern, sometimes with three substeering atmospheres being superimposed. I was inspired by the mapping of the use of the min fields used in the A section of *IIm–IIM* to a MAJ field in its A1 section, creating an interesting dissonance and simultaneous coherence through a slight shift in intervallic colour to disturb the perception of the repeated motivic material. The way in which the min and MAJ substeering is expressed in both A sections of *VIIm–VIIM*, is almost exactly repeated in each.

The constant use of the superimposing thematic material in canon-like counterpoint, is also linked to the visual representation of the steering and substeering palettes. Each surface TC triad forming a singular point in the steering is treated as a motivic block to be positioned temporally, or spectrally stacked as in the palettes. The opening bars show this concept, where A min_{min} over bb. 1-10, spreads the TC triads temporally, each coming one after the other. The following A min_{MAJ} and A MAJ_{min} steering palettes over bb. 11-20, begins to superimpose the constituent triadic fields, before it returns to a temporal

presentation for A MAJ_{MAJ} in bb. 21-30 (creating a textural palindrome). In the areas where more than one steering palette is used, this stacking becomes even more pronounced, as in bb. 37-39 where E, D, and B MAJ_{min} steering palettes are presented simultaneously.

XIm–XIM (3–4|4–3):

As stated, *XIm–XIM* was intended as a conclusion to the concept that connected *Seven studies in interaction*. The interactive elements of the study and portions of its deep structure have been mentioned, but the latter needs further analysis, as its extremely complex steering structure raises a discussion about the coherence of this structure and whether that coherence even matters.

Guiding the mosaic surface, four levels of steering structure unravel across the temporality of the study. The two closest to the surface, S1 (steering level) and S2 (the first substeering level), can both be divided into two interacting steering continuities (S1a/S1b and S2a/S2b). The defining aspect of this steering structure is still the recursive expression of the study's main hour (XI), where it is expressed on every level of the deep structure–S4, the deepest level, presenting one minor (3-4) triad. But contextualising this study within its larger collection, another level of recursive structure emerges, with a representation of all the previous studies' hours forming part of the steering (as well as the surface from b. 98 onwards). As mentioned earlier, the expression of these steering patterns at the surface is not something that was unified across the study. The divided S1a/S1b level causes issues of coherence of the intended pattern, as while composing I freely expressed its two continuities simultaneously, as well as freely moving between them. These two continuities were also highlighted by the texture or articulation; the resulting surface becomes a union of the two, only guided by my inspiration in the moment of composing. The lowest structural level is however, always clearly defined as it coincides with the *b* motivic area, as well as returning to a fully recursive steering structure–alignment of Hour XI across all structural levels providing a tonal resonance or structural focal point. The moments of

ambiguity at the surface could be seen as a corruption of my intended deep structure, but I feel that perspective is one that invalidates the composer's perspective. For me, the constant return and move away from the aforementioned tonal focal points, where the steering is always clear, creates a dynamic in the perceptual experience that I was interested in expressing. The study, therefore, was my experimentation with the perception of deep structure. Additionally, any level of complexity in the TC fabric will always proliferate increasing potential for alternate interpretation of the TC fields. It is a relationship between composer and listener, and both interpretations are equally valid.

This playing with the perceptual expression of TC fields and deep structure atmospheres, is explicitly made clear in the coda of the study. The deep structure complexity over bb. 55-82, is stripped back and the purity of the Hour XI focal point in bb. 83-97 brings a comprehensibility and purity of expression back to the musical surface. The coda that follows this section (bb. 98-105), strips back the deep structure again, bringing the other TC hours to the surface and first steering level (S1). The surface expresses the hours of the previous steering patterns (and by extension, the other studies) in order of their use in *XIm–XIM* (with the exception of the use of Hour XI between Hour V and VII). This surface use of these hours is steered by all the hours up to Hour XI (excluding Hour XII), each overlapping and being presented in a completely integrative structure.

This was the most complex deep structure I had attempted, but in the context of what I wanted the study to be, It highlighted considerations to be made when using deep structure. This piece at first was meant to be comparable in length to the rest of the collection, but even after redrafting it (I discussed its original form earlier) it is still longer than I originally planned. Even with the faster tempo and dense TC fabric, four levels (six if you consider the branching steering levels) of deep structure is a lot of tonal information. It made clear to me that the deeper the level of intended structure, the more temporal space needed, or a denser spectral field.

Ratio and Translation

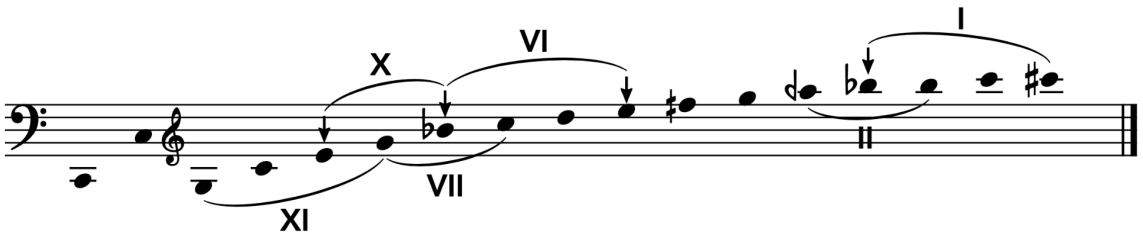
One question defines this section: what capacity does the TC have for understanding pitch in all equal-tempered music? My concept of hour-ratios allows a moveable TC system to be applied to any equal division of the octave, but while the exploration of non-12-tet hours is approached here, it is done so in an exploratory manner to serve as a foundation to expand upon. Firstly the interaction between the equalised and non-equalised twelve tones is approached in *Form gulping after formlessness*, with the synthetic nature of the equal-temperament system serving as a gateway to explore larger systems not defined by a 12-tet division. In effect, using natural microtonal features to conceptually introduce an exploration of synthetic equal-tempered microtonal systems. The 24-tet division is then explored through ratio connections to 12-tet in *Sikah*. The exploration of Arabic tonal theory serves as a way of reducing the larger number of hours in 24-tet down to a few select microtonal hours, allowing the first steps in the application of the TC to microtonal divisions to be controlled and systematically explored here.

Form gulping after formlessness

Form gulping after formlessness is my first tentative step in translating the TC to a sound world not governed by the twelve-tones. Taking its title from a line in the Wallace Stevens poem *The Auroras of Autumn*, I wanted this piece to have a sense of emergence, like aurora undulating across the sky. The piece is therefore a representation of trying to grasp or perceive something transient and formless and struggling to do so fully. Equal temperament is the translation of the non-tempered pitches of the harmonic series (as we have seen with Rameau and Schoenberg), which divides the octave into twelve equal steps.

The tempering of these pitches into the twelve-tones enabled the conscious control of them as realised by Schoenberg, and then the conscious understanding of them by Schat and Mcleod with the TC. The twelve-tones were derived from the integration of three harmonic series (tonic, dominant, sub-dominant), but by removing this context and attempting to understand the intervals of a singular ordered harmonic series, we find a pattern on overlapping TC triads. Therefore, the concept of the piece is filtering the attainable non-tempered pitches of the harmonic series through the lens of the TC to define the progression of the tonal fabric, using the TC to understand the natural structure or physics of pitch. I was interested in composing something that explored the strings' connection to the harmonic series, especially in the order obtained from natural harmonic glissandi. Consequently, the harmonic series is considered in its ascending/descending ordered form (up to harmonic 17), with the hours only being derived from neighbouring pitch groups in this order:

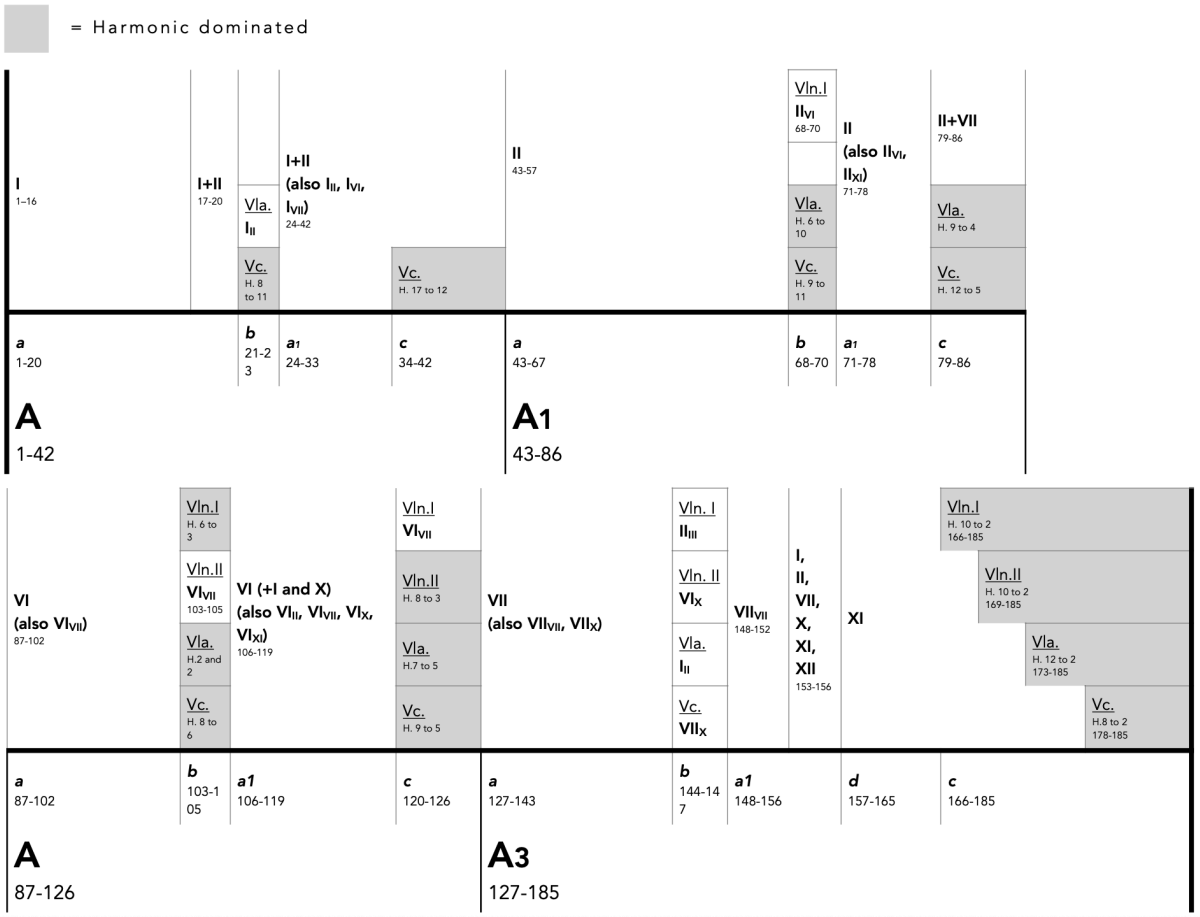
Fig.54: TC Hours derived from harmonic series.



Hours I, II, VI, VII, X, XI are the closest representations of the harmonic series' intervallic structure and are used in this order to build the tonal progression of the piece. This creates a similar gestural widening of the intervallic atmosphere across the temporality of the piece, as in *The flood…*, but moving from the closeness of Hour I to the harmonious Hour XI.

The overall structure of the piece is four expressions of the same A section, each subsequently motivically developed, and new hour fields dominating the TC fabric:

Fig.55: *Form gulping…* structure.



Apart from the last A section (which has the small addition of *d* motivic material), each section follows the same motivic structure, each motivic area fulfilling the same textural and tonal function, and finishing on the same harmonic rich 'formless' *c* motivic areas. Generally each *a* motivic area presents a clear melodic theme (related motivically, but a different hour colour) which emerges from and is elaborated over drones, a feature that had not left my compositional language since *An Exequy*. The *b* motivic areas present three musical sighs, each constructed schematically to create purposeful and foreshadowing interactions between the non-harmonic TC translations and the non-tempered harmonics. The *a1* motivic areas develop the melodic ideas of *a* through rich and undulating contrapuntal textures to build to the start of each *c* motivic area. Sections finish with a *c* motivic area, where each instrument voices their own character with particular timbral and melodic

proclivities. Each subsequent return to this motivic area causes another instrument to join the cello's cascading harmonic glissandos, allowing the harmonics to represent the gradual blooming of the aurora which reaches its climax at the piece's end.

The piece begins in Hour I, with the TC structures emerging out of the C drone over bb. 1-16. Similarly to *IVm–IVM* and particularly *Vm–VM*, these structures use this drone as a fulcrum to spread out from, generating two inversionally related Hour I fields. The drones are an exploration of the open strings of the quartet, moving from lowest to highest over the course of the piece. After the cello and viola's use of their low C strings in bb. 1-16, the drone modulates to violin II where it uses its lowest two strings G and D in bb. 17-20. Additionally these four bars begin to imply shade of Hour II, where halftone sets of 2112 and 21112 are implied.

The *b* motivic areas are best discussed when they can be positioned together as a separate structural idea which interjects itself in small sighing moments during the piece. Various Hour I interactions are presented in *a1* over bb. 24-33, some forming halftone sets with Hour II and others through $\text{Surface}_{\text{Steering}}$ patterns between an Hour I surface and a steering of one of the other derived hours. For example, in bb. 25-34, an Hour I surface is steered by an Hour VI triad in bb. 25-31 by violin II (drawing attention to the ratio connection between Hour I and VI, which share a 1:1 ratio) (see Fig.56), and in bb. 25-34, an Hour I surface steered by a MAJ Hour VII triad in violin I (see Fig.57).

Fig.56: Hour I steered by Hour VI in violin II bb. 25-31.

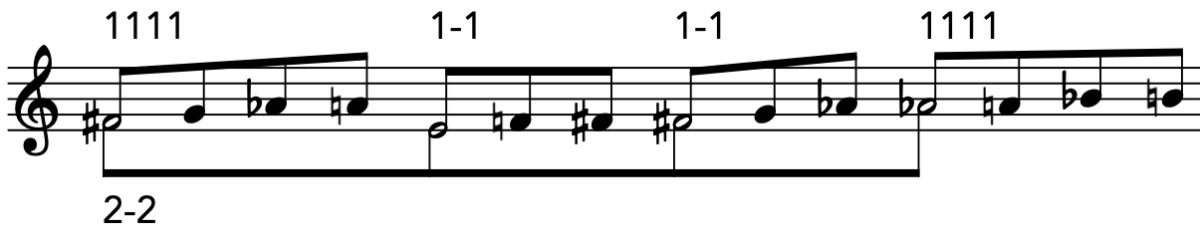


Fig.57: Hour I steered by Hour VII in violin I
bb. 25-34.

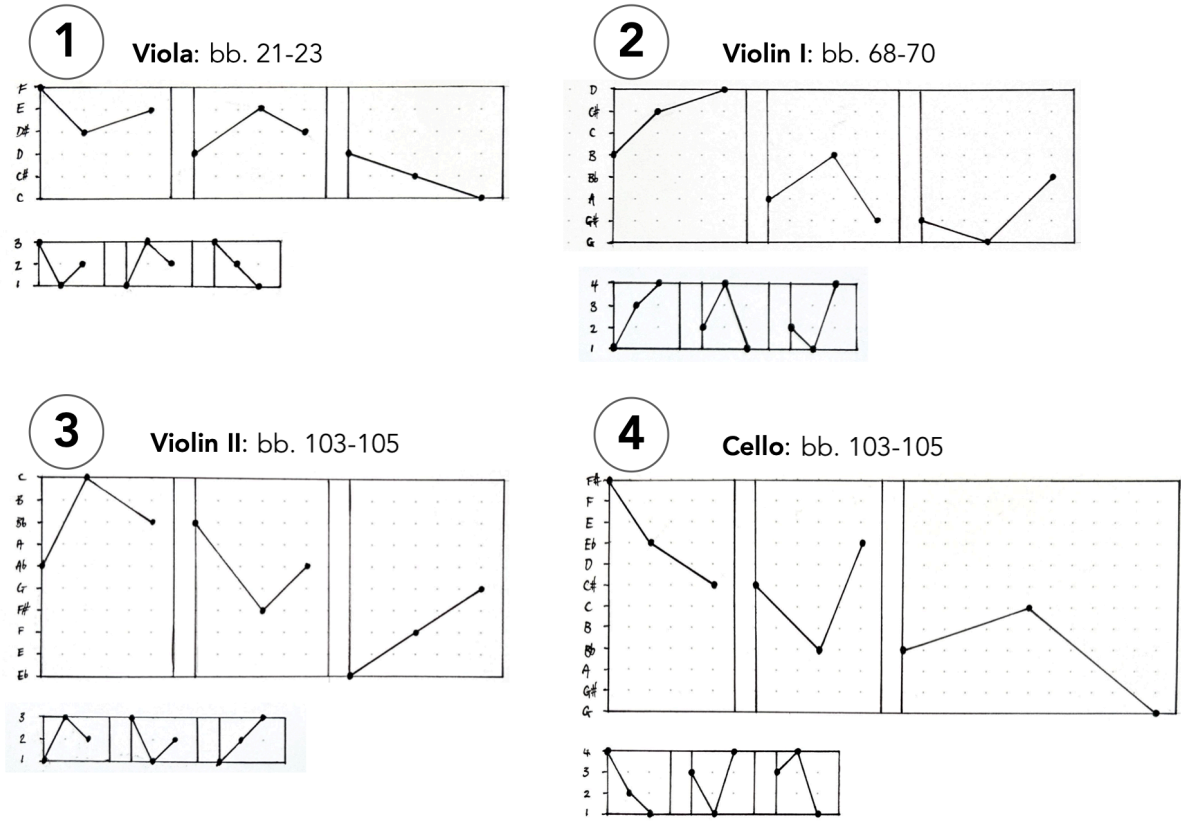
In the first *c* motivic area, only the cello has the cascading harmonic glissandos, making use of a range from harmonic 17 to 12, from which the TC atmosphere has been derived for this A section. This congruence between the overall TC atmosphere of A sections, and the area of the harmonic series being used in the constituent *c* motivic area, is roughly maintained throughout the piece. This further helps to emphasise the concept of the piece, the connection between the tempered TC fabric, and the non-tempered harmonic series fields.

The following A sections all follow a similar structure, where the *a b a1* motivic units present tonal and textural material gradually increasing in complexity to build to the dissolution of the established dynamics of each. With each following *c* motivic area, the tempered TC fabric exerts less control, with the dominance of the non-tempered atmosphere of the harmonic series, and glissando through the natural harmonics of the strings, rising through the quartet. The individualised timbral expressions presented in the first *c* motivic area also gradually submit to the swelling tide of harmonic glissandos. The *d* motivic area presents the last push of the tempered TC fabric, where a climax of interlocking ostinato ideas in each voice outline a C XIM^{4} field, before each voice is taken over by the descending harmonic glissandos (in reverse order to their joining this texture in previous *c* motivic areas). This highlights again the unintended reverence I apply to Hour XI in my compositional use of the TC.

The *b* motivic areas always present three sigh-like gestures where Surface$_{\text{Steering}}$ interactions are clearly outlined, and PC use order and contour being carefully controlled

and conceptualised through McLeod's *gestalt* notation. These areas form their own separate but parallel structure, a feature I developed from earlier explorations of this idea in *Seven studies in interaction*. The first *b* motivic area (bb. 21-23) has the viola play three Hour I triads steered by a MAJ Hour II triad; the second's contour being inversionally related, and the third's being a permutation of the second, with each paired with rising harmonic glissandos in the cello. This *b* area is linked through an inversional *gestalt* relationship, to the third *b* area (bb. 103-105). When composing, these were derived through McLeod's *gestalt* notation to easily build these structural relationships:

Fig.58: Gestalt analyses of b motivic areas.

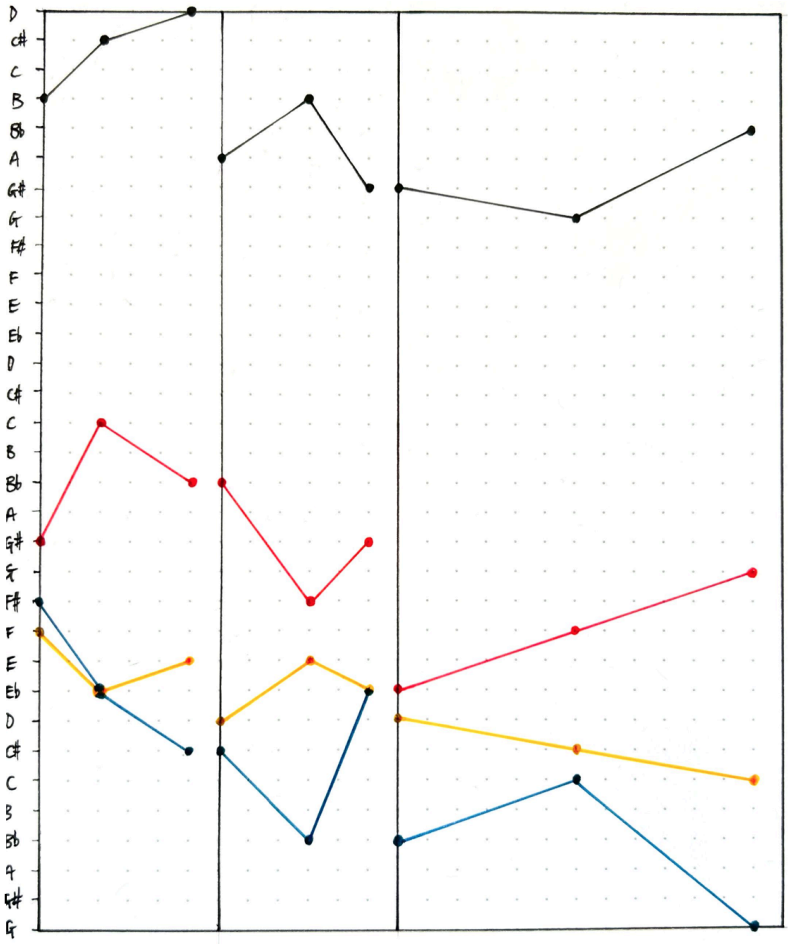


We can see that the first and third *b* area's *gestalts* are inversions of each other, both also sharing the same TC ratio, with the third being a magnification of the first at the surface (1-1 and 2-2 both have a 1:1 ratio). The second (bb. 68-70) and fourth (bb. 144-147) *b* are (when the latter, which is presented in the cello, is separated from the repetitions of the previous sighs which accompany it), share a similar inversional *gestalt* relationship as the first and

third. The only difference being the hours used in the second and fourth, II and VII respectively, are not related by ratio. Therefore, the *gestalt* from the second has been mapped to this unrelated hour by respecting the min and MAJ contours used, as can be seen in the simplified *gestalt* notation.

The fourth area of sighs (bb. 144-147) have no natural harmonic accompaniment, and all three previous sigh area *gestalts* accompany the new one presented in the cello:

Fig.59: Gestalt analysis of bb. 144-147.



This piece, while isolated in its application to larger TC theory, was my first attempt at translating the TC to a tonal realm not governed by the twelve-tones. Just like the twelve-tones themselves, I was interested in this piece presenting a 'misunderstanding' of the harmonic series, where its structure is attempted to be understood, but not fully doing so, providing the metaphor for the experience of viewing aurora. The composing of this

piece and reading about McLeod's thoughts on the possibility of extending the TC to a wider tonal space than twelve chromatic divisions, is what led me to my categorization of the TC through ratios, thereby allowing it to chart any equal division of the octave.

This piece was specifically composed for the Arditti Quartet, and was refined during a workshop, before being performed at Firth Hall, Sheffield in 2023. This meant I felt comfortable writing dense rhythmic contrapuntal areas like those in the *a1* motivic areas, and also was able to fully commit to the dominating use of natural harmonic glissandos after testing them during the workshop. The piece begins with the instruments being slightly out of sync with each other, where heterophonic melodic interactions, for example bb. 13-15 between the violins, or dense rhythmic areas which have the same gestural movement, like bb. 24-33 which presents a general rising motion. By the end of the piece however, the voices become increasingly unified, with strong unison melodic motion like in the start of A3 in bb. 127-143. This presents a structural parallelism to the TC's descent through the harmonic series, where the lower portions of the series are more easily translated by the TC due to less microtonally affected pitches.

The increasing focus on larger-interval hours also may have had an effect on how I felt the motifs should be presented, due to the differing atmospheres each hour creates. This descent through the series also affected the control of timbre through the piece, as the lead up to each *c* motivic areas present a general ascent to a breaking point, from which the harmonic glissandos that control the *c* motivic areas descend. As each of these subsequent areas are reached, one more voice is only playing natural harmonics, meaning the TC structure influenced a parallel timbral structure.

Sikah

My interest in extending the TC past its 12-tet bounds joined with a separate interest of mine that started during my research–my learning to play the Arabic 'ud (or oud). Exploring

this instrument and Arabic music theory, as well as its interaction with my theoretical background in the TC, is what brought this piece into existence. As with *Form gulping…*, I didn't want to wholly submit to abandoning the 12-tet TC, instead choosing to explore the shared language between it and other tempered divisions of the octave through the concept of ratio. This is the concept of the piece, and while I think the theoretical overlap I found between the TC and Arabic music theory to be interesting, I also recognise it is only an experiment to enable a dialogue between 12-tet music and 24-tet music through the TC. The adaptation of TC theory to other equal-tempered divisions of the octave was first approached by Norris (2006b) in his article "Tessellations and Enumerations: Generalising Chromatic Theories". The cultural aspects of Arabic music and the standard practice of the use of its theory was not strictly adhered to, but influenced my approach to certain aspects of the composition. The understanding of this theory through the TC and creating a theoretical dialogue was prioritised here, but that isn't to say more cannot be done to further this dialogue.

The 24-tet octave In Arabic music theory came into being in a similar way to the 12-tet equal temperament system in Western Classical music. It is a similar synthetic translation of the non-tempered pitches in common use, and was conceived by Arabic music theorists around the 18th century, dividing the octave into 24 equal quartertone divisions (Farraj & Shumays, 2019). The smallest atom of tonal colour in Arabic music is that of the '*jin*'–a basic melodic unit, translated as 'genus' (Farraj & Shumays, 2019, p. 192). Apart from the implied melodic functions these possess, they are comparable to the TC hours. Both *jin* and TC hour are understood through their intervallic quality, not their pitch and are recognised as the same pattern under transposition, consisting of 3 to 6 tones (Farraj & Shumays, 2019). In performance, these *jins* form part of larger intervallic structures called '*maqamat*', usually divided into an upper and lower *jin*, and their combination forming the unique mode-like structure of a *maqam*, with the lower of the two defining the

family of which the *maqam* is a part (Farraj & Shumays, 2019, pp. 167-168). The combination of intervallic atoms (*jins*) to form a larger intervallic structure, is very reminiscent of the combination of TC structures into larger steered atmospheres.

Because the Harp cannot play the quartertone pitches possible in the *'ud*, they are positioned as two constantly interacting continuities where tonal material is translated through ratio. Where the *'ud* is playing 24-tet based atmospheres, the harp plays a 12-tet atmosphere related by ratio–usually meaning that the intervals of *'ud* are doubled (and reduced to their IPF) when translated to harp. This interaction is reversed at certain moments to create tension, emphasising transitions between tonal areas, but the starting point is usually the intervallic atmosphere of the *'ud*. For this piece I took three *jins* as a starting point–*Jin Sikah*, *Jin Saba*, and *Jin Rast*:

Fig.60: *Jin Sikah, Jin Saba, and Jin Rast.*

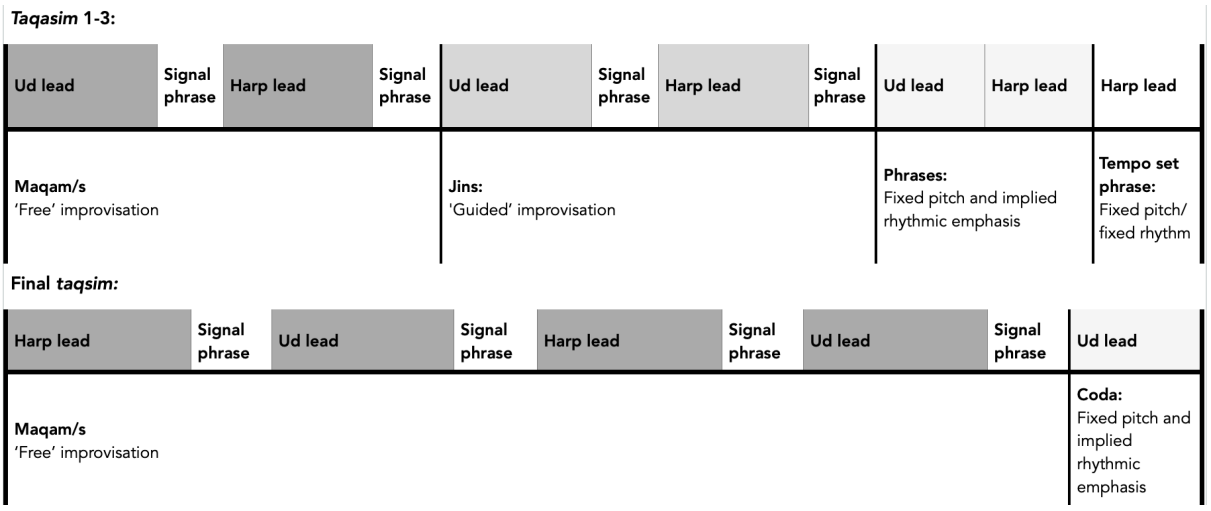
The piece takes its name from the first of these–*Jin Sikah*–as it is the only *jin* which traditionally tonicises the quartertone pitch E half-flat (Farraj & Shumays, 2019). It additionally shares a nice connection to the triadic nature of the TC, as it contains three main pitches, and the word '*sikah*' comes from the Persian word 'seh' meaning 'three' (Farraj & Shumays, 2019, p. 224). The intervals of *Sikah*, 1.5-2, are extremely prolific in Arabic music (even in other *jins*), and also share a ratio relationship with Hour XI (intervals 3-4)–the 'original' triad before Schat's redefining of the word. Each *jin* is explored individually in improvisatory '*taqsim*'-like sections, used as interludes to strictly performed melodic sections which modulate between the *jin* atmospheres:

Fig.61: *Sikah* structure.

Sikah ***Taqsim***	***Sikah*** to ***Saba*** Melody	***Saba*** ***Taqsim***	***Saba*** to ***Rast*** Melody	***Rast*** ***Taqsim***	Rast to Sikah Melody	Sikah Taqsim

The interludes function similarly to Arabic *taqsim*, an improvisatory exploration of one *maqam* to introduce its character before a stricter melody is played (Farraj & Shumays, 2019). Each of my *taqsim* sections begin like this, but their progression was designed as a deconstruction of these *maqam*, as well as the improvisatory nature of them. They begin with one instrument asked to freely improvise with a given *maqam* as the 'leading' performer, while the 'supporting' performer plays drones of the maqamat tonic. A signal motif, which is more strictly defined in notation and in expression (fixed pitch level and order, implied rhythmic emphasis), is used by the 'leading' performer to communicate to the 'supporting' performer that their improvisation is over and they will switch roles. This repeats with switched roles before moving to a 'guided' improvisation section, where smaller intervallic atoms (related to the *jin* and *maqamat*) are given to the performer to improvise with, each moved through in a given order. The final part of these sections features the performers exchanging less improvisatory phases (similar to the signal motives), before one voice repeats a rhythmic unit to set the tempo for the following melodic section. This structure is repeated exactly in all *taqsim* sections except for the final one, which is slightly truncated:

Fig.62: Structure of taqsim sections.



The interaction between the performers' intervallic atmospheres is strictly maintained across the *taqsim* sections, and the repeated alternations between *'ud* and harp is to further emphasise this ratio translation occurring.

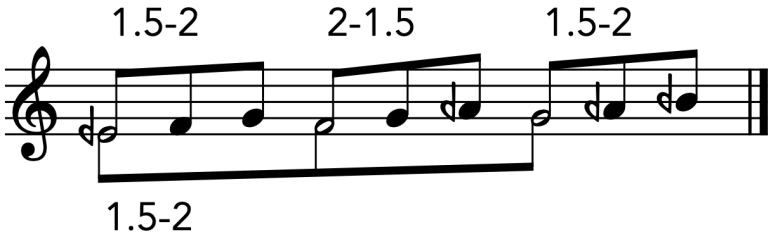
For example, in the first *taqsim* I experiment with the interactivity of the *'ud* and harp, where in the former's guided improvisation, two atoms of Hour XI surround two atoms of *Sikah* (1.5-2). This emphasises both the relation through ratio, plus creating a connection between the instruments, as the harp's translation of this improvisation results in two central atoms of Hour XI, and a shell of two Hour VI atoms (made because of the recursive translation of 1.5-2 = 3-4 = 6-8 (2-4 IPF)).

Each melodic section is a short transition between the *jins* in a traditional Arabic rhythmic cycle called an *iqa'* (Farraj & Shumays, 2019, 87). The first begins in *Sikah* where the *'ud* uses the Hour 1.5-2 while the harp plays Hour XI (3-4). In bb. 1-6 the harp plays C XIM, while also clearly outlining *Iqa' Aqsaq Turki* (which means 'limping') (Farraj & Shumays, 2019, p. 115) (Fig.63).

Fig.63: *Iqa' Aqsaq Turki* (which means 'limping') (Farraj & Shumays, 2019, p. 115).

The *'ud* mirrors the harp and plays the MAJ form of its hour (2-1.5) in bb. 3-6. The harp switches to C XIm for bb. 7-17, and consequently the '*ud* follows this min expression (with 1.5-2) for bb. 8-13. After this though, the *'ud* exploits a 1.5-2-1.5-2 min oedipus structure from bb. 14-19. This oedipus field can also be interpreted as three recursively steered triads:

Fig.64: Recursive *Sikah* field in bb. 14-19.



The harp briefly mirrors this structure in bb. 17-18 by playing C XIm[4] oedipus (3434). A fragment of *Jin Saba* is played in bb. 20-21, where its Hour III intervallic atom (131) exerts itself across both instruments. In response to the harp exerting this *Jin Saba* colour first, the *'ud* responds in bb. 22-24 with a quartertone hour related to Hour III through ratio–0.5-1.5.

Here the metre shifts to *Iqa' Dawr Hindi* (Farraj & Shumays, 2019, p. 116) (Fig.65) foreshadowing its use in the second melodic area. After a continued period of transitory moments, *Jin Saba* in the new *iqa'*, is reached in b. 36. The same structural landmarks of the first melodic section also guide the transition between *Jin Saba* and *Jin Rast*, although the *'ud* is placed in more of an accompanying role while the harp is more dominant. The thematic material here is also new and a contrast from the previous, but similar transitory reactions between the instruments occur. For example the harp's Hour III again being translated to 0.5-1.5 in the *'ud* in bb. 37-39. The final melodic section, which moves from *Jin Rast* back to *Jin Sikah*, makes use of *Iqa' 'Awis*, and sporadically of *Iqa' Dharafat* (Farraj & Shumays, 2019, p. 119) (see Fig.66). This section functions as a blending of the two thematic ideas of the preceding two melodic areas being applied to the new metrical context. In the use of *Jin Rast*, two of its common larger *maqam* structures are used–*Maqam Rast* and *Maqam Nairuz* (Farraj & Shumays, 2019, pp. 377, 381):

Fig.65: *Iqa' Dawr Hindi* (Farraj & Shumays, 2019, p. 116).

Fig.66: *Iqa' Dharafat* (Farraj & Shumays, 2019, p. 119).

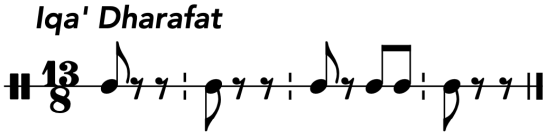


Fig.67: *Maqam Rast* and *Maqam Nairuz* (Farraj & Shumays, 2019, pp. 377, 381).

The sections of overt intervallic ratio connection, where the harp's interval patterns are used to derive microtonal hours for the *'ud,* is concentrated in this melodic area also. Previously, this relationship was only used to derive interval patterns, while the instruments' expressions of them are independent, whereas in b. 31 of this melodic area, the expression of both the harp's RH and *'ud* are exact representations of each other, both in rhythm and in intervallic presentation. This is foreshadowed in b. 21, with a less exact, but similar inversional connection.

Improvisation at the piano is a key part of my compositional process, but for this piece I composed through improvisation primarily on the *'ud*. In doing so I gained a new perspective on my processes while composing, and was able to compose something far more in touch with the instrument's character and playing limitations, especially for an instrument outside of the Western Classical tradition. The piece therefore reflects the limits of my playing at that moment in time, with each passage carefully written with the knowledge I could play it. For this reason, the upper range of the *'ud* is dwelt on less than its middle and lower range (where open strings are possible), and passages where multiple fingers are needed at once, such as the chord in b. 31 of the *Rast* to *Sikah* melody where *three* are needed, are used only at select moments. By composing on the *'ud* I was also able to organically incorporate articulations and ornamentations commonly associated with the instrument. The stepped ascents and descents which mix legato with regular rearticulation are used frequently, for example the descent in bb. 11-12 in the *Saba* to *Rast* melody, and the distinctive legato acciaccatura ornament like those used in b. 33 of the *Sikah* to *Saba* melody are characteristic of the instrument. The framing of my compositional process through the *'ud*, and my exploration of specific rhythmic patterns changed how I built the motifs and themes of this piece. Additionally, the mood of each TC interval pattern derived from the *jins* guided how I wrote for them, so that the melody sections could present these two contrasting halves both in TC structure and in motivic construction. For

my revisions of this piece, I worked with a harpist to reduce the amount of difficult bass-register work, especially though the stripping back of unnecessary repeated notes which could cause buzzing. Additionally, I collaborated with the harpist to make sure the notation was correct for a harp part and the best pedal settings were utilised.

In many ways, the precomposed sections are secondary to the improvisational *taqsim*, as they are merely transitory areas between the sections of pure expressions of the 24-tet and 12-tet TC and the ratio relationship between the two. This wasn't the first time I had written passages where improvisation and non verbal communication was needed to control the progression of a piece, having previously explored this in a piece I produced in my MA for harp and piano called *Passing* (2021). The goal in *Sikah* was to seamlessly move from freely improvised areas to precomposed melodies by controlling the limits of the amount of TC information available to the performer. Increasingly smaller units of TC information is given to the performer, moving from the full seven-pitch *maqam,* to TC triads in an ordered steering, until the exact order of the pitches are given and the performer can only affect the temporal spread and dynamics of the final expressions of the *taqsim*. This is also an interaction between myself the composer and the performers too, where I am gradually taking control of the musical surface, and then renunciating it at each new *taqsim* section.

Auguries of Innocence

This collection of songs, a full setting of William Blake's poem of the same name, was the last piece I wrote during my research. I was interested in both expanding on the spatial spreading of the TC in the physical performance space that I had started to develop in *The flood…* and also creating a dynamic interaction between not only the TC and the instruments, but between the trio as well. This piece serves as a unification of all the threads

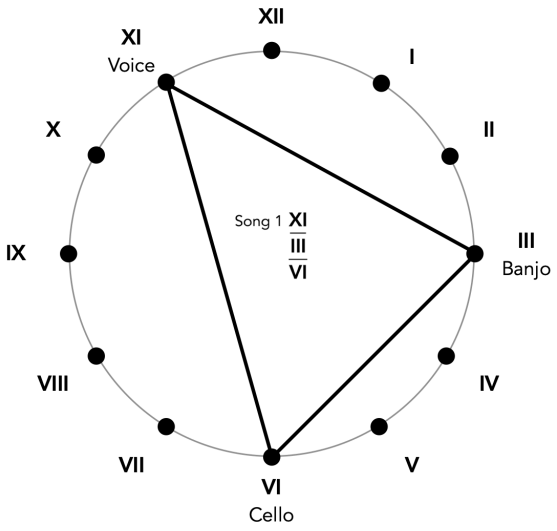
of my research, and while not a definitive statement on the potential of the continuation of the TC and future understanding of musical language (which is out of the reach of any composition solely), it does represent the conclusion to my years of work. Physical and compositional space and interaction therein are explored through *gestalt*, deep structure and recursive steering, and also the connections of the TC understood as ratio. These all coalesce in a complex and inseparable matrix, of which each song from the cycle is an equal representation. Therefore, I will, for the most part, discuss the global aspects of the collection as a whole as a unified piece, with more detailed references to each piece being used as and when appropriate.

The concept of the piece as a whole is twofold. Firstly, as this is a setting of a text, the representation of its themes and moods was of great concern and affected the moment-to-moment decisions while composing. Secondly, I wanted to create a connective and interactive structure that defines the changing TC atmospheres (including their deep structures), their motivic and timbral expression, as well the overall translation of these to the physical space. There are secondary aspects that also occur through the whole piece, as well as individual aspects in each song itself because of my own personal compositional interests while composing through the lens of the main two parts of the piece's concept. One such aspect is the instrumentation; similarly to *Sikah*, I chose a non-standard instrument because I play it myself and was interested in exploring its unusual timbre. The 5-string banjo's construction consists of four full length strings and one shorter drone string; in the style I am most comfortable playing–called clawhammer or frailing–two main strokes are used. These are "downstroking", made with the back of the nail (usually on the four full length strings), and "up-picking", where the thumb plucks the drone string (and the full length strings also) at regular rhythmic intervals between downstrokes and usually on the offbeat (Conway, 1995, pp. 200-203). The use of a regular drone as a contextualising or interactive element of musical construction is something that I am very interested in (maybe

originally drawing me to the banjo and also Hindustani music) and have previously exploited purposely in *The Flood…* particularly. While I experiment with more ways of playing the banjo than a clawhammer-based style, the repeated rhythmic drone is a constant element of these songs.

The song cycle's structure and TC expression was conceptualised as radiating out from the voice and the text. The voice undergoes a journey around the cycle of the TC, starting at Hour XI (the original triad), and ticking over to the next hour of the clock in each piece before ending where they began in *Song 13*. The TC fields expressed by the banjo and the cello are derived from the voice; If we draw out the hour structure of the voice on a Schat-like circle diagram, overlaid with the positions of the rest of the hours, we find two derived hours. Each diagram forms a single triangle on the circle, the corners of which indicate the related hours given to the banjo and the cello (going clockwise around the triangle):

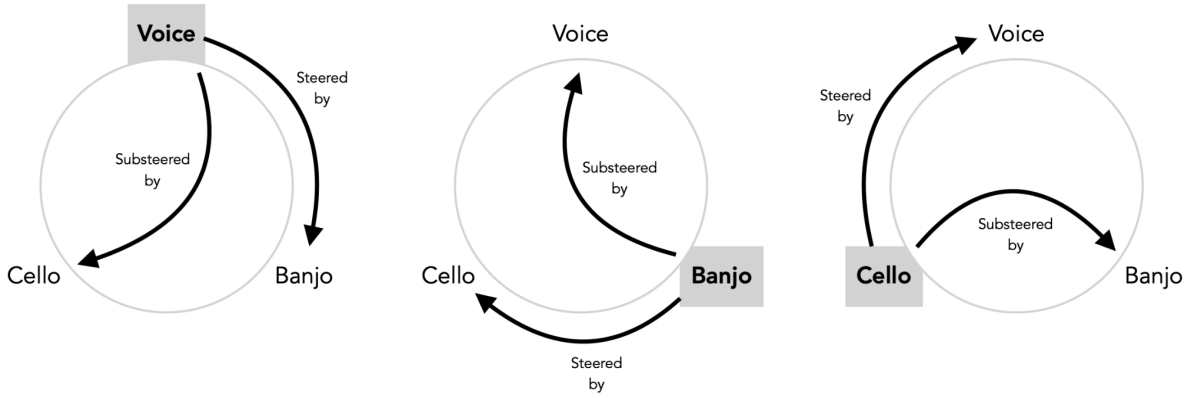
Fig.68: Spatialisation of Hour XI.



I take this derived structure one step further to emphasise the interconnectivity of the instruments, by deriving the steering and substeering patterns for each instrument from this triangle also. Therefore, the voice is steered by the banjo and substeered by the cello; the banjo is steered by the cello and substeered by the voice; and the cello is steered by the

voice and substeered by the banjo–thus creating a cyclical and self-defined steering interaction between the instruments, recursively formed by the structures of the TC hours themselves:

Fig.69: Inter-instrument deep structure interaction.



Where hours have min and MAJ structures, the decision of which will be used to create this derived structure was mostly formed from the desire to create song-to-song interactions. If a min or MAJ form resulted in an hour being repeated in the neighbouring songs (but in a different instrument), this was the hour chosen. For example, the use of Hour V in songs 6 and 7; Hour X in songs 7 and 8; Hour XII in songs 9 and 10; Hour II in songs 10 and 11; and finally Hour IV in songs 11 and 12 where the cello retains its hour in both. Each song is named with a number and the three hours it uses. To enhance these connections between songs, and to make the changing of hours more meaningful, each hour ratio has a certain *gestalt* mode of expression attached to it. This was a more focused use of the same 'character' concept I used in *The flood…*; each character is as follows:

- The 1:1 hour ratio (I, VI, X, XII) is a wave-like gesture. Its first use, in the cello in *Song 1*, presents two temporally contrasting ways of expressing it. In, b. 6 a fast, almost ornamental use of it, then bb. 17-21 a slower retrograde inversion is used. For its next appearance, in the voice in *Song 2*, I experiment with a rhythmically fluctuating use of this wave. See, for example, the comparison between the quintuplets in b. 5

and the quavers in its next use in b. 8, and when this wave fragments in b. 42 and b. 45. In *Song 3*, the voice again has this wave structure, as can be seen in bb. 5-8, but over the course of this song I stretched and elaborated the descent part of the wave as in bb. 20-24 and bb. 31-34. Because this hour ratio has the most hours that can be represented through it, this *gestalt* is the most represented in the cycle.

- The 1:2 ratio (II and VIII) has two parts to its *gestalt*: a long sustained note reached through a fast rising ornamental gesture (1:2-A), and a hook-like gesture (1:2-B). 1:2-A can first be seen in *Song 2* in bb. 24-25 in the cello, and then next in the banjo, where the ornament part is played as a finger brush in bb. 5-6. The ornament takes over in the banjo here, with the finger brush developing into repeat arpeggiation in b. 36. 1:2-B is first used in bb. 10-11 in *Song 2* by the cello. Its most representative use is in *Song 4* in the voice, where two succinct expressions introduce the melody in bb. 3-6, which is then elaborated on through the fusing of two forms of 1:2-B in bb. 15-17.
- The 1:3 ratio is a more loosely defined gesture, mostly expressed through the upwards reaching and subsequent fall to the same pitch which can first be seen in *Song 1* in bb. 2-15. A similar use can be seen in the voice in bb. 4-14 in *Song 5*. Its only other appearance (other than *Song 13*) is by the cello in *Song 3*; here similar gestural use can be seen (if more elaborated) in bb. 7-15. Additionally, its use is infected by the cello copying parts of the banjo's idiomatic thumb plucking, as can be seen in the comparison of the banjo in bb. 34-39 of *Song 1*, and the cello in bb. 16-18 in *Song 3*.
- The 1:4 ratio has two main parts: a repeated pulsing gesture (1:4-A), and an angular gesture (1:4-B). 1:4-A is first used by the banjo from the outset of *Song 2,* where its articulation is defined by muting extended techniques. Moving between pitch levels for the pulse gesture is achieved through arpeggiated chords, as can be seen in bb.

4-5. These muted pulses and arpeggios become pizzicato plucks (some with glissandos to mirror the banjo) and strums on the cello in *Song 11*. 1:4-B, which is first used by the banjo in bb. 10-13 of *Song 2*, undergoes temporal stretching on each use.

- The 1:5 ratio is positioned as a partner of the *gestalt* of 3:4. Its structure will be discussed when 3:4 is described, but 1:5 is first used by the cello in *Song 4*. This was a small detail I used at certain points, where hours can be connected to their symmetrical partner (the hour at the other side of the clock). See, for example in bb. 60-65 of *Song 1*; the banjo which is in Hour III, expresses a Hour IX pentad.
- The 2:3 ratio is expressed as Schat describes Hour VII with "blues" inflections and with a "pentatonic impulse", with lots of expressive glissandos (Schat, 1993, 65), which can be seen in *Song 9* in the voice.
- The 2:5 ratio has two parts to its *gestalt*: long drones on a singular pitch (2:5-A), and a permuting rhythmic gesture (2:5-B). 2:5-A can first be seen in the opening of *Song 6* in the cello, with 2:5-B responding to these drones in 11-15. Both these gestures can be seen in the banjo and its regular drone string accompaniment in *Song 9*. When 2:5 is passed to the voice for *Song 11*, as well as these two gestures being used, the 1:1 *gestalt* emerges in b. 26 due to Hour IX being related to 1:1 through permutation (2-5=5-5=1:1).
- The final hour ratio of 3:4 again has two parts: a strong rising gesture (3:4-A), and an interlocking curve gesture (3:4-B). 3:4-A can be first seen in the voice in bb. 4-9, and 3:4-B in bb. 10-12 of *Song 1*. As mentioned, 3:4 is paired with 1:5, with the connection reaching its climax in *Song 7,* where the voice (1:5) and the cello (3:4) play in a heterophonic texture following similar rhythms and in contrary motion.

A recursive expression of the voice's move around the TC is also expressed in a few ways. Firstly, the pitch level from which the TC (and steerings) are generated ascends chromatically every song–starting and ending on F♯–to mirror the voice's ticking around the hours. The banjo's tuning in each song is also a representation of this and the voice's hour field. It is common for banjos to use different tunings, with some having names or songs associated with them, and they are understood through their intervallic nature (Conway, 1995, pp. 223-224). As the banjo is a very resonant instrument, with the open strings always ringing out, I created tunings that expressed the interval pattern of the voice's hour. Additionally, the drone string tuning of each song represents the pitch level from which the hours are generated (a 5th string capo having to be used for some). This drone string's use varies from song to song, but it generally has a rhythmic mode of expression, appearing on specific beats, or as part of specific structures. It is an ever-present metaphorical representation of the ticking of the TC.

What drew me to Blake's poem was its emphasis on opposing poles; just like the contrast of min and MAJ, the poem's structure is largely built through pairs of contrasting moods with rhyming ending words. To set this structure to music, I wanted to both emphasise this contrast between lines where possible, as well as highlight the rhyming structure. For example the lines set in bb. 5-9 of *Song 2*:

> A Robin Red breast in a Cage
> Puts all Heaven in a Rage
> (Blake, 1807c., p. 506)

Each is expressed through the same 1:1 wave gesture highlighting the rhyming pattern between "Cage" and "Rage". However, because of the nature of Hour XII where only four possible transpositions of 4-4 exist, and the Hour IV steering applied to it, the voice's TC

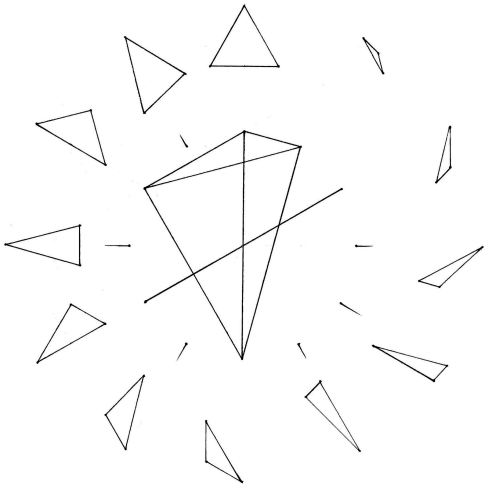
material consists wholly of two alternating Hour XII triads (G B D♯ and A ♭ C E) in this part of the steering field. In the expression of these two lines, each takes one of the triads, both changing on the last note of the gesture to create a different interval (semitone to C on "Cage", and minor 3rd to B on "Rage"). Similar connections can be found throughout the cycle.

The final consideration of the song cycle is its exploration of physical space. While *The flood…* made use of a six-pointed spatial outlining of a circle, I was interested in a full physical manifestation of the TC. The same patterns from which the intervallic substructures were derived are used to determine the seating position of each instrument. Twelve chairs are placed in an equally spaced circle facing inwards, each signifying an hour of the TC. For each song, the performers are seated in their surface hour (indicated by the title of the song) and move to a different position each song. Due to each hour ratio having an individual *gestalt* associated with it, and each hour having a particular spatial position, this will create an association between *gestalt*, hour colour and the physical space they are presented in for the audience. Also similarly to *The flood…*, there is an aleatory aspect to the experience of this piece, as each audience member, seated around the ensemble, will hear this spatial TC manifestation from a different angle.

Like *Sikah*, I chose to compose and improvise mostly through the instrument I played in the piece–banjo–while only making minimal use of the piano. This allowed me to create idiomatic parts for this non-standard instrument, and discussions at frequent intervals with a soprano singer helped guide the use of the voice in each song. Like *The flood…* this piece also was constructed almost like a collage due to the attachment of hour-ratios to motivic shapes. However, because these connections stretch out over multiple songs and have to be interpreted by each individual instrument, the translation of motivic shapes between pieces was a looser process. Each hour-ratio character could be interpreted very differently on each use, with each subject to its own individual development through a

piece. The hour-ratio connection or actual hour connection was used as a thread that maintains the continuity of the collection as a whole. Therefore, the TC is used as the guiding hand of the motivic material in a more integrated way than I have previously attempted, and is further emphasised by the spatialisation of the TC and its geometric hour shapes in the staging for the piece. Layers of interactions are deliberately controlled in this song cycle, exposing and emphasising the complex matrix of information and interactions within that forms any composition. The image on the front of my song cycle's score is a representation of the interactions of this piece:

Fig.70: Visual representation of deep structure networks in *Auguries of Innocence*.



Conclusion

In the search for a way to conceptualise the chromatic, cycles of theoretical 'revolutions' form recurring resonances across post-tonal Western music history. As I have shown, Schat's break from serialism and formation of the TC is resonant of Schoenberg's emancipation of the dissonance and subsequent twelve-tone serial method. McLeod's extension of the TC to other musical elements, and my subsequent research here, resonates with the extension of

serialism to all elements of music at Darmstadt. My own attempts at beginning to consolidate her unfinished explorations of a *gestalt*-based musical language to define the musical field (including the spatialisation of music) is resonant with the dissection of sound that was a result of Darmstadt's increasing systemisation and desire for deep levels of structure. Exploring the separated constituent elements of sound–pitch, duration, timbre, and silence–through the spatial axis' of the spectral (vertical) and temporal (horizontal) musical dimensions, the actual physical space could also be integrally investigated to explore the whole musical field through a holistic musical language. However, we must be careful in the steps taken towards this goal; the overattachment to strict theoretical functions is a theme that, as I have shown, extends throughout the history of post-tonal music theory.

In exploring the interactions of the field, I believe I have shown the potential of a *gestalt*-based approach to composition, where my concept of interaction–distilled from the TC–can be a powerful tool when used to sculpt the field and create purposeful interrelated structures. At the smallest level, this concept can reframe the understanding of intervallic perception by revealing the underlying colours of multi-hour hues, showing their internal atomistic relationship, and potentially providing a new modulatory process for interval-based composition. At larger levels, conceptualising composition through interaction only enhances the composer's potential to control both the TC fabric and structure, and also the purposeful manipulation of tension and release through the expression of the interactive relationships of the field. An overlap with the visual domain is facilitated by the exploitation of the dimensionality of the field; both spectral (vertical) and temporal (horizontal) axes form the construction of the musical field in the compositional space. As I have shown, interaction can function at every level of musical structure, from the musical surface to the deepest consciously controlled structural level, acting within and between separate continuities. Interaction can also function outside of them in the larger

spatial field, where the TC and other facets of the musical continuity can be translated to actual physical space. I have also shown how the purposeful control of the interaction of this dimensionality across structural levels and continuities can create powerful structural resonances, through both the alignment across levels and continuities, and the exploitation of symmetry. I have demonstrated the ways this allows the composer a greater level of control, over not only the form of the field but also its *gestalt* expression and perception. I have only begun to expand on the potential that a *gestalt*-based understanding of composition affords the composer, but it is clear that it allows a greater degree of purposeful control of the forms of the field. Like Schat and McLeod, I was strongly attracted to the way this control can be exerted in a more immediately perceptible way, rather than working atomistically with pitch classes or with the strictures of a serial approach by focussing on intervallic interaction. My research has shown this principle to be able to exert significant influence over large structural matrices, creating unique interactive structural paradigms.

The exploration of deep structure was a natural consequence of exploring the interactions of the field as well as the contextualisation of the TC within the spatial field. Schat's steering was already a powerful concept for the control of larger structural areas, and the expansion of this to deeper levels felt like a natural way of amplifying this structural control. While the conceptualisation of multiple levels of musical structure isn't new, I have endeavoured to discover the value of TC theory for exploiting deeper structural networks. These deep structures are always inherently there, even without conscious structuring of them while composing, and they can be seen as fractal branches which form a connective tissue and resource for composition. The purposeful control of these fractal branches, therefore, gives the composer agency over deeper and less obviously perceptible, but nevertheless powerful, directionality of the field. Experimenting with the use of recursion (across the already recursive theoretical construction), which I believe formed potent

structural dynamics and strengthened structural patterns through unity across multiple levels, was of great interest to me. The issue with purposefully controlling such depths is the "amount of content" (McLeod, 1980-1995, MS-Papers-7349-050). The more content, the greater the effect on both structural density in the spectral (vertical) and temporal (horizontal) domains, therefore requiring either vertical stacking of this content or a faster temporal expression of this content (or both). This can cause loss of coherence of these structures, but ultimately it is up to each composer to determine both how much content they use and how much importance they place on the comprehensibility of their intended structure. The weighing of this content's expression in spectral (vertical) and temporal (horizontal) dimensions can be exploited to create interesting transformations of the shape of the field, with areas of density and sparsity being used again to control tension and release. This can be seen in the various spreadings of deep structure explored in individual pieces in *Auguries of Innocence* (see APPENDIX VI, pp. 180-184). Further experimentation is needed to explore the perceptible qualities of deep structure, the effects of order at deeper levels, and of recursion as a unifying factor.

I have only begun to adapt the TC to a wider pitch sphere, so there is far more to be researched. I have shown that the structure of the TC as a theory can be extracted to form a new moveable ratio-based system, allowing hours and hour-ratios to be defined for any equal division of the octave. While I explored this through approaching the understanding of the 24-tet octave in Arabic music through translation to 12-tet structures, the actual colours of all the hours of the 24-tet system, as well as any other equal division of the octave, have yet to be fully explored. Additionally, I have mostly approached the TC in relation to pitch but, as shown by McLeod, its theoretical potential to understand any aspect of music is ripe for exploration. The thematic content of my pieces is a small representation of this; following the ideas expounded by Schoenberg (1967), my pieces are all built from an economical approach to motivic construction. Small singular motifs are

magnified and transformed to create full pieces, creating "unity, relationship, coherence, logic, comprehensibility and fluency" (Schoenberg, 1967, p. 8). I see this as an exploitation of as yet undefined ratio relationships in the thematic *gestalt*, which can be seen in my motivic approach to *Auguries of Innocence*.

While only briefly mentioned, I conceptualise music in a similar way to Schat, where the expression and perception of music is a "triadic" relationship. This conceptual triad is formed from the composer's intended structures, the actual content of these structures (all interpretations) and the listener's perceived structures. The striving for a greater understanding of both of these elements themselves, and also their interaction, forms the pedagogical direction I believe will form a unified musical language. McLeod stated:

> All the millions of conscious decisions that a composer must make in the course of composing a piece are concerned very fundamentally with the weighing and assessing the manifold effects of these perceptual laws [*gestalt* grouping principles] interacting upon one another. (And this is as true of all other arts as it is of music).
> (McLeod, 1980-1995, MS-Papers-7349-050)

Schoenberg called form in music a "living organism" (Schoenberg, 1967, p. 1). If we are to understand and purposefully control this organism, we must define the structures that are there and inherent in music, exploring their actual characteristics rather than forcing them into a system (Boulez, 2018). While a unifying musical language has been, and may still be, considered a "utopian vision"(Boulez, 2018, p. 60), I believe it to be a vision worth aspiring to. "Who, today, would dream of working towards a collective [musical] language?" (Boulez, 2018, p. 60)–Certainly, for my own musical purposes in the current portfolio, this has been answered by the Tone Clock and the *gestalt* understanding it affords.

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APPENDIX I:

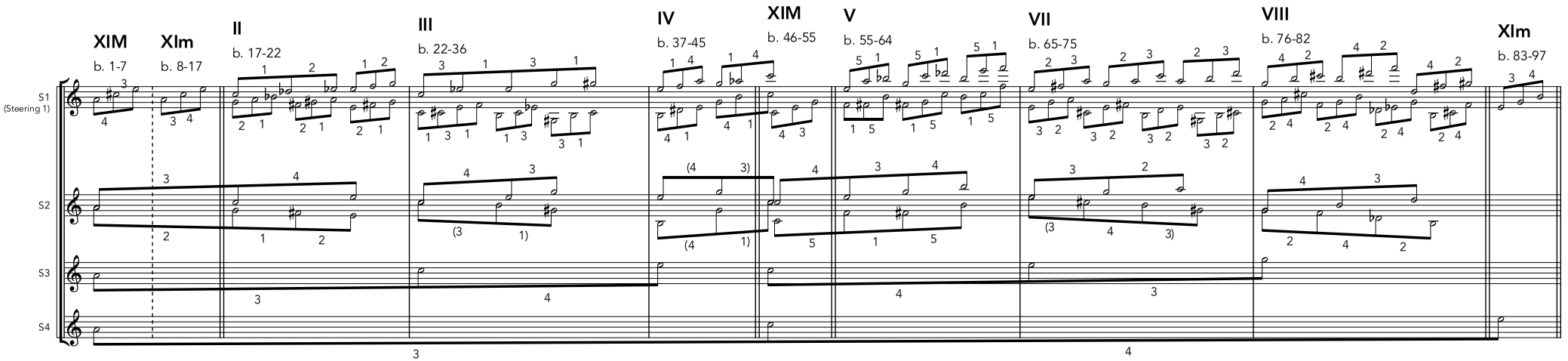
List of Hour and Hour-ratios from 3-TET to 24-TET

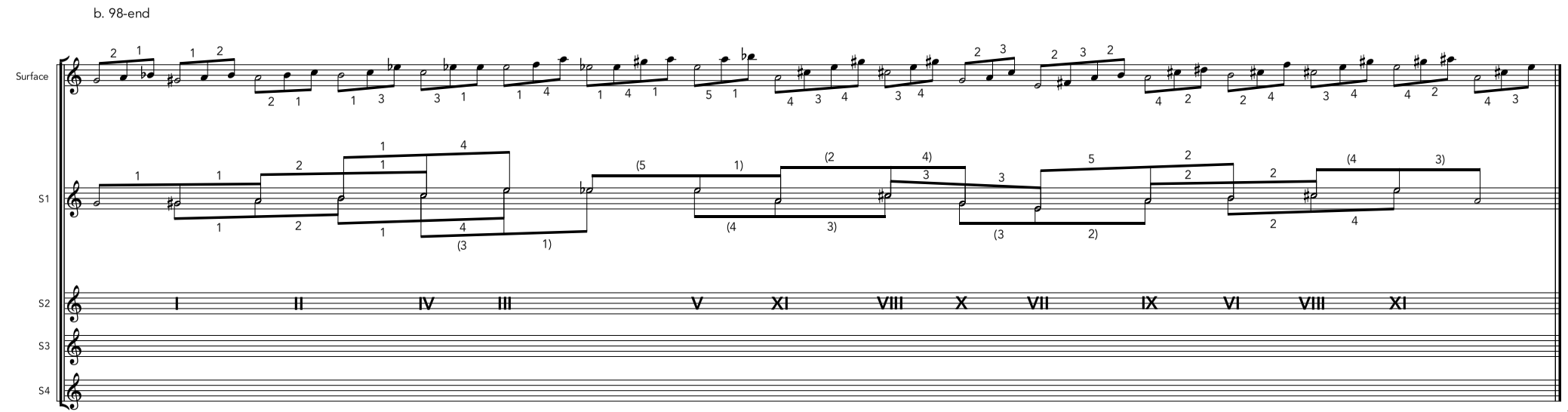
	Hours								Hour-ratios						
3-TET 1=400 cents	1-1								1:1						
4-TET 1=300 cents	1-1								1:1						
5-TET 1=240 cents	1-1 1-2								1:1 1:2						
6-TET 1=200 cents	1-1 1-2 1-3	2-2							1:1 1:2 1:3						
7-TET 1=171 cents	1-1 1-2 1-3	2-2							1:1 1:2 1:3						
8-TET 1=150 cents	1-1 1-2 1-3	2-2 2-3							1:1 1:2 1:3	2:3					
9-TET 1=133 cents	1-1 1-2 1-3 1-4	2-2 2-3	3-3						1:1 1:2 1:3 1:4	2:3					
10-TET 1=120 cents	1-1 1-2 1-3 1-4	2-2 2-3 2-4	3-3						1:1 1:2 1:3 1:4	2:3					
11-TET 1=109 cents	1-1 1-2 1-3 1-4 1-5	2-2 2-3 2-4	3-3 3-4						1:1 1:2 1:3 1:4 1:5	2:3	3:4				
12-TET 1=100 cents	1-1 1-2 1-3 1-4 1-5	2-2 2-3 2-4 2-5	3-3 3-4	4-4					1:1 1:2 1:3 1:4 1:5	2:3 2:5	3:4				
13-TET 1=92 cents	1-1 1-2 1-3 1-4 1-5 1-6	2-2 2-3 2-4 2-5	3-3 3-4	4-4					1:1 1:2 1:3 1:4 1:5 1:6	2:3 2:5	3:4				
14-TET 1=86 cents	1-1 1-2 1-3 1-4 1-5 1-6	2-2 2-3 2-4 2-5 2-6	3-3 3-4 3-5	4-4 4-5	5-5				1:1 1:2 1:3 1:4 1:5 1:6	2:3 2:5	3:4 3:5	4:5			
15-TET 1=80 cents	1-1 1-2 1-3 1-4 1-5 1-6 1-7	2-2 2-3 2-4 2-5 2-6	3-3 3-4 3-5 3-6	4-4 4-5	5-5				1:1 1:2 1:3 1:4 1:5 1:6 1:7	2:3 2:5	3:4 3:5	4:5			
16-TET 1=75 cents	1-1 1-2 1-3 1-4 1-5 1-6 1-7	2-2 2-3 2-4 2-5 2-6 2-7	3-3 3-4 3-5 3-6	4-4 4-5 4-6	5-5				1:1 1:2 1:3 1:4 1:5 1:6 1:7	2:3 2:5 2:7	3:4 3:5	4:5			

17-TET 1=71 cents	1-1 1-2 1-3 1-4 1-5 1-6 1-7 1-8	2-2 2-3 2-4 2-5 2-6 2-7	3-3 3-4 3-5 3-6 3-7	4-4 4-5 4-6	5-5 5-6				1:1 1:2 1:3 1:4 1:5 1:6 1:7 1:8	2:3 2:5 2:7	3:4 3:5 3:7	4:5	5:6		
18-TET 1=67 cents	1-1 1-2 1-3 1-4 1-5 1-6 1-7 1-8	2-2 2-3 2-4 2-5 2-6 2-7 2-8	3-3 3-4 3-5 3-6 3-7 3-8	4-4 4-5 4-6 4-7	5-5 5-6	6-6			1:1 1:2 1:3 1:4 1:5 1:6 1:7 1:8	2:3 2:5 2:7	3:4 3:5 3:7 3:8	4:5 4:7	5:6		
19-TET 1=63 cents	1-1 1-2 1-3 1-4 1-5 1-6 1-7 1-8 1-9	2-2 2-3 2-4 2-5 2-6 2-7 2-8	3-3 3-4 3-5 3-6 3-7 3-8	4-4 4-5 4-6 4-7	5-5 5-6 5-7	6-6			1:1 1:2 1:3 1:4 1:5 1:6 1:7 1:8 1:9	2:3 2:5 2:7	3:4 3:5 3:7 3:8	4:5 4:7	5:6 5:7		
20-TET 1=60 cents	1-1 1-2 1-3 1-4 1-5 1-6 1-7 1-8 1-9	2-2 2-3 2-4 2-5 2-6 2-7 2-8 2-9	3-3 3-4 3-5 3-6 3-7 3-8	4-4 4-5 4-6 4-7 4-8	5-5 5-6 5-7	6-6 6-7			1:1 1:2 1:3 1:4 1:5 1:6 1:7 1:8 1:9	2:3 2:5 2:7 2:9	3:4 3:5 3:7 3:8	4:5 4:7	5:6 5:7	6:7	
21-TET 1=57 cents	1-1 1-2 1-3 1-4 1-5 1-6 1-7 1-8 1-9 1-10	2-2 2-3 2-4 2-5 2-6 2-7 2-8 2-9	3-3 3-4 3-5 3-6 3-7 3-8 3-9	4-4 4-5 4-6 4-7 4-8	5-5 5-6 5-7 5-8	6-6 6-7	7-7		1:1 1:2 1:3 1:4 1:5 1:6 1:7 1:8 1:9 1:10	2:3 2:5 2:7 2:9	3:4 3:5 3:7 3:8	4:5 4:7	5:6 5:7 5:8	6:7	
22-TET 1=55 cents	1-1 1-2 1-3 1-4 1-5 1-6 1-7 1-8 1-9 1-10	2-2 2-3 2-4 2-5 2-6 2-7 2-8 2-9 2-10	3-3 3-4 3-5 3-6 3-7 3-8 3-9	4-4 4-5 4-6 4-7 4-8 4-9	5-5 5-6 5-7 5-8	6-6 6-7 6-8	7-7		1:1 1:2 1:3 1:4 1:5 1:6 1:7 1:8 1:9 1:10	2:3 2:5 2:7 2:9	3:4 3:5 3:7 3:8	4:5 4:7 4:9	5:6 5:7 5:8	6:7	
23-TET 1=52 cents	1-1 1-2 1-3 1-4 1-5 1-6 1-7 1-8 1-9 1-10 1-11	2-2 2-3 2-4 2-5 2-6 2-7 2-8 2-9 2-10 2-11	3-3 3-4 3-5 3-6 3-7 3-8 3-9 3-10	4-4 4-5 4-6 4-7 4-8 4-9 4-10	5-5 5-6 5-7 5-8 5-9	6-6 6-7 6-8 6-9	7-7 7-8	8-8	1:1 1:2 1:3 1:4 1:5 1:6 1:7 1:8 1:9 1:10 1:11	2:3 2:5 2:7 2:9 2:11	3:4 3:5 3:7 3:8 3:10	4:5 4:7 4:9	5:6 5:7 5:8 5:9	6:7	7:8
24-TET 1=50 cents	1-1 1-2 1-3 1-4 1-5 1-6 1-7 1-8 1-9 1-10 1-11	2-2 2-3 2-4 2-5 2-6 2-7 2-8 2-9 2-10 2-11	3-3 3-4 3-5 3-6 3-7 3-8 3-9 3-10	4-4 4-5 4-6 4-7 4-8 4-9 4-10	5-5 5-6 5-7 5-8 5-9	6-6 6-7 6-8 6-9	7-7 7-8	8-8	1:1 1:2 1:3 1:4 1:5 1:6 1:7 1:8 1:9 1:10 1:11	2:3 2:5 2:7 2:9 2:11	3:4 3:5 3:7 3:8 3:10	4:5 4:7 4:9	5:6 5:7 5:8 5:9	6:7	7:8

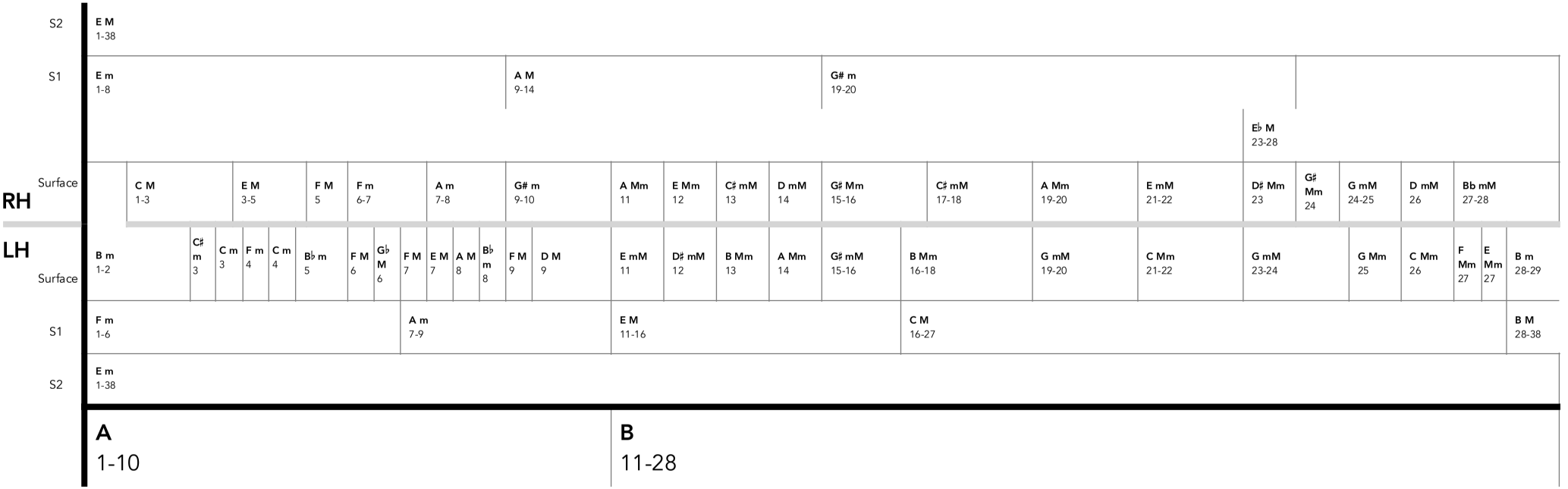
APPENDIX II: list of Hours in 24-tet

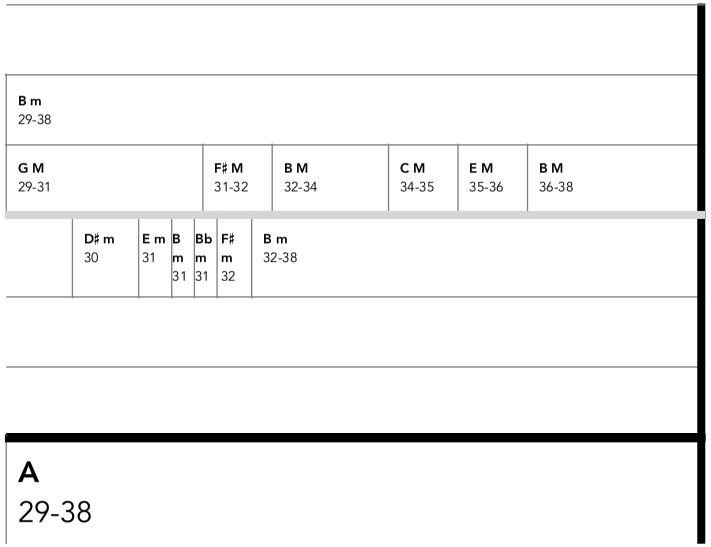
APPENDIX III: Steering diagram for *IXm–IXM*





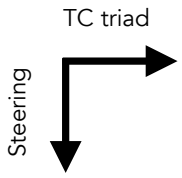
APPENDIX IV: Steering diagram for *IVm–IVM*

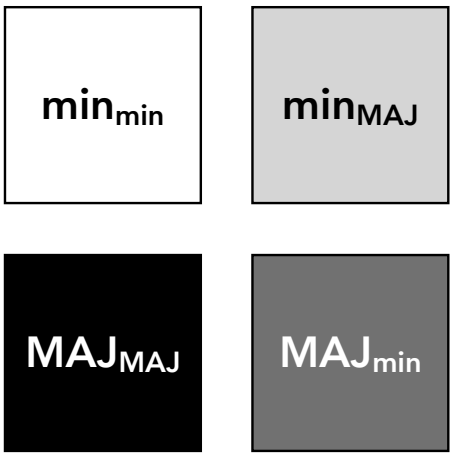


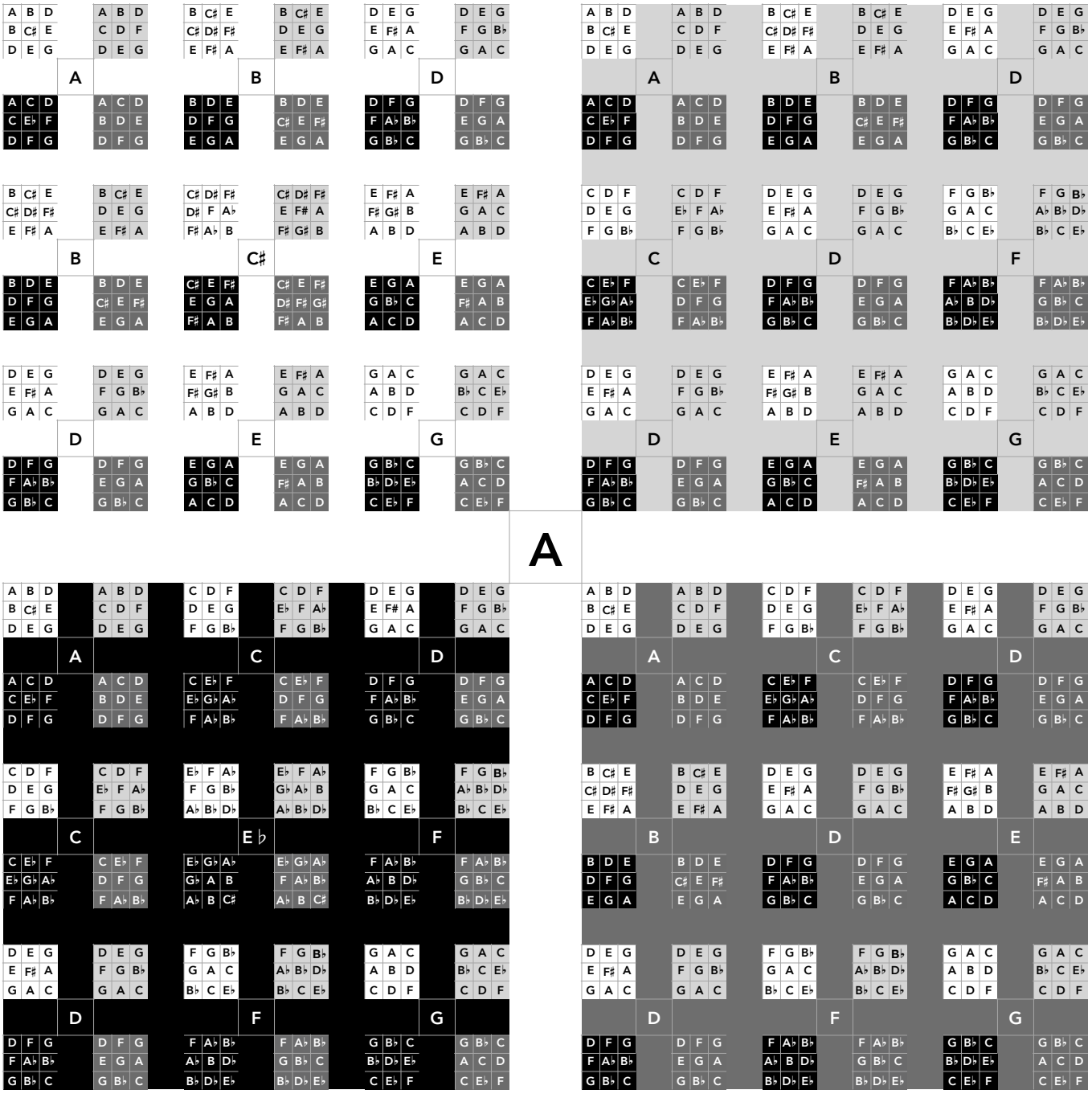


APPENDIX V:

Piece key for *VIIm–VIIM from Seven Studies in Interaction*

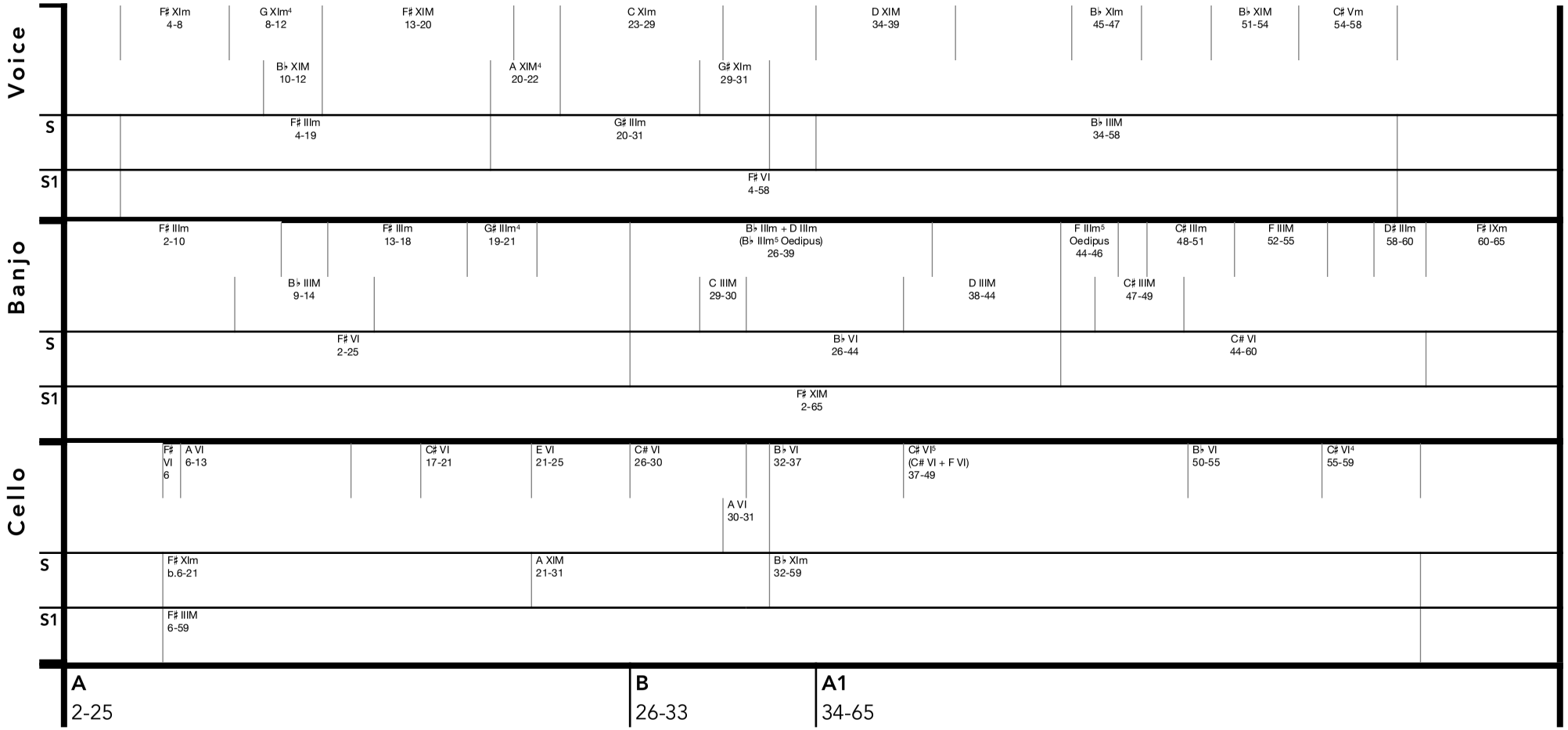




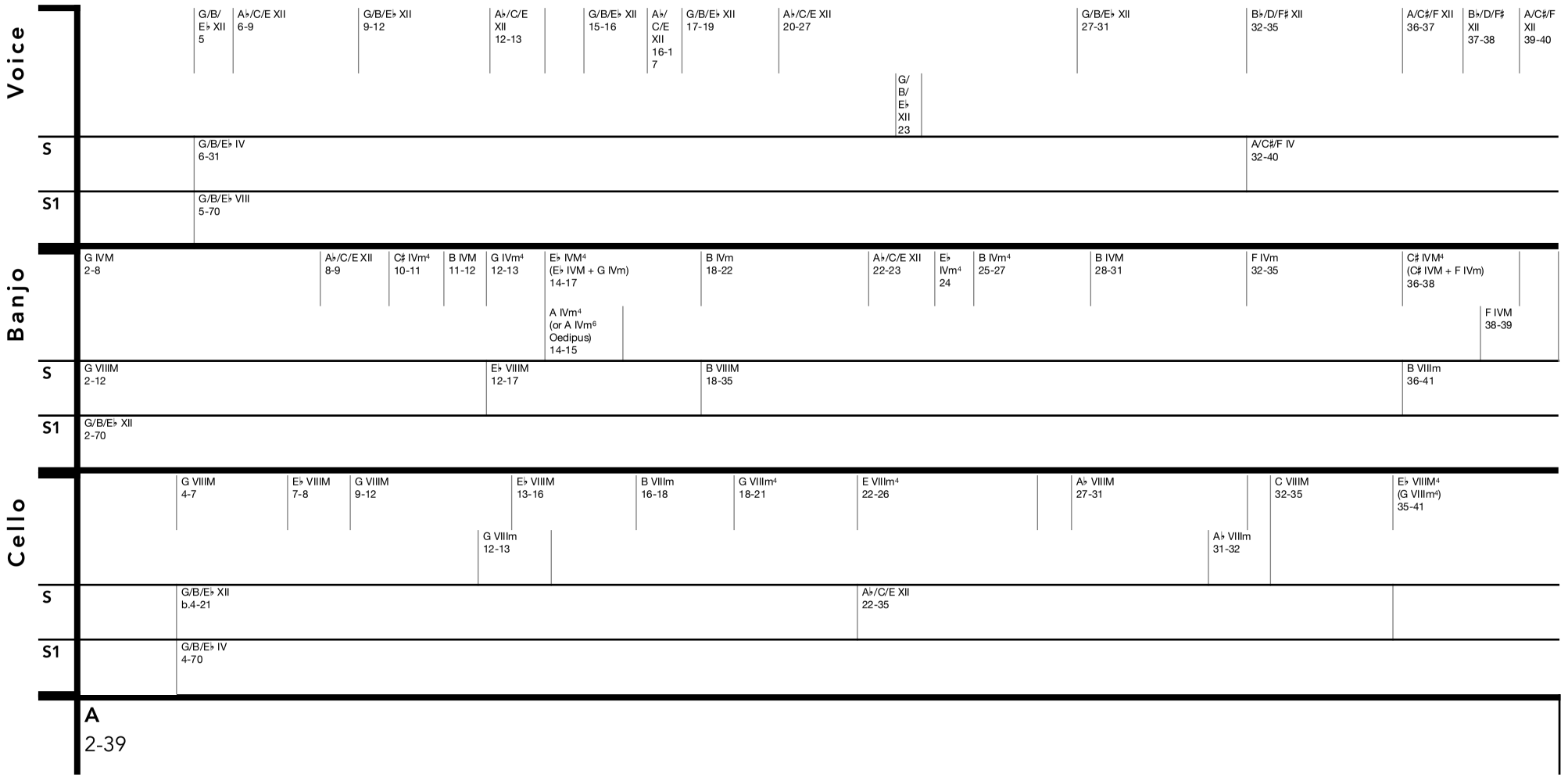


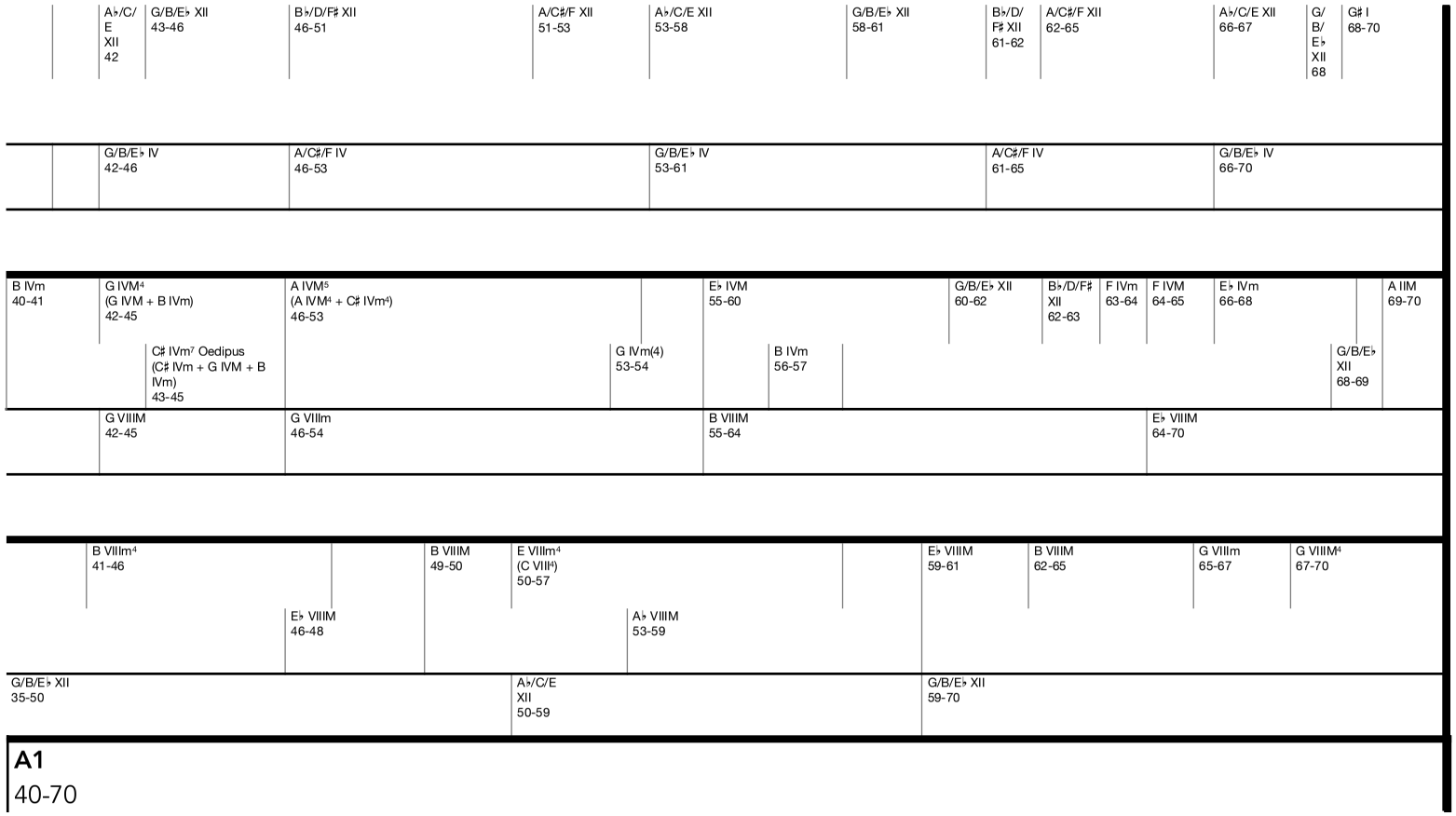
APPENDIX VI: Full steering structures for songs 1-4

Song 1: **XI/III/VI**



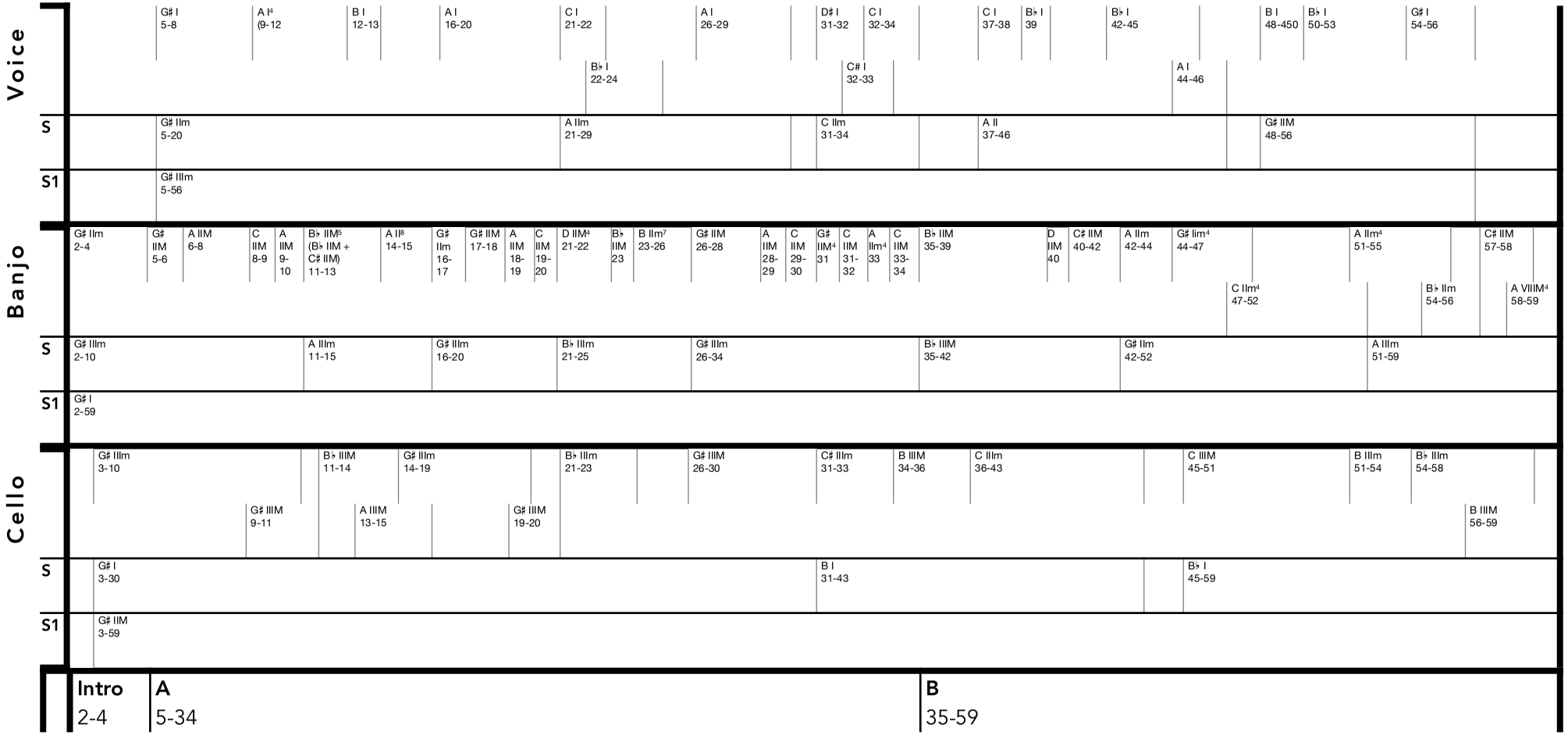
Song 2: **XII/IV/VIII**



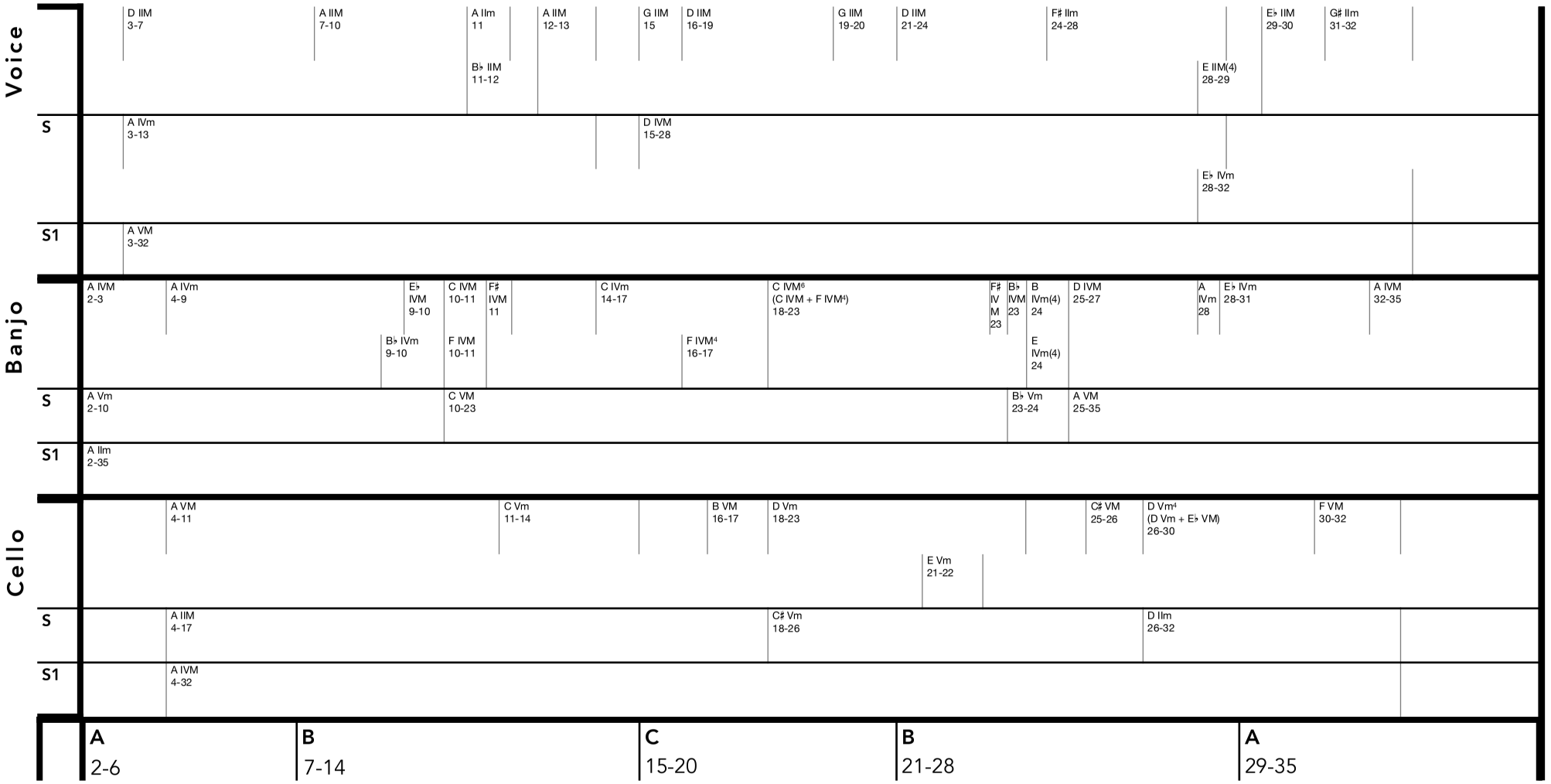

A♭/C/E XII 42
G/B/E♭ XII 43-46
B♭/D/F♯ XII 46-51
A/C♯/F XII 51-53
A♭/C/E XII 53-58
G/B/E♭ XII 58-61
B♭/D/F♯ XII 61-62
A/C♯/F XII 62-65
A♭/C/E XII 66-67
G/B/E♭ XII 68
G♯ I 68-70
G/B/E♭ IV 42-46
A/C♯/F IV 46-53
G/B/E♭ IV 53-61
A/C♯/F IV 61-65
G/B/E♭ IV 66-70
B IVm 40-41
G IVM4 (G IVM + B IVm) 42-45
C♯ IVm7 Oedipus (C♯ IVm + G IVM + B IVm) 43-45
A IVM5 (A IVM4 + C♯ IVm4) 46-53
G IVm(4) 53-54
E♭ IVM 55-60
B IVm 56-57
G/B/E♭ XII 60-62
B♭/D/F♯ XII 62-63
F IVm 63-64
F IVM 64-65
E♭ IVm 66-68
G/B/E♭ XII 68-69
A IIM 69-70
G VIIIM 42-45
G VIIIm 46-54
B VIIIM 55-64
E♭ VIIIM 64-70
B VIIIm4 41-46
E♭ VIIIM 46-48
B VIIIM 49-50
E VIIIm4 (C VIII4) 50-57
A♭ VIIIM 53-59
E♭ VIIIM 59-61
B VIIIM 62-65
G VIIIm 65-67
G VIIIM4 67-70
G/B/E♭ XII 35-50
A♭/C/E XII 50-59
G/B/E♭ XII 59-70

A1
40-70

Song 3: **I/II/III**



Song 4: **II/IV/V**


Voice
D IIM 3-7
A IIM 7-10
A IIm 11
B♭ IIM 11-12
A IIM 12-13
G IIM 15
D IIM 16-19
G IIM 19-20
D IIM 21-24
F♯ IIm 24-28
E IIM(4) 28-29
E♭ IIM 29-30
G♯ IIm 31-32
S
A IVm 3-13
D IVM 15-28
E♭ IVm 28-32
S1
A VM 3-32
Banjo
A IVM 2-3
A IVm 4-9
E♭ IVM 9-10
B♭ IVm 9-10
C IVM 10-11
F IVM 10-11
F♯ IVM 11
C IVm 14-17
F IVM4 16-17
C IVM6 (C IVM + F IVM4) 18-23
F♯ IVM 23
B♭ IVM 23
B IVm(4) 24
E IVm(4) 24
D IVM 25-27
A IVm 28
E♭ IVm 28-31
A IVM 32-35
S
A Vm 2-10
C VM 10-23
B♭ Vm 23-24
A VM 25-35
S1
A IIm 2-35
Cello
A VM 4-11
C Vm 11-14
B VM 16-17
D Vm 18-23
E Vm 21-22
C♯ VM 25-26
D Vm4 (D Vm + E♭ VM) 26-30
F VM 30-32
S
A IIM 4-17
C♯ Vm 18-26
D IIm 26-32
S1
A IVM 4-32
A 2-6
B 7-14
C 15-20
B 21-28
A 29-35

Portfolio of Compositions

Seven studies in interaction

For
Solo piano

ALEX BARKER

These pieces mark my first focused exploration of a concept central to my research, that of 'interaction.' The idea when starting to compose these studies was to follow in the footsteps of a composer who has had a great influence on my work, Jenny McLeod, and especially her 24 Tone Clock Pieces for piano. These express and document McLeod's creative exploration and eventual development on Tone Clock theory (resulting in her Chromatic Maps I and II), providing a deeply personal insight into a composer's thought processes. I therefore sought a similar catalyst through composing these studies, and to find my footing in my own development of the Tone Clock and as a composer. Each piece presents a single Hour's interaction with itself, exploring the seven possible Hour's capable of unique min/Maj forms (as defined by McLeod). These small studies admittedly took longer than I expected to finish, but I think became more than I had originally hoped, where my concept of interaction was extended further than this initial concept. These helped me in my goal of starting to understand the foundations of a possible unifying musical language, and as McLeod did with her chromatic maps, I wish to map the matrices of information that form music.
Sadly Jenny McLeod passed away not long ago at the time of writing this, these pieces wouldn't have come about without her work, therefore these pieces are dedicated to her.

_ALEX BARKER

C O N T E N T S

STUDY II:	**1 - 2 ‖ 2 - 1**	1
STUDY III:	**1 - 3 ‖‖ 3 - 1**	4
STUDY IV:	**1 - 4 ‖‖‖ 4 - 1**	7
STUDY V:	**1 - 5 ‖‖‖‖ 5 - 1**	11
STUDY VII:	**2 - 3 ‖‖ 3 - 2**	13
STUDY VIII:	**2 - 4 ‖‖‖ 4 - 2**	19
STUDY XI:	**3 - 4 ‖‖‖ 4 - 3**	24

Duration: ca. 20 minutes

Seven studies in interaction

ALEX BARKER

STUDY II

1 - 2 || 2 - 1

19
accel.
♩. = 120
pp
mp
f
ppp sub.
mp
24
f
pp sub.
mp
ff
(Ped.)
poco accel.
28
ppp sub.
f
♩. = 132
31
ff
f
p
pp
(Ped.)
35
poco rit.
♩. = 120
mp

38
mf
44
f
pp
mp
ppp
poco rit. ..... = 105
50
mp
f
pp
ppp
mp
poco rit. ..... = 92
57
p
pp
ppp

STUDY III

1 - 3 ||| 3- 1

Strong and resolute ♪ = 120

(2+3)

poco rit. .....

ppp *mf* *pp* sub. *mp* *ppp* *p*

Ped.

7

.....a tempo

pp *mf*

poco accel. .....a tempo (♪ = 120)

12

ff *ppp* *f* *p* *pp*

Ped.

17

mp *mf* *mp* *p*

Ped.

22
pp
mf
poco accel.
(♪ = 120)
a tempo
26
(3+2)
ff
ppp
ff
Ped.
31
mf
p
mp
mf
pp
mp
(Ped.)
36
3
3
p
pp
mf
(mf)
p
(Ped.)

40
mf
pp sub.
f
p sub.
(Ped.)
poco rit. ♪ = 108
43
(2+3)
mp
mf
ff
mp
ff
mp
Ped.
poco accel. ♪ = 120
poco rit.
48
ff
pp
ff
fff
ppp
mf

STUDY IV

1 - 4 | 4 - 1

8
p
ppp
9
poco rit.
mp
f
fff
11
♩ = 42
mp sub.
pp
mf
mp
f
14
pp
mf
f
mf
p

17
ppp
mp
pp
mp
mf
21
poco accel. ..... ♩ = 50
f
mf
p
24
mf
p
mf
27
f
fff
pppp
Ped.

poco accel. ..... a tempo (♩ = 50)
29
ppp
mf
mp
ppp
(Ped.)
31
mf
pp
33
mp
f
pp
35

STUDY V

1 - 5 | 5 - 1

28
mf
f
pp sub.
(Ped.)
34
poco rit. ..... ♩ = 50
mp
mf
pp
ppp
p
40
mf
ppp
p
B
A
(Ped.)
45
ff
pp
f sub.
pp sub.
mf sub.
ppp sub.
Ped.

STUDY VII

2 - 3 ‖ 3 - 2

♩ = 144
(2+3)
31
pp
mp
mf
mp
poco accel.
♩ = 150
35
mf
f
38
mf
mp
f
(Ped.)
Ped.
poco rit.
41
(3+2)
(2+3)
mf
p
f
(Ped.)

45
♩ = 144
p
mp
3
Ped.
poco accel.
48
ppp
p
mp
mf
51
♩ = 150
ff
fff
mp
55
pp

62
p
Ped.
71
mp
p
mf
p
(Ped.)
78
f
(Ped.)
84
(Ped.)

poco rit. ....♩ = 144
(2+3)
91
p
pp
mf
p
pp
(Ped.)
95
p
ppp
(Ped.)
poco accel. .....
98
mp
pp
(pp)
mf
.....a tempo (♩ = 144)
(3+2)
101
ff
p sub.
pp
Ped.

104
(2+3)
mp
108
mf
ppp

STUDY VIII

2 - 4 ‖ |||| 4 - 2

19
♩ = 120
mp sub.
ff mp sub.
(Ped.)
Ped.
24
poco accel. ..... ♩ = 135
poco rit. ..... ♩ = 120
p
ppp
p
(Ped.)
Ped.
29
poco accel. .....
pp
mp pp sub.
(Ped.)
34
♩ = 135
poco accel. .....
mp pp sub.
mf mp
(Ped.)

38
♩ = 150
f
(Ped.)
41
mf
p
mp
ff
45
p
mp
p
mp
p
♩ = 120
mp
(Ped.)
52
p
mf
(Ped.)

57
p
pp
f
(Ped.)
62
poco accel. ..... ♩ = 135
poco accel. .....
pp sub. ppp
pp ppp
66
♩ = 150
mp
f
ff
70
♩ = 120
p
pp
p

75
mp
(Ped.)
Ped.
80
mf p sub.
mp p
(Ped.)
84
p pp
pppp
(Ped.)

STUDY XI

3 - 4 ||| |||| 4 - 3

poco rit.
12
8va
p
pp
ppp
3
15
♪ = 190
mp
pp
p
(Ped.)
Ped.
Ped.
18
mp
Ped.
poco rit.
21
p
mf
p sub.
Ped.
Ped.
Ped.

24
♪ = 176
poco accel.
♪ = 190
mp
f
Ped.
27
mf
p sub.
30
mf
mp
33
poco rit.
♪ = 176
p
(Ped.)

accel.
♪ = 210
36
poco rit.
f
3
(Ped.)
Ped.
Ped.
a tempo (♪ = 210)
poco rit.
39
♪ = 190
mf
ppp
p
Ped.
Ped.
poco accel.
43
ff
ppp sub.
mp
♪ = 210
46
ff
3

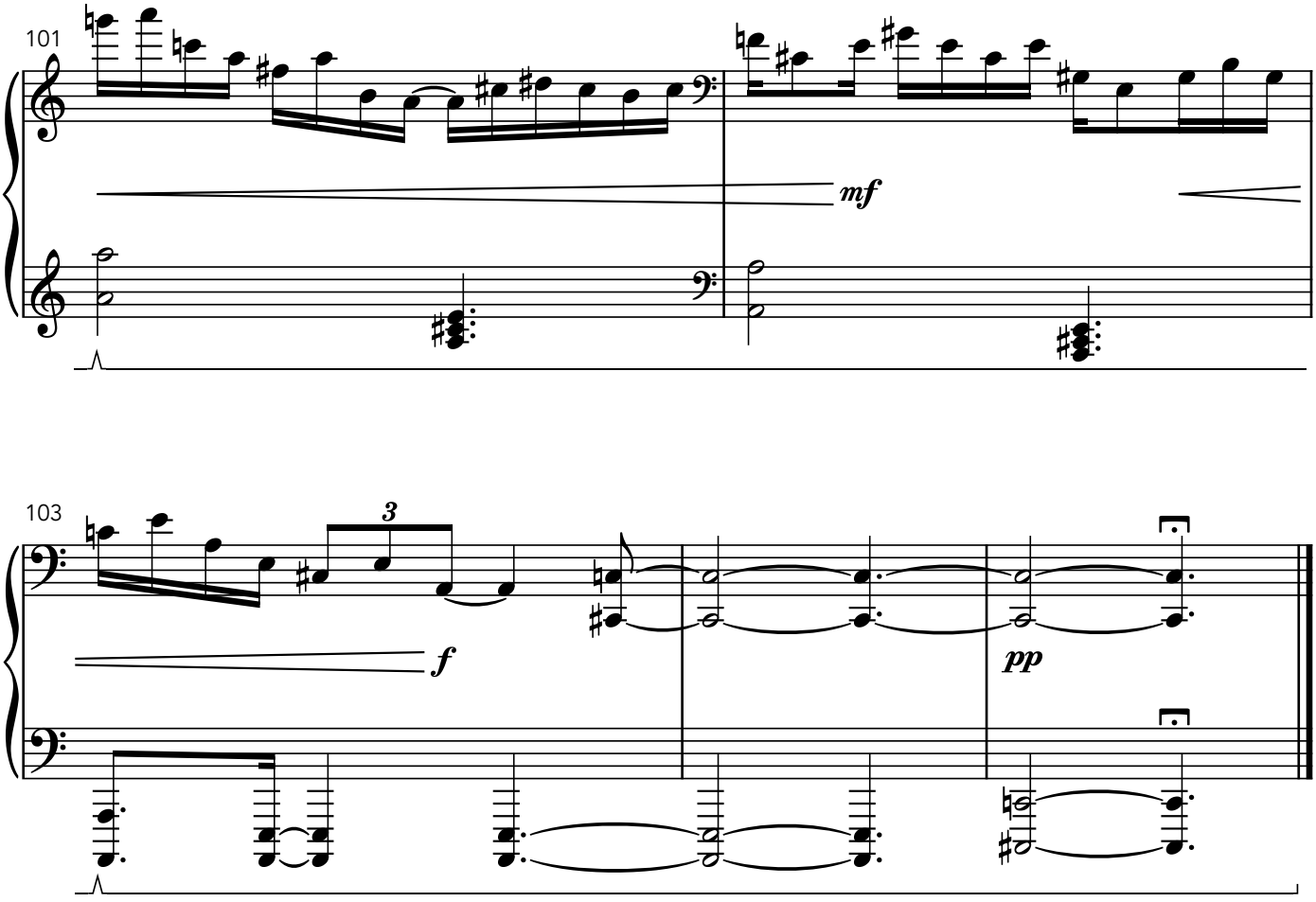
48
mf
f
rit.
♪ = 176
51
3
mp
Ped.
poco accel.
54
pp
p
mp
Ped.
♪ = 190
57
f mp sub.
Ped.

60
poco rit.
♪ = 176
f
p sub.
Ped.
Ped.
63
poco rit.
mp
pp
(Ped.)
Ped.
Ped.
66
♪ = 160
accel.
p
69
♪ = 190
poco rit.
mf
mp
(Ped.)
Ped.

72
♪ = 176
accel.
mf
Ped.
75
♪ = 210
poco rit.
p
mf
Ped.
78
a tempo (♪ = 210)
poco rit.
♪ = 190
pp
mf
mp
Ped.
81
♪ = 210
ff
ppp sub.
mf

84
3
f
86
poco rit. ♪ = 190
mf
f
mp
Ped.
Ped.
89
p
Ped.
Ped.
91
mp
mf
(Ped.)

93
3
f
(Ped.)
95
mf
p
(Ped.)
poco rit.
♪ = 176
97
8va
pp
mp
Ped.
99
mf
f
mp sub.
(Ped.)


101
mf
103
3
f
pp

An Exequy

ALEX BARKER

for Symphony Orchestra

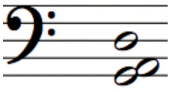
Transposing Score

Instrumentation

Piccolo
2 Flutes
2 Oboes
2 Clarinets in Bb
2 Bassoons

4 Horns in F
2 Trumpets in Bb
2 Tenor Trombones
Bass Trombone
Tuba in CC

3 Percussionists
- Timpani
- Bass Drum
- Suspended Cymbal

Timpani tuning: 

Harp

Violins I
Violins II
Violas
Violincellos
Contrabass

An Exequy

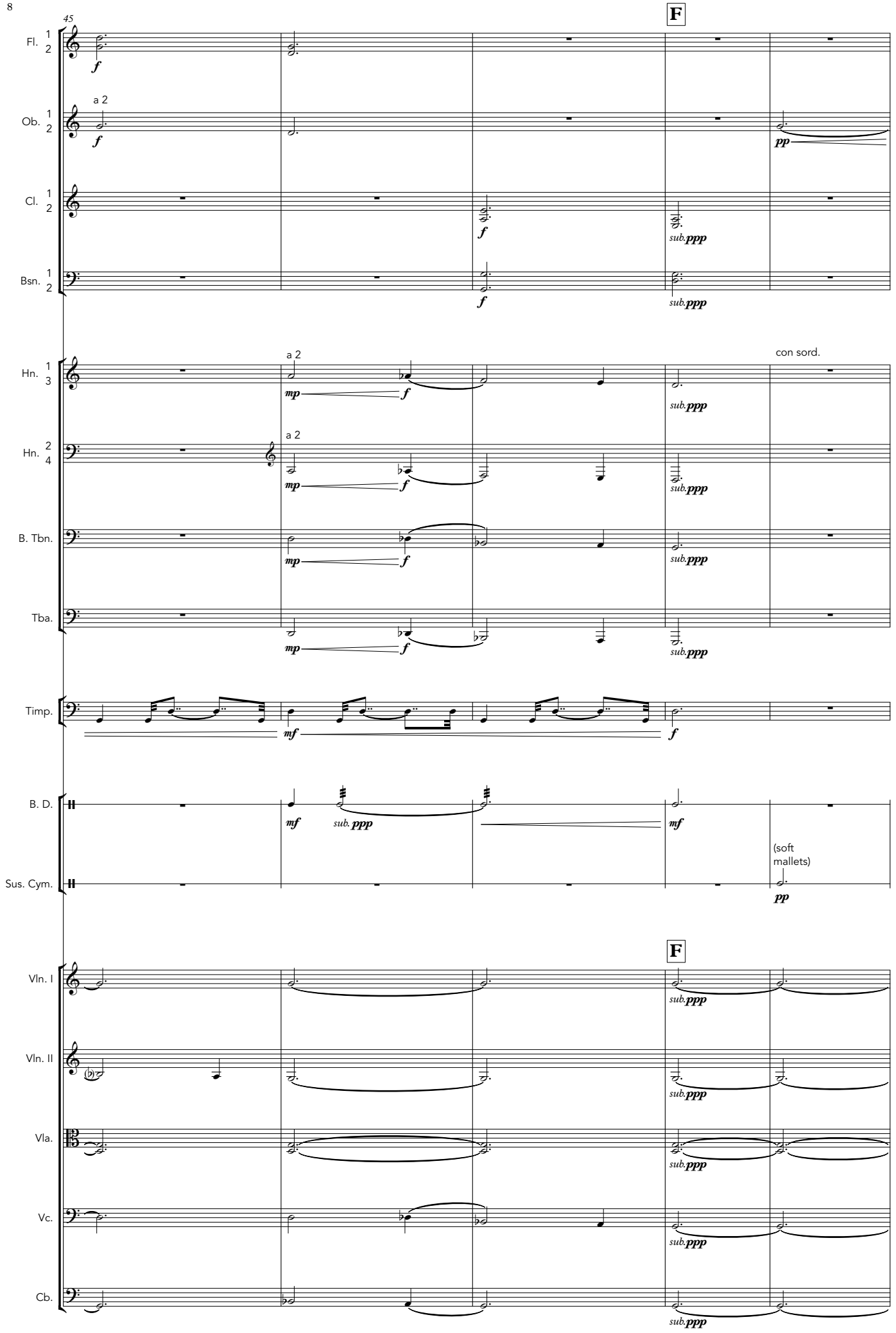
ALEX BARKER

11
B
Picc.
Fl. 1 2
Ob. 1 2
Cl. 1 2
Bsn. 1 2
Hn. 1 3
Hn. 2 4
Tbn. 1 2
B. Tbn.
Timp.
B. D.
Sus. Cym.
Hp.
Vln. I
Vln. II
Vla.
Vc.
Cb.
a 2
(a 2)
(1.)
senza sord.
soft mallets
take triangle beater
(triangle beater)
scrape outwards
ord.
tutti
sul tasto
sul pont.
arco

21
C
Picc.
Fl. 1 2
Ob. 1 2
Cl. 1 2
Bsn. 1 2
Hn. 1 3
Hn. 2 4
Tpt. 1 2
Tbn. 1 2
B. Tbn.
Timp.
B. D.
Hp.
Vln. II
Vla.
Vc.
Cb.
1.
(a 2)
a 2
(1.)
senza sord.
ord.
tutti
mp
mf
f
pp
p
5

27
poco accel.
Picc.
Fl. 1 2
a 2
Ob. 1 2
Cl. 1 2
a 2
Bsn. 1 2
(a 2)
Hn. 1 3
1.
Hn. 2 4
1.
Tpt. 1 2
a 2
con sord.
Tbn. 1 2
con sord.
B. Tbn.
Tba.
B. D.
Vln. II
half
poco accel.
Vla.
half
Cb.

D
35
♩ = 80
Picc.
sub. mp
Fl. 1 2
pp
p
Ob. 1 2
(a 2)
Cl. 1 2
Bsn. 1 2
Hn. 2 4
1.
scrape outwards
take soft mallets
Sus. Cym.
mp
Hp.
Vln. I
tutti
E
38
poco rit.
a 2
3
Timp.
Vln. II
Vla.
tutti div.
Vc.
Cb.
mf
f


45
F
Fl. 1 2
Ob. 1 2
a 2
Cl. 1 2
Bsn. 1 2
Hn. 1 3
a 2
con sord.
Hn. 2 4
a 2
B. Tbn.
Tba.
Timp.
B. D.
Sus. Cym.
(soft mallets)
F
Vln. I
Vln. II
Vla.
Vc.
Cb.
f
mp
mf
pp
ppp
sub.

50
a 2
flz.
flz.
ord.
G
Fl. 1 2
Ob. 1 2
(a 2)
Cl. 1 2
a 2
Bsn. 1 2
a 2
Hn. 1 3
1.
Tpt. 1 2
1.
Tbn. 1 2
1.
Timp.
take triangle beater
(triangle beater)
scrape outwards
ord.
take soft mallets
Sus. Cym.
Hp.
G
Vln. I
Vln. II
Vla.
unis.
sul pont
Vc.
sul pont
Cb.
sul pont

59
Picc.
Fl. 1 2
(a 2)
Ob. 1 2
Cl. 1 2
(a 2)
Bsn. 1 2
Hn. 1 3
senza sord.
(1.)
a 2
Hn. 2 4
(a 2)
Tpt. 1 2
senza sord.
a 2
Tbn. 1 2
senza sord.
a 2
B. Tbn.
Timp.
Hp.
Vln. I
non div.
Vln. II
non div.
Vla.
non div.
ord.
Vc.
non div.
ord.
Cb.
ord.
mf
mp
p
f
pp

66
H
a 2
Bsn. 1 2
Timp.
Sus. Cym.
(soft mallets)
Hp.
H
Vln. I
Vln. II
Vla.
Vc.
Cb.
tutti
72
I
Ob. 1 2
ped. gliss.
Ab - ♮
I
sul tasto
div.
unis. sul tasto
div. sul tasto
tutti div.
unis. sul tasto
sul tasto

77
poco accel.
J = 80
molto rit.
Picc.
Fl. 1 2
Ob. 1 2
Cl. 1 2
Bsn. 1 2
Hn. 1 3
Hn. 2 4
Tpt. 1 2
Tbn. 1 2
B. Tbn.
Tba.
Sus. Cym.
Hp.
Vln. I
Vln. II
Vla.
Vc.
Cb.
a 2
(a 2)
ord.
sul pont

K
A Tempo (♩ = 70)
83
Picc.
Fl. 1 2
Ob. 1 2
Cl. 1 2
Bsn. 1 2
a 2
Hn. 1 3
Hn. 2 4
Tpt. 1 2
Tbn. 1 2
B. Tbn.
Tba.
Timp.
B. D.
take triangle beater
(triangle beater)
Sus. Cym.
K
A Tempo (♩ = 70)
tutti div. ord.
Vln. I
Vln. II
tutti div. ord.
Vla.
tutti div. ord.
Vc.
ord.
Cb.

90
L
Picc.
Fl. 1 2
(a 2)
Ob. 1 2
Cl. 1 2
Bsn. 1 2
Hn. 1 3
Hn. 2 4
Tpt. 1 2
Tbn. 1 2
B. Tbn.
Tba.
Timp.
B. D.
Sus. Cym.
Vln. I
Vln. II
Vla.
Vc.
Cb.
fff
ff
f
mf
pp
1.
con sord.
unis.
(triangle beater)
scrape outwards
take soft mallets

98
M
Picc.
Fl. 1 2
Ob. 1 2
Cl. 1 2
Bsn. 1 2
Hn. 1 3
Hn. 2 3
Tpt. 1 2
Tbn. 1 2
B. Tbn.
Tba.
Timp.
B. D.
Sus. Cym.
Hp.
Vln. I
Vln. II
Vla.
Vc.
Cb.
(a 2)
a 2
1.
tutti
(soft mallets)
div.
pp
p
mp
ppp

107
N
Picc.
Fl. 1 2
Ob. 1 2
Cl. 1 2
Bsn. 1 2
Hn. 1 3
Hn. 2 4
Tpt. 1 2
Tbn. 1 2
B. Tbn.
Tba.
Vln. I
Vln. II
Vla.
Vc.
Cb.
(a 2)
a 2
a 2 flz.
1.
pizz.
pp
mp
p
mf

The flood on which all move and wish to move

For Oboe, Horn and String Quartet

ALEX BARKER

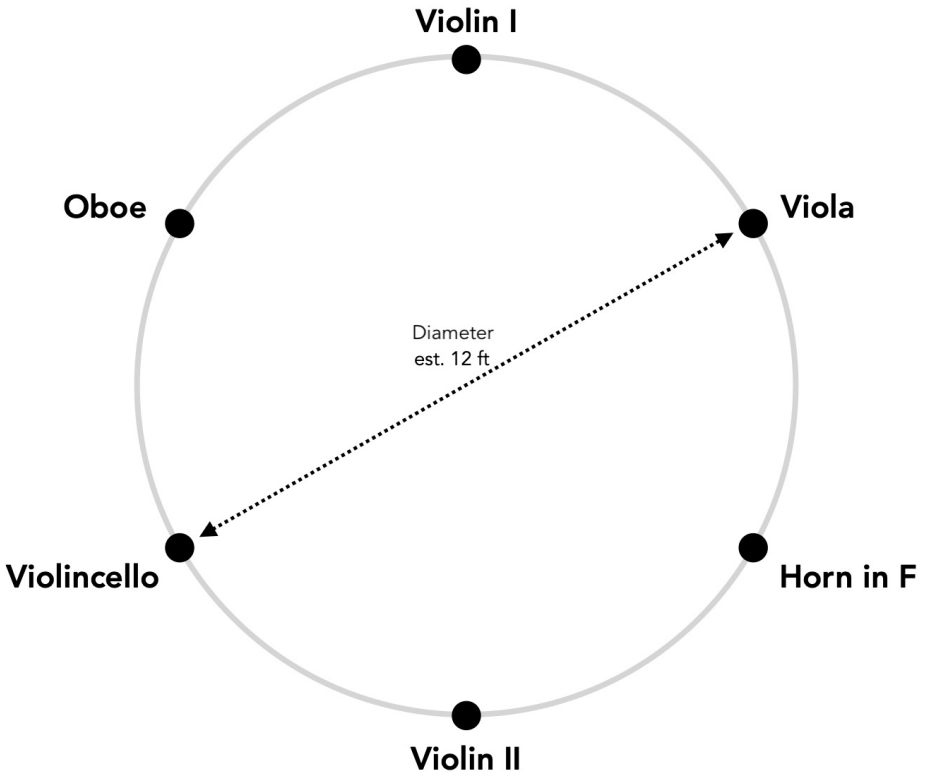
Transposing Score

Instrumentation

Oboe
Horn in F
Violin I
Violin II
Viola
Cello

Performance Notes

Performers are to be positioned in a circular formation with a diametre of 12 ft, preferably facing outwards (although facing inwards would be acceptable) in this order:



Taking its title from the last line of W.H. Auden's poem 'Meiosis', this piece is an exploration of spacial spreading of intervalic structures. The voices gradually divide into two cells of distinct interval patterns which rotate around the voices within, and the cells around the circle of different timbral colours.
— ALEX BARKER

Duration: ca. 5 *minutes* 2 *seconds*

The flood on which all move and wish to move

ALEX BARKER

20
Ob.
Hn.
Vln.I
Vln.II
Vla.
Vc.
pizz
27
arco
pizz.
arco
33
sul pont

40
Ob.
Hn.
Vln.I
Vln.II
Vla.
Vc.
ord.
molto vib.
47
Notes in bass clef sound a fifth lower than written
pizz.
arco
sul pont
(vib. norm.)
54
ord.
molto vib.
vib. norm.

61
Ob.
Hn.
Vln.I
Vln.II
Vla.
Vc.
68
sul pont
ord.
75
pizz.

81
Ob.
Hn.
Vln.I
Vln.II
Vla.
Vc.
arco
sub. mp
87
93

101
Ob.
Hn.
Vln.I
Vln.II
Vla.
Vc.
sul pont
molto vib.
vib. norm.
106
molto vib.
senza vib.

Form gulping after Formlessness

For string quartet

By
ALEX BARKER

The title of this piece comes from a line in the poem 'The Auroras of Autumn' by Wallace Stevens, which inspired my initial idea for the piece. I wanted to relate the idea of the contrast between form and formlessness, between reality and perception, to my research on intervallic atmospheres of the Tone Clock rooted in the equal temperament system. I therefore wanted to explore the equal tempered intervallic atmospheres as reflections of the natural harmonics formed from the harmonic series.
–ALEX BARKER

Performance Notes

- Harmonic glissandi are specified at their first use, then only as a glissando line with a harmonic circle symbol.

- Normal glissandi are always notated with a glissando line and the text: gliss.

= Fall off - quick descending glissando off the given pitch as well as reducing bow pressure to have the note fade away simutaneously.

Duration: *est.* 6 *mins* 50 *seconds*

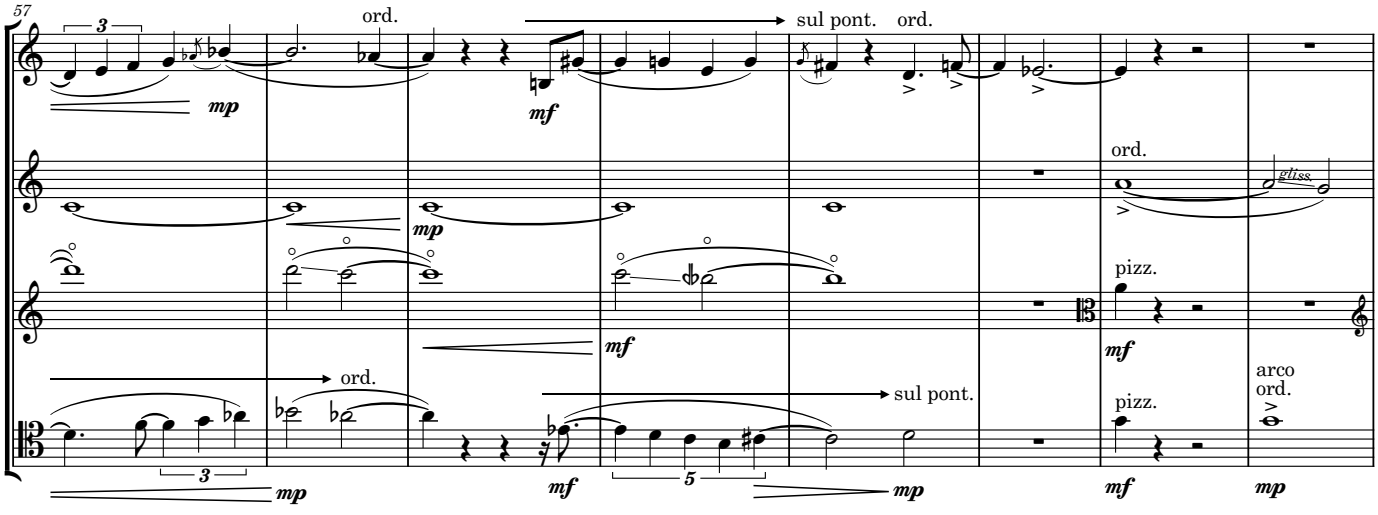
Form gulping after Formlessness

ALEX BARKER

24
Moderato ♩= 110
ord.
poco accel.
a tempo
sul pont.
30
8va
sul pont.
trem. decel.
pizz.
36
(8)
ord.
trem. decel.
ord.
trem. decel.

41
gliss.
molto sul tasto
3
p
fp
arco
molto
sul tasto
pp
molto
sul tasto
pp
pp

48
sul pont.
molto sul tasto
mp
p
sul pont.
molto
sul tasto
gliss.
IV
arco
harm. gliss.
IV
ord.
pizz.
mp
p
mp
molto sul tasto
ord.
mp
p
3
mp
pp


57
3
ord.
sul pont.
ord.
mp
mf
ord.
gliss.
mp
mf
pizz.
ord.
mf
sul pont.
arco
ord.
pizz.
3
mp
mf
5
mp
mf
mp

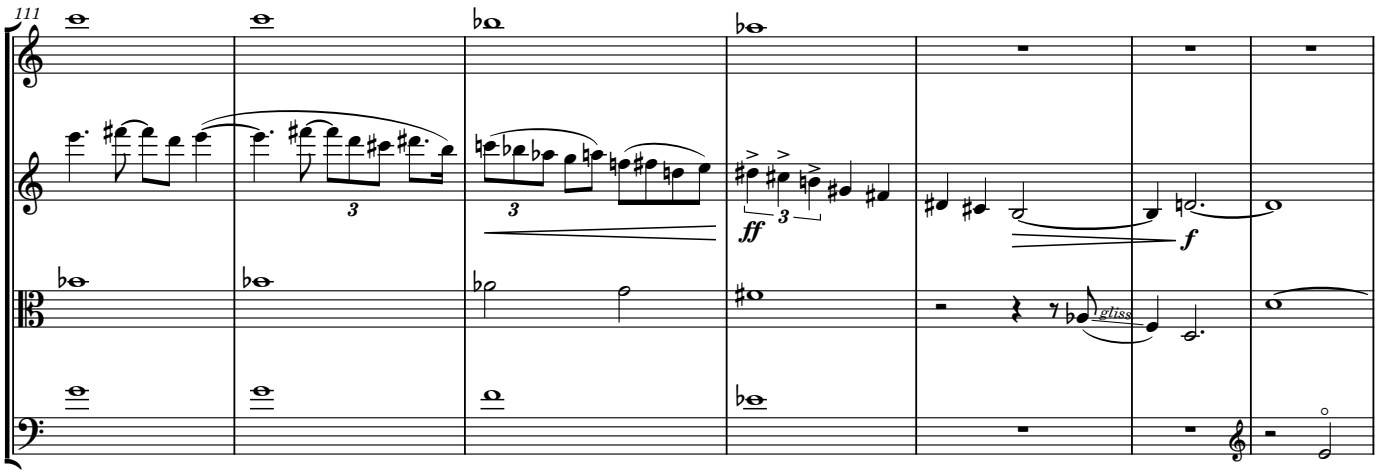
poco rit.
Andante moderato ♩= 90
sul pont.
poco accel.
65
IV
arco
gliss.

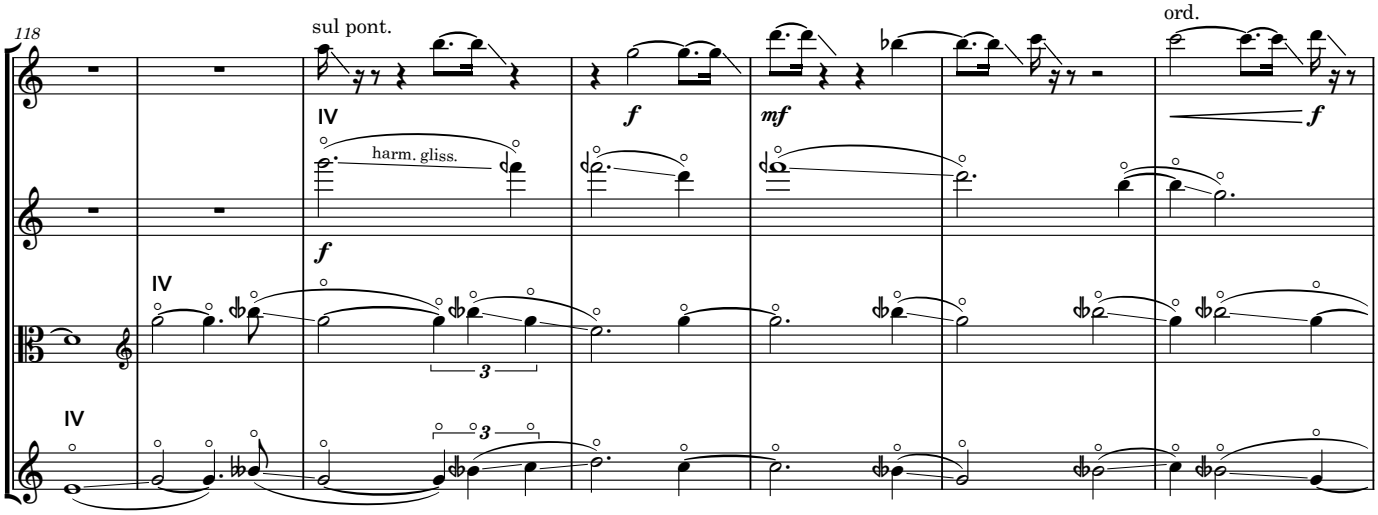
Moderato ♩= 110
ord.
71
gliss.

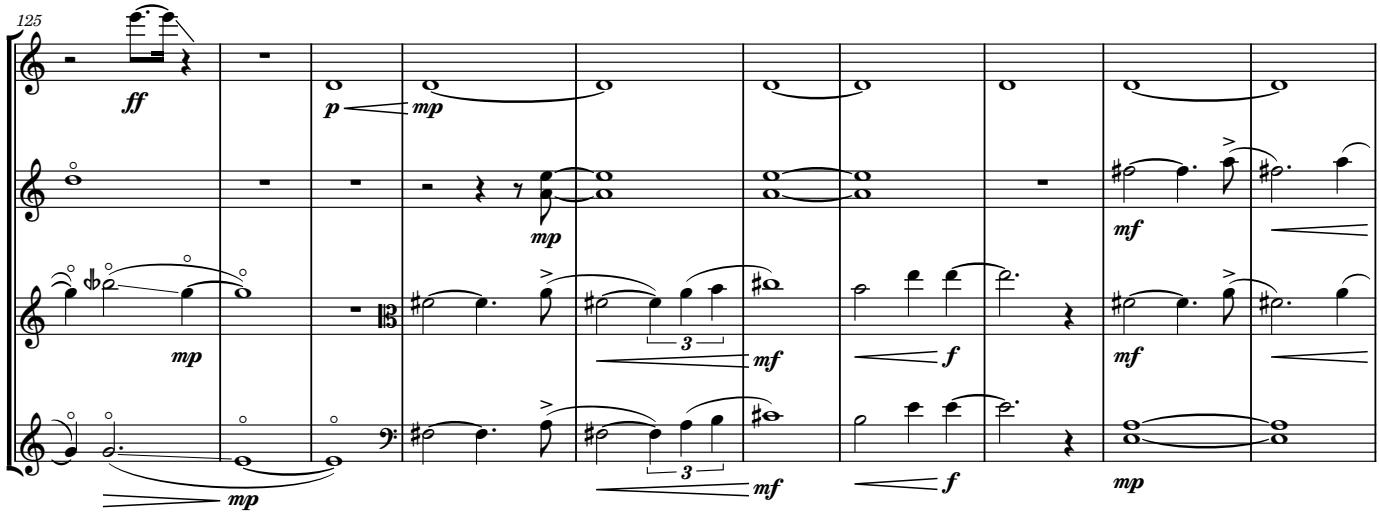
77
sul pont.
sul pont.
trem. decel.
pizz.
arco
trem. decel.
III
8va
IV

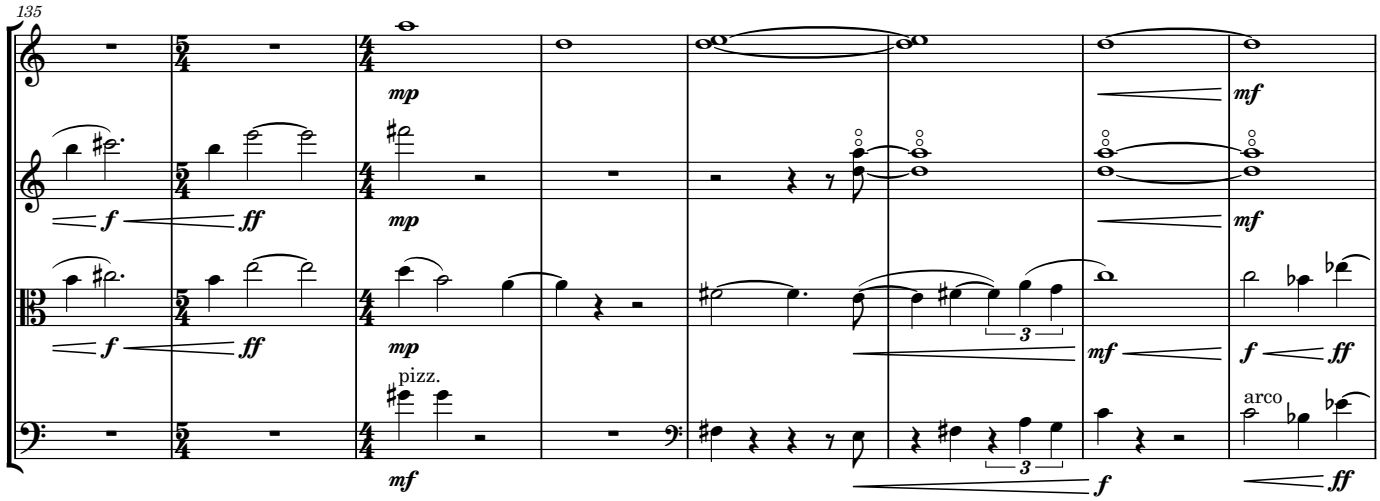
84
ord.
mp
ord.
trem. decel.
gliss.
(8)
pizz.
f
arco
mf
91
IV
harm. gliss.
p
pizz.
arco
98
rit.
Andante ♩= 80
sul pont.
ff
IV

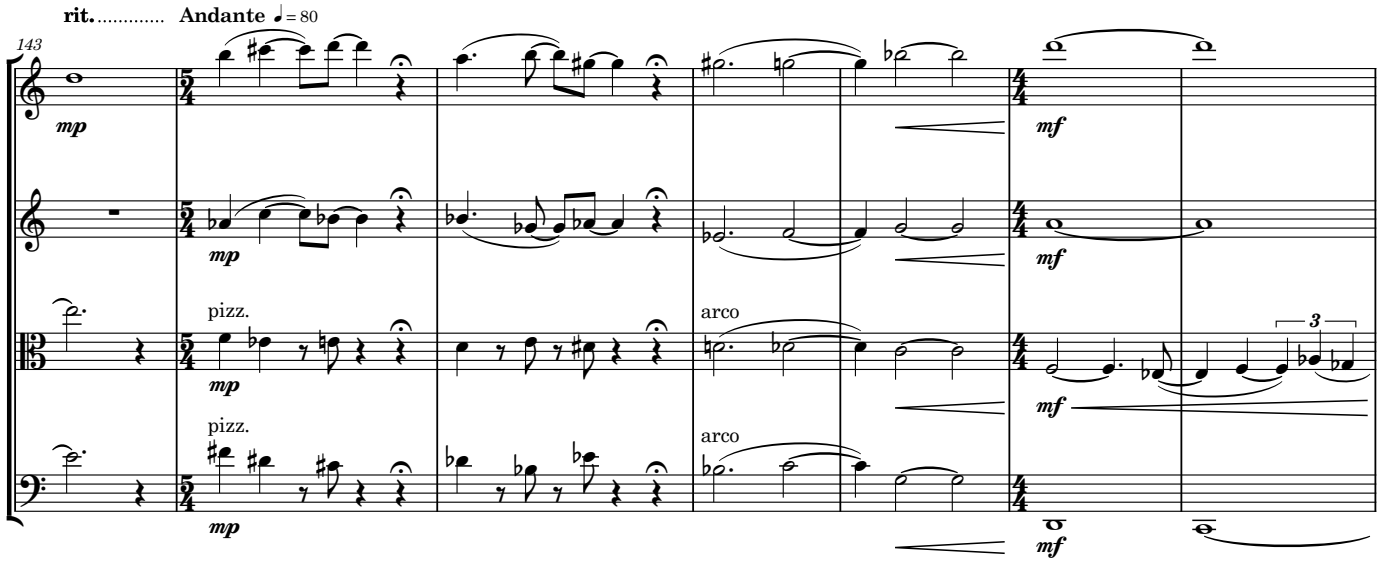
104
accel.
Moderato ♩= 110
ord.
gliss.


111
gliss.

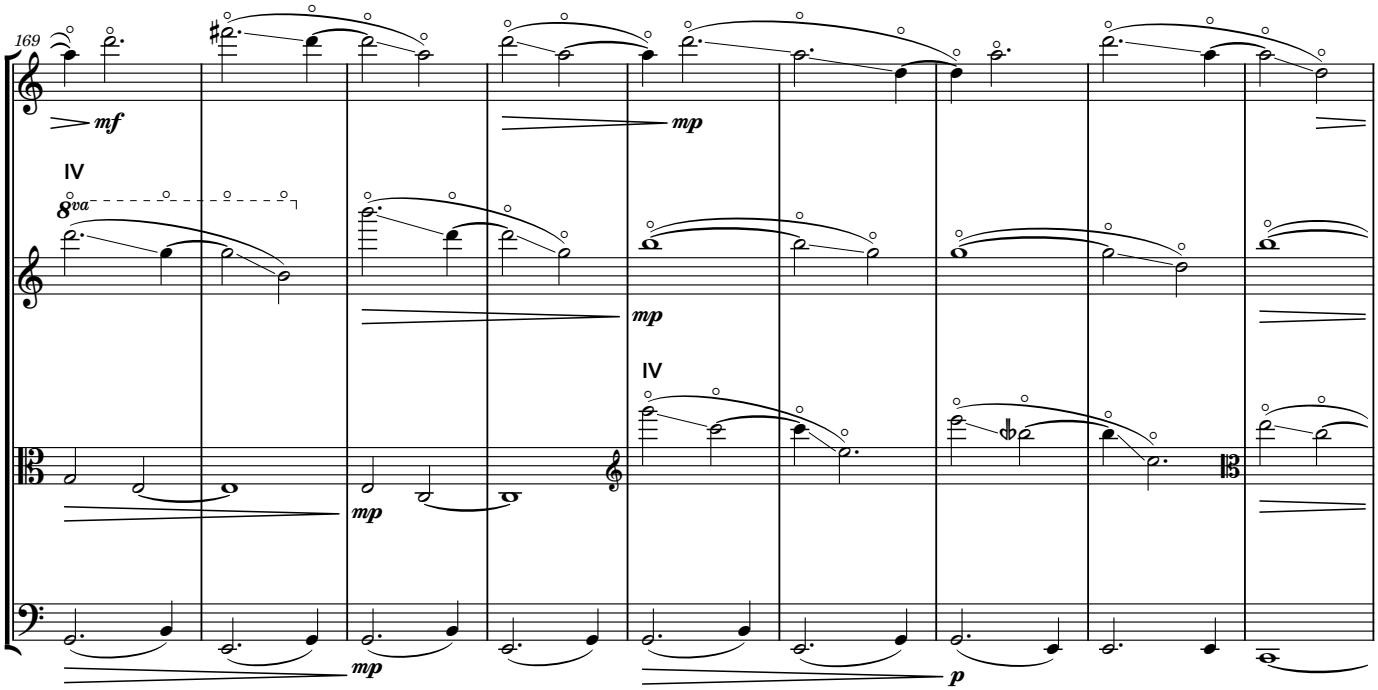

118
sul pont.
ord.
harm. gliss.
IV

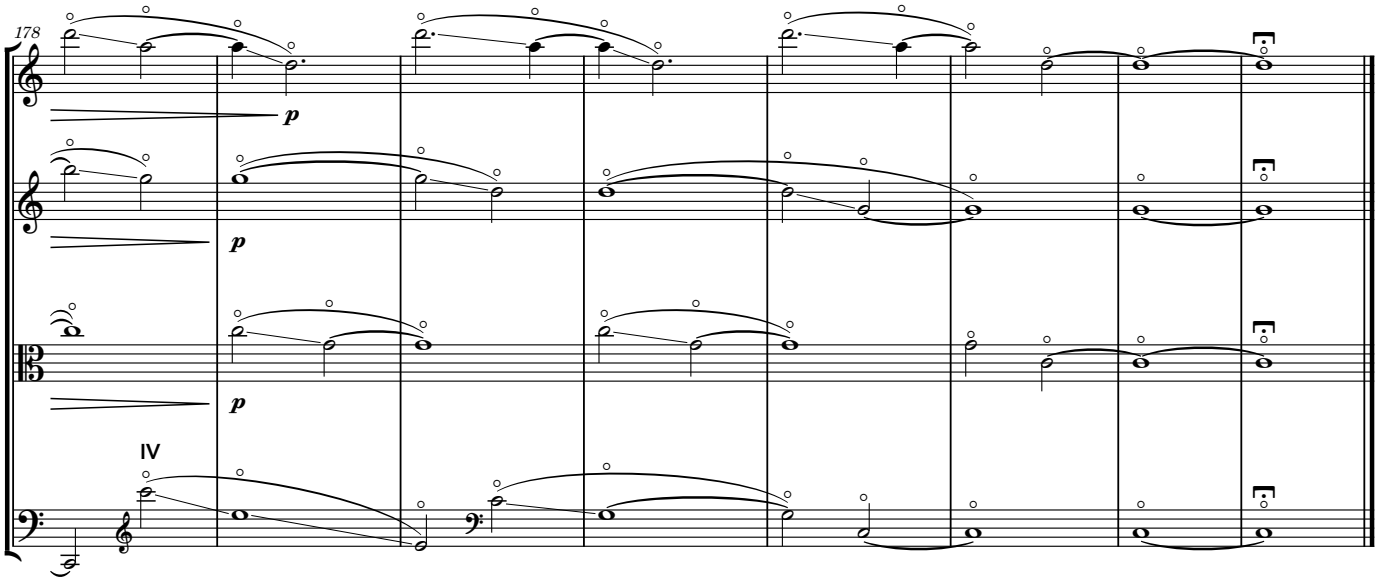

125
ff
p
mp
mf
f
mp


135
mp
mf
f
ff
pizz.
arco


rit.
Andante ♩= 80
143
mp
mf
pizz.
arco

accel.
150
Moderato ♩ = 110
156
161
IV
8va
8va


169
mf
mp
IV
8va
mp
IV
mp
mp
p


178
p
p
p
IV

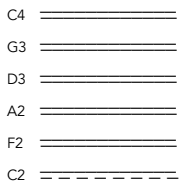
S i k a h

For Arabic 'Ud and Pedal Harp

By
ALEX BARKER

I n s t r u m e n t a t i o n

– Arabic 'Ud - 'Uds (or 'oud') can vary in string number, body size and tuning. This piece is written for Arabic 'Ud which generally has a larger body and mellower more resonant timbre. It has 11-12 strings in six courses tuned to:



– Pedal Harp

Sikah meaning 'three' from the Persian word ‘seh’, is an exploration of two different music worlds—the 12-tones of Western classic music, and the 24-tones of Arabic classical music. Inspired by my learning of the Arabic 'ud, I want to experiment with creating a musical interaction between two different divisions of the octave.
– ALEX BARKER

Duration: ca. 10 *minutes*

Performance Notes

– 'Ud notation:

– Sounds an octave lower than written

= Expressive glissando off the note while also reducing finger pressure to create a decrescendo.

= Hammer-on the grace note at the last possible moment before plicking the next note

– The piece is formed from seven sections of two alternating forms of notation. While these sections contrast in play style and notation, they should be played as one uninterupted piece/performance:

Section Types

– Improvisational

– These sections are non-metrical and make use of performer choice and non-verbal communication to progress through them.

– During these sections each performer will swap between either a supportive or leading role.

– Supportive

The supportive player has breve drones with laissez viber ties which are left to ring over the leading player's improvisation or semi-free signal motif.

– How these drones are played is indicated by wavy arrows or vertical arrows and square brackets.

= Wavy arrows indicate to appegiate the given pitches in the direction of the arrow.

= The square brackets indicate the pitches should be played simultaniously as a unit. The arrow direction shows the order in which to play these units.

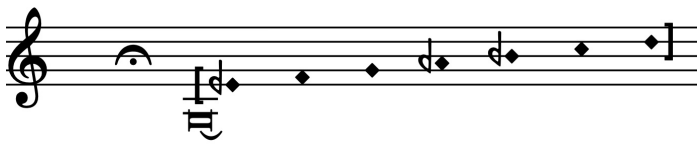
– Leading

– At the start of each improvisational area, the leading player waits for the supportive player to play thier drones before starting. The amount of time the leading player waits before starting is up to them. This is notated with a fermata placed centrally on the stave/s.

– The leading player will have a pool (or mulitple pools in a select order) of pitches from which to use for improvisation, which are notated as cue sized diamond noteheads in square brackets.

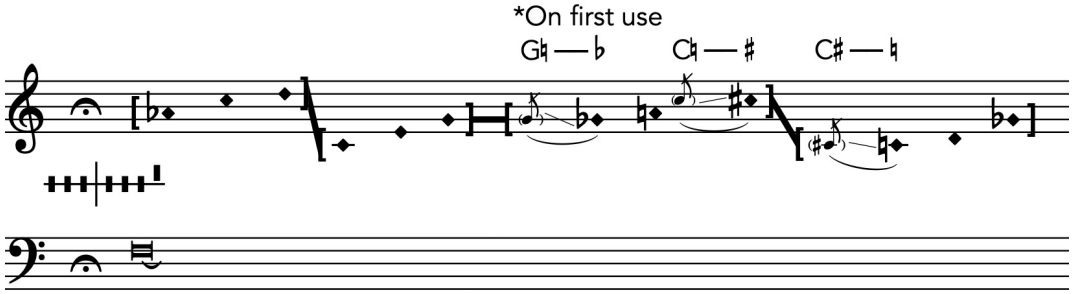
– The leading player also has drones/pedal notes which they can freely articulate while improvising, which are notated as a cue sized breves with laissez viber ties. It is important to note that the improvisational pool of pitches and drones/pedal notes, are NOT restricted to the octave they have been notated as. They can be freely played at any octave.

– Improvisation is completely free and the duration of the improvisation is up to the performer, as long as all pitches within the square brackets are used at least once, an example of one of these passages is below:

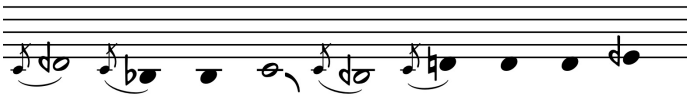


– When the leading player is presented with multiple sets of brackets connected by thick black lines, the brackets are played in order of appearance (left to right). The above points about improvisation still apply to the pool of pitches in brackets:

– When pedal glissandos appear in the harp's improvisational passages, they only apply to the first use, every subsequent use of that pitch in that pool is the new tuning:



– Improvisation is followed by a semi-free signal motif which is used to communicate to the other performer that the piece is progressing and both players are moving on to the next area. These are notated as stemless round noteheads, and are to be played at the octave they are written at. While there is not proper indication of rhythm, the white noteheads should be interpreted as moments of stress, where the performer lingers on or accents the pitch:



– Improvisational sections end with a small phrase repeated three times to esablish the tempo of the prescriptive section that follows. If the player feels they started too fast or slow for the next tempo, they should rit. or accel. within these three repeats. The notation of these bars is the same as the prescriptive sections:

– Presciptive

– Should be read and performed as written.
– These sections begin on pages 3, 7 and 13.

S I K A H

ALEX BARKER

7
'Ud
Hp
*On first use
G♮ — ♭
C♮ — ♯
C♯ — ♮
G♭ — ♮
9
'Ud
Hp
10
'Ud
Hp
F♮ — ♭
11
'Ud
Hp
Repeat 3x to establish tempo

Uneasy
♪ = 190
'Ud
Harp
p
7
mf
Hp
14
mp
Bb — ♮
21
f
C♮ — ♯

26
'Ud
Hp
f
G♯ — ♮
f
G♮ — ♭
33
'Ud
accel.
ff
Hp
ff
G♭ — ♮
G♮ — ♯
38
'Ud
trem. decel.
♪ = 210
mp
Hp
mp
44
'Ud
mf
Hp
mf

'Ud
Harp
3
'Ud
Hp
5
'Ud
Hp

7
'Ud
Hp
9
'Ud
gliss.
Hp
10
'Ud
C♯ — ♮
E♭ — ♮
A♯ — ♮
Hp
11
'Ud
Repeat 3x to establish tempo
Hp

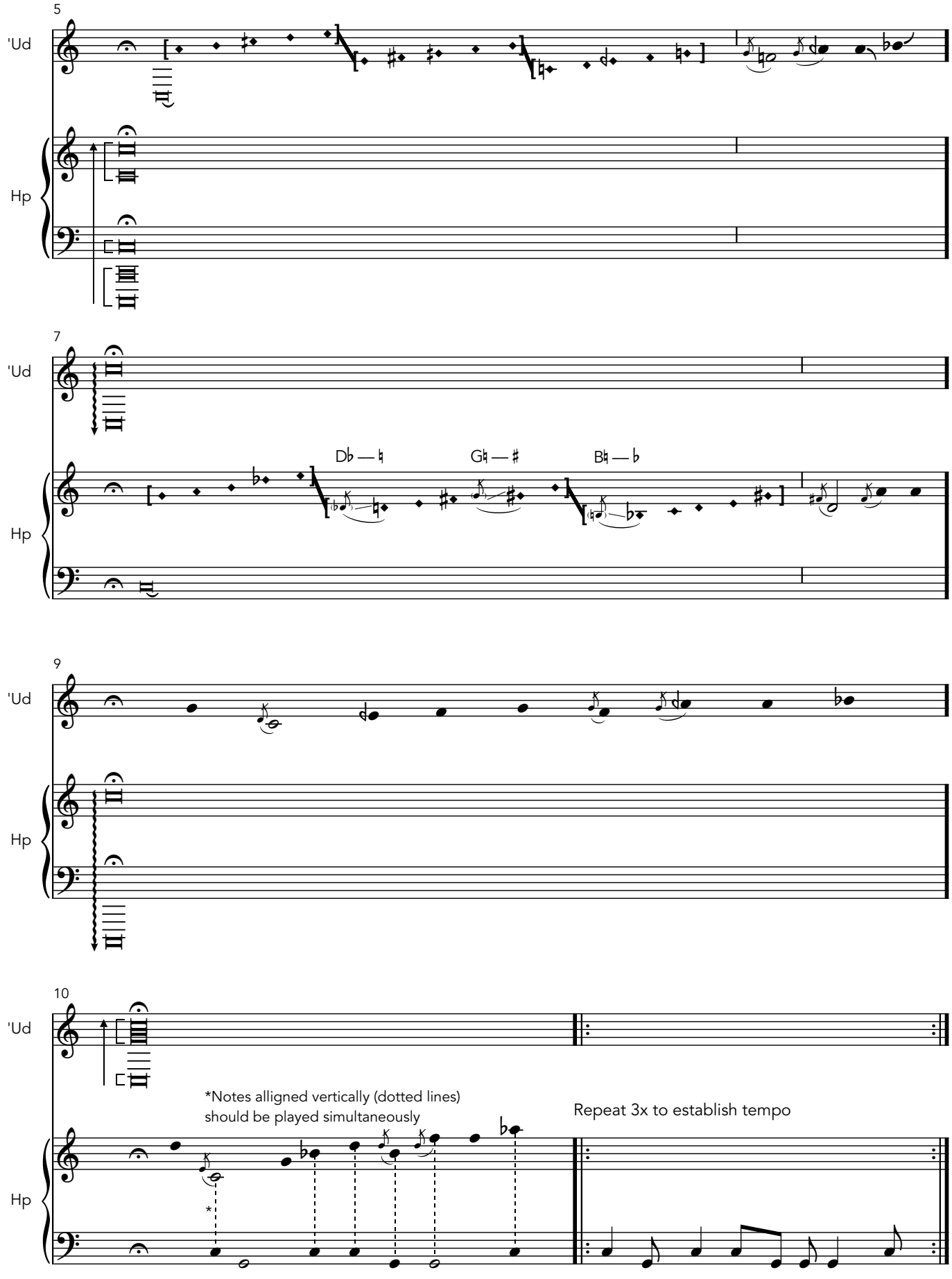
Bright ♪ = 210
'Ud
Harp
mf
p
mf
mf
5
'Ud
Hp
f
9
'Ud
Hp
f
13
'Ud
Hp
mf
sul tasto
B♯
3
3

18
'Ud
Hp
ord.
mf
ff
m.g.
m.d.
ff
mf
23
'Ud
Hp
f
25
'Ud
Hp
mp
mp
F♯ —— ♮
28
'Ud
Hp
G♭ — ♮

31
'Ud
Hp
f
D♮ — ♭
D♭ — ♮
f
Eb — ♮
36
'Ud
Hp
ff
f
D♮ — ♭
D♭ — ♮
ff
42
'Ud
Hp
f
A♮ — ♯
gliss.

46
'Ud
Hp
Bb
48
'Ud
mf
Hp
mp
gliss.
52
rit. ..... ♪ = 190
'Ud
p
Hp
mp

'Ud
Harp
2
'Ud
Hp
3
'Ud
F♯ — ♮
A♮ — ♭
Hp
4
'Ud
Hp


5
'Ud
Hp
7
'Ud
Hp
D♭ — ♮
G♮ — ♯
B♮ — ♭
9
'Ud
Hp
10
'Ud
Hp
*Notes alligned vertically (dotted lines)
should be played simultaneously
Repeat 3x to establish tempo

Resolute
3+4+4
♪ = 190
'Ud
Harp
ff
f
4
'Ud
Hp
7
'Ud
Hp
mf
mf
10
'Ud
Hp
mp
mp

13
'Ud
Hp
mf
f
15
'Ud
Hp
ff
mf
f
18
'Ud
Hp
f
mf
mf
f
mp
13/8
13/8

21
3+3+4+3
'Ud
Hp
p
mf
3+3+4+3
bisbigl.
p
f
24
'Ud
Hp
f
27
'Ud
Hp
mf
p
mf
mf
p

30
'Ud
Hp
pp
mf
p
mp
33
accel.
36
♪ = 210
f
ff
38
fff

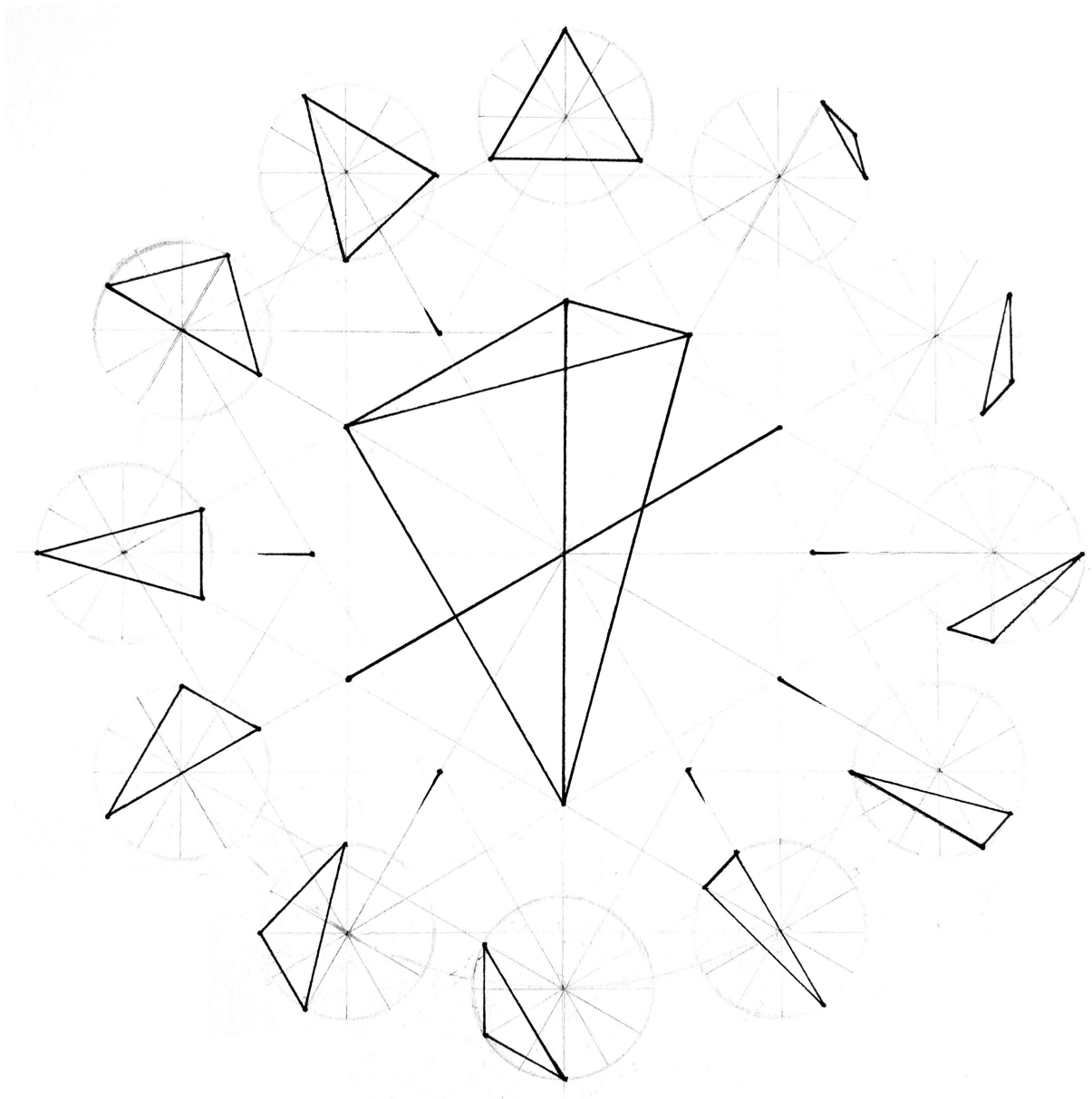
40
'Ud
Hp
fff
ff
43
'Ud
Hp
mf
mf
46
'Ud
Hp
49
'Ud
Hp
f
mf

'Ud
Harp
Ab — ♮ Eb — ♮
3
'Ud
Hp
5
'Ud
Repeat ad lib
Hp
Bb — ♮ F♮ — ♯

Auguries of Innocence

For soprano, 5-string banjo, and cello

By ALEX BARKER

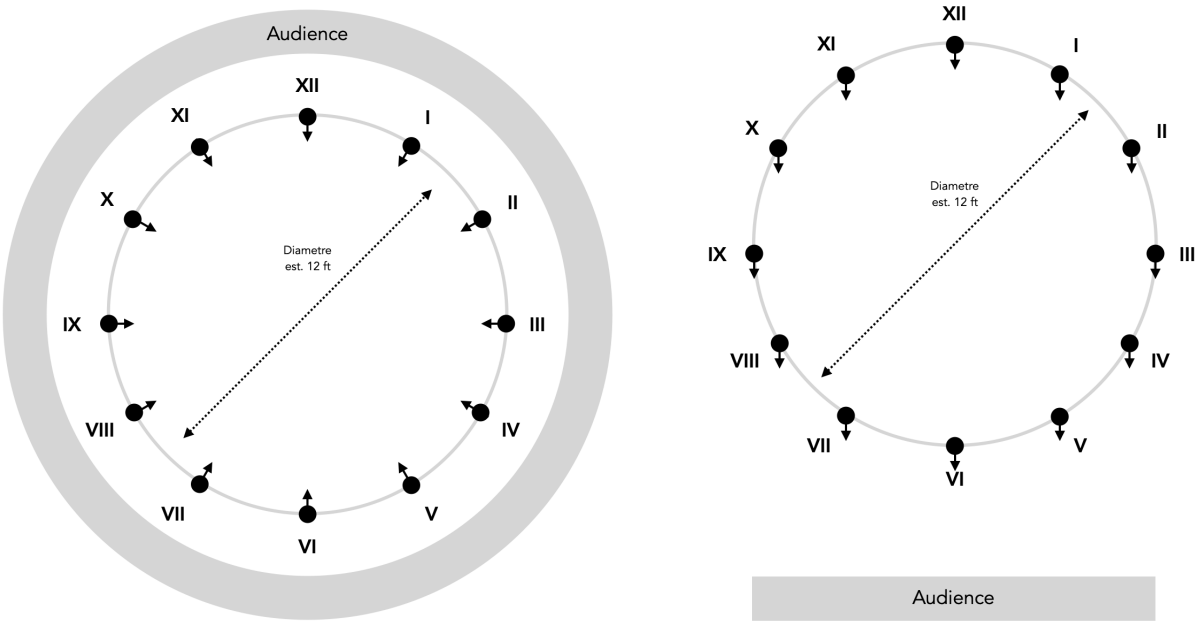


Instrumentation

– Soprano
– 5 String Banjo
– Cello

Performance Notes

– General notes



– The performers have set seating positions for each song. Twelve seats should be positioned in an inward facing circle of a 12ft diameter, and numbered in Roman numerals I-XII. The audience should be placed around the performers circle in a larger circle (above left diagram). When this arrangement is unattainable, and only a standard stage/audience separation is possible, the seats should be placed in the same circle as above on the stage, with the seats facing the audience (above right diagram).

– The performers seating position is governed by the title of the song:

Voice position: $\frac{XI}{\quad}$

Banjo position: $\frac{III}{\quad}$

Cello position: $\frac{\quad}{VI}$

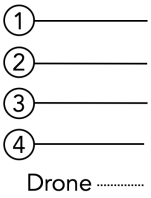
– After each song's conclusion, all the performers should move to their next seating position at the same time, and once settled, the banjo should proceed to retune.

– Instrument specific notes

—— Soprano

– Range:

—— Banjo

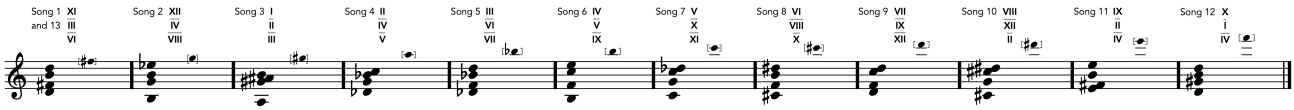


– This piece is written for 5-string banjo—four full length strings, and one shorter drone string (above diagram)—and for the most part is written for clawhammer style playing which traditionally uses an open-backed banjo instead of one with a resonator. While either is acceptable, the open-backed banjo is preferable for its warmer timbre. The upper frets near the banjo head are used, so the neck cannot be scalloped. The base playing position for the banjo, is where the neck meets the pot of the instrument, with the hand over the pot skin.

– Since there is no standard notational conventions for banjo, I have opted to use guitar notations as a starting point. Banjo sounds an octave lower than written.

– Each song requires the banjo to be retuned (scordatura); this should be done after moving positions for the next piece. When the banjo player is ready, the new tuning should be played as a 4-finger brush of the four full length strings followed by plucking the drone string—this is shown as the first bar of each piece. While it is possible to get through a full performance with same strings, the process of retuning so frequently does put stress on the strings, so extras should be brought as a precaution. An extra instrument can be brought to swap to if this happens also.

– The 12 tunings:



– The drone string plays an important role throughout the course of the cycle. Each piece its tuning is raised by a semitone, until it returns to its starting point for the last song. These tunings are not possible to achieve without breaking the string, therefore a 5th string Capo is required. This should be used for Song V—XII where the drone string goes above A.

– Clawhammer playing traditionally is formed from the rhythmic intersection of downstrokes by the back of the plucking hand's index or middle finger nail (or all four fingers nails for brushes) and the drone string plucked by the thumb (which can move down to pluck the other four strings too, called drop-thumbing). The traditional structures which would imply which pitches should be played with a nail downstroke or plucked with the thumb, are not always apparent in these pieces due to not being fully in a traditional style. Therefore I have opted to have specific notation for the drone string, drop-thumbing, different downstrokes as well as deviations from the clawhammer style playing.

– The drone string is always plucked by the thumb and notated as a cue sized bracketed notehead:

– The only exception is when it is joined to a pitch on the 4th string with a square bracket, where it should be played as a nail downstroke (see b. 2 of Song 4).

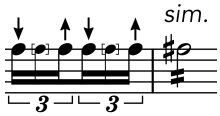
– In addition, the drone string as the name suggest should be left to resonate as much as possible unless otherwise notated with a damping sign.

– Drop-thumbing is always included in the notation. It is notated as an italic p above the note:

– Regular clawhammer nail downstrokes don't have a specific notation but are the basic playing style and are expected where there is an absence of other qualifiers such as drop-thumbing or non-clawhammer notations. If modified versions of the nail downstroke are used, a downward arrow will be placed above the note.

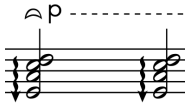
–1-finger brush: When a nail downstroke is brushed (with set rhythms) across multiple strings in one gesture, this will be notated with a downward arrow above the starting note, and a dotted line extending over the subsequent brush notes:

–3-stroke tremolo: This is a sequence of 3 strokes; a nail downstroke, drone string pluck, then a nail upstroke (with the finger that has done the nail downstroke). This should be a smooth and even motion to create a continuous sound. On first use, It is notated with a downwards arrow, a drone string notehead, and then an upwards arrow. After first use, it is notated with tremolo symbols:



–4-finger brush: when three or more strings are played simultaneously as a chord, all four fingers should brush through the strings to then slightly hit the banjo pot skin at the end of the movement. When no other notations are present, this should be done as quickly as possible; when accompanied by a wavy arpeggio line, the brush motion should be slower and emphasised.

–p nail upwards brush: The thumb should be held perpendicular to the strings and strummed upwards with the nail, but allowing the thumb to catch after the nail emphasising harmonics. This is notated with a nail symbol and a p over wavy arpeggio lines:



– p rest stroke: strings should be plucked or brushed with the thumb and land to rest on adjacent strings.

– Flautando: pluck the string at the octave harmonic point (the halfway point of the string from wherever it is fretted).

– Regular plucking of the strings like a guitar, will always be notated with notation of the plucking finger (i, m, a, etc).

– Golpe: percussive technique. Strike the banjo pot skin with the thumb just above the drone string.

– Pizzicato (pizz): while the string is plucked, the fretting hand damps the string just above the fret.

– Touch point damping: while one finger frets a note, after it is struck, another finger very lightly and briefly touches at the bottom end of the fret notated by the circle x noteheads. This creates a harmonic resonance, shown by the harmonic circle over the next rest:

– Touch point slides: after an open string is plucked, a fretting hand finger is very lightly slid from behind the nut, up the string to the fret indicated by the circle x notehead:

– Touch points mutes: when a touch point notehead appears in a chord, a string between the other two notes needs to be muted. The pitch the touch point notehead has is the position it should be muted at:

– Fretting hand pizz: pluck the string with the fretting hand, this is notated with a + symbol with the note.

– Fretting hand finger slap: without a string being plucked, the fretting hand slaps at the notated fret to create a sound. This is notated with a x on the stem of the slapped note, with a written notation at first use.

– Hammer-ons and Pull-offs (legato technique) are always notated with a dotted slur.

– Fretting on drone string is only used once, and is accompanied by a written notation.

– Harmonics: notated at octave lower than sounding pitch with diamond noteheads.
– A fret touch point (roman numeral) will always be given, and a string indication (circled number) is given for single string harmonics:

—— Cello

– In Song 11 (IX–II–IV), there are long periods of playing pizz, as well as strumming of all the string. Therefore for the ease of the player I have notated, with a written instruction, to put the bow down and pick it back at certain points.

– The pizz arpeggios in Song 11 should be strummed in one motion, not individually plucked. Those with square brackets, should be plucked in those groups.

Auguries of Innocence

By WILLIAM BLAKE

XI
III
VI
p.1
To see a World in a Grain of Sand
And a Heaven in a Wild Flower
Hold Infinity in the palm of your hand
And Eternity in an hour

XII
IV
VIII
p.4
A Robin Red breast in a Cage
Puts all Heaven in a Rage
A dove house filld with doves & Pigeons
Shudders Hell thro all its regions
A dog starvd at his Masters Gate
Predicts the ruin of the State
A Horse misusd upon the Road
Calls to Heaven for Human blood
Each outcry of the hunted Hare
A fibre from the Brain does tear
A Skylark wounded in the wing
A Cherubim does cease to sing
The Game Cock clipd & armd for fight
Does the Rising Sun affright
Every Wolfs & Lions howl
Raises from Hell a Human Soul
The wild deer wandring here & there
Keeps the Human Soul from Care

I
II
III
p.10
The Lamb misusd breeds Public strife
And yet forgives the Butchers Knife
The Bat that flits at close of Eve
Has left the Brain that wont Believe
The Owl that calls upon the Night
Speaks the Unbelievers fright
He who shall hurt the little Wren
Shall never be belovd by Men
He who the Ox to wrath has movd
Shall never be by Woman lovd

II
IV
V
p.14
The wanton Boy that kills the Fly
Shall feel the Spiders enmity
He who torments the Chafers sprite
Weaves a Bower in endless Night
The Catterpiller on the Leaf
Repeats to thee thy Mothers grief
Kill not the Moth nor Butterfly
For the Last Judgment draweth nigh

III
VI
VII
p.17
He who shall train the Horse to War
Shall never pass the Polar Bar
The Beggers Dog & Widows Cat
Feed them & thou wilt grow fat
The Gnat that sings his Summers song
Poison gets from Slanders tongue
The poison of the Snake & Newt
Is the sweat of Envys Foot
The Poison of the Honey Bee
Is the Artists Jealousy

IV
V
IX
p.20
The Princes Robes & Beggars Rags
Are Toadstools on the Misers Bags
A truth thats told with bad intent
Beats all the Lies you can invent

V
X
XI
p.23
It is right it should be so
Man was made for Joy & Woe
And when this we rightly know
Thro the World we safely go
Joy & Woe are woven fine
A Clothing for the Soul divine
Under every grief & pine
Runs a joy with silken twine
The Babe is more thsn swadling Bands
Throughout all these Human Lands
Tools were made & Born were hands
Every Farmer Understands

VI
VIII
X
p.27
Every Tear from Every Eye
Becomes a Babe in Eternity
This is caught by Females bright
And returnd to its own delight

VII
IX
XII
p.29
The Bleat the Bark Bellow & Roar
Are Waves that Beat on Heavens Shore
The Babe that weeps the Rod beneath
Writes Revenge in realms of death
The Beggars Rags fluttering in Air
Does to Rags the Heavens tear
The Soldier armd with Sword & Gun
Palsied strikes the Summers Sun
The poor Mans Farthing is worth more
Than all the Gold on Africs Shore
One Mite wrung the Labrers hands
Shall buy & sell the Misers Lands
Or if protected from on high
Does that whole Nation sell & buy

VIII
XII
II
p.37
He who mocks the Infants Faith
Shall be mock'd in Age & Death
He who shall teach the Child to Doubt
The rotting Grave shall neer get out
He who respects the Infants faith
Triumphs over Hell & Death

IX
II
IV
p.40
The Childs Toys & the Old Mans Reasons
Are the Fruits of the Two seasons
The Questioner who sits so sly
Shall never know how to Reply
He who replies to words of Doubt
Doth put the Light of Knowlege out
The Strongest Poison ever known
Came from Caesars Laurel Crown
Nought can deform the Human Race
Like to the Armours iron brace
When Gold & Gems adorn the Plow
To peaceful Arts shall Envy Bow
A Riddle or the Crickets Cry
Is to Doubt a fit Reply
The Emmets Inch & Eagles Mile
Make Lame Philosophy to smile
He who Doubts from what he sees
Will neer Believe do what you Please
If the Sun & Moon should doubt
Theyd immediately Go out

X
I
IV
p.47
To be in a Passion you Good may do
But no Good if a Passion is in you
The Whore & Gambler by the State
Licencd build that Nations Fate
The Harlots cry from Street to Street
Shall weave Old Englands winding Sheet
The Winners Shout the Losers Curse
Dance before dead Englands Hearse

XI
III
VI
p.51
Every Night & every Morn
Some to Misery are Born
Every Morn & every Night
Some are Born to sweet delight
Some are Born to sweet delight
Some are Born to Endless Night
We are led to Believe a Lie
When we see [with] not Thro the Eye
Which was Born in a Night to perish in a Night
When the Soul Slept in Beams of Light
God Appears & God is Light
To those poor Souls who dwell in Night
But does a Human Form Display
To those who Dwell in Realms of day

Inspired by William Blake's poem of the same name, this song cycle presents a unification of the threads I have explored in my *gestalt* appraoch to composing. A multifaceted deep structure network governs the intervallic atmospheres (and their separation between instrumets), the instrumental character of each performer, and also the spatial expression of the music and its interactions.
– ALEX BARKER

Duration: 15 *minutes* 47 *seconds (*full cycle *ca.* 32 *minutes)*

Auguries of Innocence

ALEX BARKER

Song 1 XI III VI

poco rit. ♩ = 92
22
S.
Wild
Flow -
f.h.
finger
slap
Ban.
pp ppp pppp
f mf mp
Vc.
f p mp
30
S.
- - - er
Hold In - fin -
f.h.
sim.
Ban.
mf p p
Vc.
p
poco accel. ♩ = 110
36
S.
- - it - y
in the palm
Ban.
p p
mp mf f
Vc.
mp mf

41
S.
Ban.
Vc.
sim.
ff
fff
p sub.
f
45
of your hand
And E - ter -
mp
mp
mf
mp
mf
53
- - - - ni - ty in an hour
ff
f
fff
59
freely decel. trem.
p
ppp

Song 2 **XII**
IV
VIII

10
S.
Ban.
Vc.
mf
mp
A dove house filld with doves and Pig - eons
f
mf
mp
p
14
S.
Ban.
Vc.
mf
Shudd - ers Hell thro all its reg - ions
f
mp
mf
sul pont.
mp
18
S.
Ban.
Vc.
f
5
A dog starvd at his Mast - ers Gate
i
f
sul tasto
pp
sul pont.
mf sub.
p

22
S.
Ban.
Vc.
mf
mp
Pre - dicts the ru - in of the State
A
pizz.
f
p
ord.
sul tasto
3
pp
26
poco accel.
p
Horse mis - usd u - pon the Road
Calls to Hea - - ven
3
30
= 86
mp
mf
for Hu - man blood
Each out - cry
pizz.
mp
sul pont.
sul tasto
p

poco accel. ♩ = 98
35
S.
Ban.
Vc.
mf
f
ff
of the hunt - ed Hare A fi - bre from the Brain does tear
sul pont.
♩ = 70
40
A Sky - lark wound - ed in the wing
sul tasto
44
A Cher - ub - im does cease to sing
p
pp
sul pont. ord.
sul tasto

48
S.
Ban.
Vc.
f
The Game Cock clipd and armd for fight
i
f
mf
sul pont.
ord.
mp
mf
52
mp
mf
Does the Ri - sing Sun af - fright
p
56
mp
mf
E - v'ry Wolfs and Li - ons howl_
i
p
f
sul tasto
pp

59
S.
Ban.
Vc.
p
Rai - ses from Hell a Hu - man Soul
XII
VII
i
f
sul pont.
ord.
f
p
63
mp
The wild deer, wand - ring here and there
p
pp
sul tasto
pp
3
ppp
67
p
pp
p
Keeps the Hu - - man Soul from Care
V

Song 3 I
II
III

18
S.
Ban.
Vc.
mf
at close of Eve
Has left the Brain that
p
mf
fp
23
mp
wont Be - lieve
The
f
fp
p
27
Owl that calls
up - on the Night
mp
mp

31
S.
Ban.
Vc.
Speaks the Un - be - lei - vers fright
36
He who shall hurt
m i p m i p l.v. sim.
p sub.
sul pont.
39
the lit - - tle Wren
Shall
gliss.
sul tasto

43
mf
S.
ne - ver be be - lovd by Men He
V
④
XII
②
③
①
V
④
Ban.
f
ord.
Vc.
fp
49
ff
p
S.
who the Ox to wrath has movd Shall
i
IV
③
m i p m i p l.v. sim.
Ban.
p sub.
gliss
sul pont.
Vc.
p
ff
p
53
S.
ne - ver be by Wo - man lovd
V
④
XII
②
IV
④
XII
①
VII
④
Fret on
drone string
Ban.
sul tasto
Vc.
pp
ppp

Song 4 II IV V

♩ = 90
mf
Soprano
The want - on Boy
Banjo
mf
Violoncello
mf
5
S.
f
3
that kills the Fly Shall feel the Spi - ders
Ban.
Vc.
poco rit. .....
10
S.
en - mi - ty He who tor - ments the Chaf - ers Sprite
p
i
Ban.
f
Vc.
f

14
♩ = 72
mf
mp
S.
Weaves a Bow - er in end - less Night The Cat - ter -
sul pont.
sul tasto
arpegg. lento
p
i
p
Ban.
mp
Vc.
V.
p
mp
19
mf
S.
- pill - er on the Leaf Re - peats to thee thy Moth -
ord.
arpegg. lento
molto vib.
p
Ban.
p
mp
Vc.
p
mp
23
f
S.
-ers Grief Kill not the Moth nor
(vib. ord.)
Ban.
mf
f
mp
Vc.
p
mf

poco accel. ♩ = 90
28
mp
p
mp
S.
But - ter fly For the Last Judg - ment draw - eth nigh
Ban.
p
Vc.
p
33
S.
Ban.
Vc.

Song 5 III
VI
VII

21
S.
Ban.
Vc.
Feed them and thou wilt grow fat
gliss.
28
The
34
Gnat that sings his Summ - ers song
l.h. finger slap
l.h. sim.
l.h. sim.

40
S.
Ban.
Vc.
mp
Poi - - - son gets from Slan - -
p
3
p
47
f
mp
- ders tongue The poi - - - son of the Snake
3
f
mp
mp
54
f
p
and Newt Is the sweat of En - - vys Foot
i
p
mf
p
mf
p

61
mf
S.
The Poi - - - - - son_ of the
Ban.
mf
Vc.
mf
mp
66
mp
S.
Hon - - - ey___ Bee___ Is the Art - - -
Ban.
mp
p
Vc.
p
71
p
S.
- - ists Jeal - ous - y
Ban.
pp
Vc.
pp

Song 6 **IV**
V
IX

♩ = 70
Soprano
Banjo
Violoncello
The Prin - ces Robes and Beg - gars Rags
6
S.
Ban.
Vc.
Are Toad - stools on the Mis - ers Bags
11
A truth thats told with bad in - - tent

16
S.
Ban.
Vc.
mf
f
Beats all the Lies
pp
mp
f
sul tasto
ord.
pp
mp
mf
21
S.
Ban.
Vc.
mf
mp
p
you can in -
mp
p
pp
sul tasto
p
pp
27
S.
Ban.
Vc.
- - vent
ppp

Song 7 V X XI

♩ = 80
mf
Soprano
It is right it should be
Banjo
p
mf
3
3
p
f
Violoncello
ppp
mf
8
f
S.
so Man was made for Joy and
Ban.
p
3
3
3
Vc.
f
15
ff
S.
Woe And when this we right - ly know
Ban.
p
p
p
p
3
3
3
ff
Vc.
ff

22
S.
Ban.
Vc.
Thro the World we safe - - ly go
29
Joy and Woe are wo - -
36
- ven fine A Cloth - - - ing for

42
S.
Ban.
Vc.
the Soul div - ine Un - - - der
mf
mp
49
e - v'ry grief and pine Runs a joy with silk - -
mp
mf
f
56
-en twine The Babe is more
ff
f
fff

63
S.
than swad - - - ling Bands Through - out all
Ban.
Vc.
70
S.
these Hu - man Lands Tools were made and
Ban.
Vc.
78
S.
Born were hands E - - - - - v'ry
Ban.
Vc.
83
S.
Farm - - - er Un - - der - stands
Ban.
Vc.

Song 8 **VI**
VIII
X

14
S.
Fe - males bright
And re - turnd
Ban.
Vc.
mf
ff
mf
f
mf
18
S.
to its own de - light
Ban.
Vc.
f
ff
p
f
ff

Song 9 **VII**
IX
XII

15
S.
Ban.
Vc.
f
on Hea - - - vens Shore
p
f mf sub.
pizz.
arco
mf
f
20
mf
The Babe that weeps
gliss.
p
pizz.
arco
pizz.
mf
p mp
mf
25
p mp
mf
gliss.
the Rod be - neath Writes Re -
p
arco
pizz.
p mp
p

30
S.
Ban.
Vc.
mp
mf
gliss.
-venge
in
realms
p
arco
pizz.
arco
35
of
death
The
pp
pp sub.
40
Beg - - - gars Rags
flut - ter - ing
in

45
mf
S.
Air
Does
to
Rags
the
Ban.
mf
pizz.
arco
Vc.
mf
50
f
S.
Hea - - - - vens
tear
The
Ban.
f
pizz.
Vc.
f
55
mf
S.
Sol - - - - - dier
armd
with
Ban.
mp
arco
Vc.
mf
mp
60
mp
S.
Sword
and
Gun
Ban.
pp
Vc.

62
S.
Ban.
Vc.
p
mp
Pal - - - - - sied strikes the
ppp
p
pizz.
p
mp
67
mf
p
Sum - - mers Sun The
arco
mf
p sub.
72
mp
poor Mans Farth - - - ing is
mp

77
S.
Ban.
Vc.
mf
f
worth more Than all the Gold on
mp
mf
mf
82
ff
Af - - - - - rics Shore
ff
mf sub.
ff
87
mf
One Mite wrung
p
pizz.
arco
mf
mp
92
p mp
gliss.
from
p
mf
pizz.
arco
pizz.
mf
p
mp
mf

96
S.
Ban.
Vc.
mf
gliss.
the La - - - - - brers hands Shall
p
mf
arco
pizz.
arco
pizz.
101
buy and sell the Mis - -
arco
pizz.
arco
mp
106
- - ers Lands Or if
mp
p
mf
pizz.
arco

111
pp
p
mp
S.
pro - tec ed from on high Does that
Ban.
pp
mp
p
pizz.
arco
pizz.
Vc.
pp
p
mp
116
mf
mp
S.
whole Na - tion sell and buy
Ban.
mf
mp
p
arco
Vc.
mf
mp
121
S.
Ban.
pizz.
Vc.

Song 10 **VIII**
XII
II

17
S.
Ban.
Vc.
mp
He who shall teach
the Child to
mf
p
3
22
Doubt
The rot - ting Grave
sul tasto
27
shall ne - er get out

32
mf
S.
He who re - spects the In - - - fants faith
Ban.
mf
p sub.
pp
Sul G
Vc.
mf
p sub.
pp
38
f
mp
p
S.
Tri - umphs o - ver Hell and Death
i
p
Ban.
mf
mp
p
ord.
sul pont.
Vc.

Song 11 **IX**
II
IV

13
S.
Ban.
Vc.
mp
mf
of the Two sea - - sons
i
The Ques - tion - er
p
3
fff
mp
mf
f
18
who sits so Sly
Shall ne - ver know how
ff
mp sub.
23
to Re - ply
He who re - plies to words of Doubt
pp
Pick bow up
arco

28
S.
Ban.
Vc.
mp
pp
3
Doth put the Light of Know - ledge out
p
Put bow down
pizz.
ppp
p
33
mf
The Strong - est Poi - - - son ev -
fff
mp
p
mf
36
- er known
f
ff
f
ff

39
S.
Ban.
Vc.
Came from Caes - ars Lau - - rel Crown
43
Naught can de - form the Hu - man Race
47
Like to the Ar - - - mours i - - - - -

51
S.
Ban.
Vc.
mp
mf
- - ron brace When Gold and Gems a - dorn the Plow
56
p
To peace - ful Arts shall En -
61
f
mf
f
- vy Bow A Rid - dle or the Crick-ets Cry

66
S.
Is to Doubt a fit Re - - - - ply
mf
Ban.
mf
mp
Vc.
Pick bow up arco
mf
mp
71
S.
The Em - mets Inch and Eag - les Mile Make Lame Phil-
mp
mf
f
mp
Ban.
p
Vc.
f
mp
75
S.
-os - oph - y to smile He who doubts from what he sees Will
f
mf
f
Ban.
Vc.
mf
f

80
S.
Ban.
Vc.
mf
pp
3
ne - - er Be - lieve do what you Please If the Sun and Moon
pp
mp
p
pp
85
S.
Ban.
Vc.
p
mp
3
p
pp
should doubt Theyd im - me - di - ate - ly Go out
3
3
p
ppp

Song 12 $\frac{\mathbf{X}}{\frac{\mathbf{I}}{\mathbf{IV}}}$

17
S.
the State Li - cencd build that Na - tions
Ban.
p
sul pont.
Vc.
mp
mf
23
mp mf
S.
Fate The Har - lots cry from Street
Ban.
mp p mf
ord.
Vc.
p mp
29
mp p
S.
to Street
Ban.
p p
f p
Vc.
pp

34
S.
Ban.
Vc.
Shall weave
Old Eng - lands
wind - ing Sheet
sul tasto
41
The Win - ners Shout
the Los - ers Curse
sul pont.
45
sul tasto

50
S.
Ban.
Vc.
mf
f
mf
Dance be - fore dead Eng - lands Hearse
p
mf
ord.
mp
pp

Song 13 **XI**
III
VI

15
S.
Ban.
Vc.
mp
E - v'ry Morn and
sim.
p
mf
p sub.
18
mf
e - - v'ry Night
Some are
21
Born to sweet
f.h.
finger
slap
f
p

25
S.
de - light
Some are Born
Ban.
Vc.
30
to sweet
de - light
col legno tratto
35
Some are Born
to End - less Night
sim.
arco ord.

39
S.
Ban.
Vc.
p
p
mf
f
pp sub.
ff
43
p
mp
f
We are led to Be - lieve a Lie
sim.
p
pp
p
mp
p
mf
p sub.
mp
50
When we see not Thro the Eye
f
mf

56
S.
Ban.
Vc.
mp
Which was Born
sim.
mf
ff
p sub.
fff
p
mp
61
mf
in a Night
to
p sub.
65
per - - - - - ish
in a Night
When the
f.h.
finger
slap
f
p sub.

69
S.
Soul Slept in Beams of Light
Ban.
Vc.
col legno tratto
75
God Ap - pears
f.h.
finger
slap
arco ord.
79
and God is Light

83
S.
Ban.
Vc.
mp
mf
To those poor Souls
sim.
p sub.
86
who dwell in Night
mf
p
ff
89
ffp

92
S.
Ban.
Vc.
But does a Hu - man Form Dis - play To those who
98
Dwell in Realms of day
freely decel. trem.
pp sub.
ppp
pppp