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**Tonality Re-Framed:
The Tone Clock as Gateway to Expanded Tonality**

A thesis
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Abstract

During the 20th century, developments in musical practice courted controversy by abandoning traditional means of musical organization and expression. A potent response to this trend was the work of Peter Schat in creating the tone clock theory of musical composition, and Jenny McLeod's efforts to develop these ideas in the New Zealand context. However, Schat's claim to have created an 'atonal tonality' is problematic. This thesis uses the tone clock as a tool for generating an expanded form of true tonality. Based upon the common branching groupings of both tonal framing and tone clock steering, the two approaches are combined to create an expanded tonality of emancipated intervals, allowing the population of an expanded musical territory with the expressive possibilities tonality is already known to possess through the work of earlier composers and theorists. The approach, developed using small experiments in composition and analysis, is that the groupings which emerge from the small number of tonal framing motions are easily described by a steering tree, which relates them to the principles of the tone clock. This allows the same basic tonal framings to be transposed into a greater number of interval combinations. This expanded tonality is also demonstrated in multi-voice textures, making use of unconventional chordal sonorities channeled according to the same framing principles.

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*Quel sol che pria d'amor mi scaldò 'l petto,
di bella verità m'avea scoperto,
provando e riprovando, il dolce aspetto;*

Table of Contents

Abstract.....	ii
Acknowledgments	iii
List of Figures.....	vii
List of Tables	x
Introduction.....	1
Literature Review	2
Methods	10
Chapter 1: The Tone Clock in Context.....	16
The New Music.....	16
Serial Thinking and Musical Structure	19
Serial Thinking and Musical Time	21
The New Music and Perceptual Confusion	23
A Diversion into Aesthetics.....	28
A Conclusion, of Sorts.....	31
<i>Intermezzo I</i>	33
Chapter 2: The Tone Clock in Focus	38
The Tone Clock	38
The Hours	38
Steering	40
The Tone Clock and Serialism.....	43
Jenny McLeod and the Tone Clock	44
An Analysis.....	46
<i>Intermezzo II</i>	50
Chapter 3: Tonality in Focus	59
What is Tonality?.....	59
Harmonic Tonality.....	59

Functional Tonality	62
Scalar Tonality	63
Colour Tonality	66
Centrist Tonality	67
Tonality Frames: A General Theory	68
What Tonality is the Tone Clock?	71
Expressive Complications.....	73
A Conclusion and a Proposal.....	73
<i>Intermezzo III</i>	76
Chapter 4: Framing in Focus	84
Tonality Frames and Schenkerian Analysis.....	84
Framing Analyses	94
Absolution chant, <i>Liber Usualis</i> 119	95
Agnus Dei, <i>Liber Usualis</i> 18	97
Kyrie Orbis Factor, <i>Liber Usualis</i> 85	99
Conclusion	101
<i>Intermezzo IV</i>	102
Chapter 5: Steering in Focus.....	109
Steering Freedoms	109
A Problem	117
Framing Analysis Revisited.....	118
Absolution chant, <i>Liber Usualis</i> 119	118
Agnus Dei, <i>Liber Usualis</i> 18	119
Relevance.....	121
Some Stretched Chants	121
Conclusion	128
<i>Intermezzo V</i>	131

Chapter 6: Steering Tree Tonality in Textures	132
An analysis.....	132
Criticisms	137
Chords.....	139
Voice-Leading Tables.....	140
Counterpoint	146
Conclusion	152
Conclusion	154
A Hint of Politics	156
Potential Problems	157
References.....	160
Appendices.....	169
Voice-Leading Table 1	169
Voice-Leading Table 2	184
Voice-Leading Table 3	199

List of Figures

<i>Figure 1: The iterative cyclic web</i>	14
<i>Figure 2: Etude, frame 1</i>	35
<i>Figure 3: Etude, frame 2</i>	36
<i>Figure 4: Etude, frame 3</i>	37
<i>Figure 5: The hour triads</i>	40
<i>Figure 6: The steering of hour I by hour IX (I/X⁴)</i>	41
<i>Figure 7: The steering of hour VIII by hour II (VIII/II⁴)</i>	41
<i>Figure 8: Field A₁</i>	47
<i>Figure 9: Field A₂</i>	48
<i>Figure 10: Field B</i>	48
<i>Figure 11: Field B₁</i>	48
<i>Figure 12: Field C</i>	49
<i>Figure 13: Prelude, frame 1</i>	52
<i>Figure 14: Prelude, frame 2</i>	53
<i>Figure 15: Prelude, frame 3</i>	55
<i>Figure 16: Prelude, frame 4</i>	56
<i>Figure 17: Prelude, frame 5</i>	57
<i>Figure 18: Agnus Dei, Liber Usualis 18</i>	70
<i>Figure 19: Thomson's tonality frame for the Agnus Dei</i>	70
<i>Figure 20: Largo, frame 1</i>	79
<i>Figure 21: Largo, frame 2</i>	80
<i>Figure 22: 8-1 fundamental line</i>	86
<i>Figure 23: 5-1 fundamental line</i>	86
<i>Figure 24: 3-1 fundamental line</i>	86
<i>Figure 25: Arpeggiation</i>	88
<i>Figure 26: Passing notes</i>	88
<i>Figure 27: Neighbour notes</i>	88
<i>Figure 28: Linear progression</i>	88
<i>Figure 29: Unfolding</i>	89
<i>Figure 30: Reaching-over</i>	89
<i>Figure 31: Voice-exchange</i>	89
<i>Figure 32: Krumhansl's cone of pitch hierarchy</i>	91

<i>Figure 33: Absolution chant, Liber Usualis 119</i>	95
<i>Figure 34: Tonality frame of Fig. 33</i>	96
<i>Figure 35: Agnus Dei, Liber Usualis 18</i>	97
<i>Figure 36: Tonality frame of Fig. 35</i>	98
<i>Figure 37: Revised tonality frame for Fig. 35</i>	98
<i>Figure 38: Kyrie Orbis Factor, Liber Usualis 85</i>	99
<i>Figure 39: Tonality frame for Fig. 38</i>	100
<i>Figure 40: VII/IIm⁴</i>	110
<i>Figure 41: Steering inequalities between IIm⁴ and IIM⁴</i>	110
<i>Figure 42: Dyadic groupings</i>	112
<i>Figure 43: Triadic groupings</i>	112
<i>Figure 44: Tetradic groupings</i>	113
<i>Figure 45: Tetradic subgroupings</i>	113
<i>Figure 46: A bunched neighbour grouping</i>	118
<i>Figure 47: A linear progression grouping</i>	118
<i>Figure 48: Tonality frame for the absolution chant, Liber Usualis 119</i>	118
<i>Figure 49: Tonality frame for the Agnus Dei, Liber Usualis 18</i>	119
<i>Figure 50: Stretched tonality frame for the absolution chant</i>	122
<i>Figure 51: Another stretched tonality frame for the absolution chant</i>	125
<i>Figure 52: Stretched tonality frame for the Kyrie Orbis Factor</i>	126
<i>Figure 53: Another stretched tonality frame for the Kyrie Orbis Factor</i>	127
<i>Figure 54: Positions of the structural dyad</i>	129
<i>Figure 55: For a structural dyad of a minor, and a major, third</i>	129
<i>Figure 56: For a structural dyad of a perfect fourth</i>	129
<i>Figure 57: For a structural dyad of a tritone</i>	129
<i>Figure 58: The underlying voices of bb. 17-20</i>	134
<i>Figure 59: Tonality frame, bb. 1-7</i>	135
<i>Figure 60: Tonality frame, bb. 8-20</i>	135
<i>Figure 61: Bb. 17-20, alternate analysis</i>	135
<i>Figure 62: A Bach chorale prelude</i>	136
<i>Figure 63: The alto of the chorale prelude</i>	136
<i>Figure 64: Intervallic scrambling of the steering group</i>	137
<i>Figure 65: Stereotypical C major frame</i>	140
<i>Figure 66: Hour XI triads</i>	141

<i>Figure 67: Cadential motions</i>	143
<i>Figure 68: Acceptable cadential stackings</i>	143
<i>Figure 69: Unacceptable cadential stackings</i>	143
<i>Figure 70: The gymnopédie collection and its IPF</i>	144
<i>Figure 71: The canon collection and IPF</i>	146
<i>Figure 72: Canon IPF chords</i>	147

List of Tables

Table 1: The hours and their steerings	41
Table 2: Conceptions of prolongation and framing compared	93

Introduction

This research is the result of interests which have grown out of many threads of experience. I first encountered Peter Schat's writings on the tone clock theory in 2018, as a first-year undergraduate student. As a New Zealander, the term 'tone clock' had been impressed on me for some time, due to the universal esteem Schat's fellow-traveler Jenny McLeod was held in, here in her home nation. On investigation, the term 'tone clock' impressed me even more. The system struck me as a theoretical model of great simplicity and aesthetic appeal, and it closely matched a compositional approach which I had developed during my later teenage years – a system of ensuring organic unity to a work by constructing it out of motives transposed by each other.

However I was disappointed to discover that the international community of music theorists seemed largely uninterested or unaware of Schat and McLeod's contributions. Was it that their positions on the geographical boundaries of last century's musical world had prevented them from receiving what I thought was their due? Or was the technique's middle-of-the-road aesthetic out-of-step with the times? Regardless, the tone clock and its aesthetic premises resounded strongly with me. While I admired the world of post-tonality and aleatoricism, I felt those methods marginalized important aspects of music, be it expressive control, rhythm or melody. Hence, I felt in many cases they placed limits upon what it was possible to achieve musically. However, my own experiences of reverting to diatonic harmony had been one of constantly looking over my shoulder to see whose music I was inadvertently reconstituting from the history of tonal music submerged in my unconscious. Some way of finding a new sound, free from the weight of so many canonized tropes, seemed a necessity.

During the last two years of my undergraduate degree in 2019-20 I also undertook some study in the philosophy of art and aesthetics of music. This study increased my understanding of how many aspects of musical experience are fundamentally related to the embodied experience of tension and release – the most significant

historical instance being the hierarchical pitch relationships of functional tonality. Since my first encounters with species counterpoint, the idea of using different intervals as the basis for music of greater variety and less cliché had been present in my thinking. I noted this potential harmony based upon ‘exotic’, non-tertial intervals and the tone clock as a system for regulating intervallic variety seemed to match in many ways. A solution could perhaps be found, therefore, in a functional tonality merged with tone clock principles. To find this functional tone clock tonality was both a theoretically interesting topic and one full of compositional potential and seemed a promising direction for my first large-scale research project to explore.

Literature Review

My investigation into the possibility of using the tone clock as a tool to expand the resources available to music unequivocally tonal parallels in some ways the debate around prolongation and aspects of tonal form in non-conventionally tonal or post-tonal music. This debate also serves to delineate some of the outer limits to what may be reasonably labelled tonal music. Therefore in this literature review, I will outline relevant texts on the tone clock, then discuss some theorist’s approaches to the prolongation question.

A definitive starting point for tone clock research is provided by Peter Schat’s book *The Tone Clock*, published in an English translation by Jenny McLeod in 1993.¹ The book consists of a collection of essays written over nearly 30 years, outlining Schat’s gradual approach to the principles of the ‘classic’ tone clock through his earlier experiments with serial procedures – triads, restricted interval colour and the steering principle. Analyses of his own works, including the early serial but triadic First Symphony, Op. 27 (1978) and the operas *Monkey Subdues the White Bone Demon* (1980) and *Symposion* (1989), serve to provide an illustration of the classic tone clock principles of 12-note pitch fields made up of triads steered by tetrads at work, and their application to practical compositional problems.

¹ Peter Schat, *The Tone Clock*, trans. Jenny McLeod (New York, NY; London, UK: Routledge, 1993).

Jenny McLeod's book *Tone Clock Theory Expanded: Chromatic Maps I & II* present her own developments of the tone clock into a total chromatic theory.² There are considerable differences between McLeod's approach and Schat's classic tone clock; no longer limited to triads steered by tetrachords, McLeod exhaustively lists every possible combination of tones within the 12-note chromatic system (an intervallic prime form or IPF) and outlines which other IPFs can be found within them, the steering relationships which result as well as other classifications for each IPF, creating a richly interwoven tapestry of multiple musical taxonomies and techniques.

Further resources were provided by two articles from the journal *Key Notes: Musical Life in the Netherlands* authored by Rokus de Groot responding to Schat's initial announcement of the tone clock theory in the same journal;³ Erik Ibarz's 2015 thesis analysing Schat's work *Genen* includes a comprehensive and elegant outline of the tone clock and its development; it focuses upon creating an analytical framework for tone clock music by expressing the steering principle as a mathematical formula, in a Lewin-style transformational network.⁴ There are also two articles by Michael Norris, published in *CANZONA*, the journal of the New Zealand Composers' Association, from 2006.⁵ The first provides an outline of the tone clock and analyzes a selection of Jenny McLeod's tone clock pieces for piano, while the second offers a mathematical generalization of the theory. Adrian Sheriff builds upon Norris' generalizations to explore the relationship between tone clock pitch structures and South Indian rhythmic practice in a 2017 presentation to the Composers Association of New Zealand.⁶

² Jenny McLeod, *Tone Clock Theory Expanded: Chromatic Maps I & II – A New Guide to the Chromatic System* (Wellington, NZ: Victoria University School of Music Press, 1994).

³ Rokus De Groot, 'The wheels of the tone clock: The musician as clockmaker', *Key Notes* 19, 1984a, 7-17; 'The clockmaker as musician: The tone clock in motion', *Key Notes* 19, 1984b, 18-24.

⁴ Erik Fernandez Ibarz, Peter Schat's Tone Clock: The Steering Function and Pitch-Class Set Transformation in *Genen* (MA Thesis) University of Ottawa School of Music, 2015

⁵ Michael Norris, 'Crystalline aphorisms: Commentary and analysis of Jenny McLeod's tone clock pieces I-VII', *CANZONA* 26/27, 2006a, 74-86; 'Tessellations and enumerations: Generalizing chromatic theories', *CANZONA* 26/47, 2006b, 88-95.

⁶ Adrian Sheriff, "Congruent aspects between approaches to pitch by Jenny McLeod and approaches to rhythm by Karaikudi R. Mani." CANZ Composers Conference 2017, University of Canterbury, 20 April 2017. Powerpoint presentation. <https://sounz.org.nz/resources/21109?locale=en>. Accessed 20 November 2021.

The consensus account of the tone clock generated from these readings can be summarized as follows:

The tone clock is a chromatic tonality based upon the use of **interval colour** to demarcate the formal sections of a musical work. This restriction of interval colour is achieved through a **grouping principle** expressed in Schat's triads and in McLeod's classification of IPFs according to hour group. These groupings are articulated by **steering** – that is, the ability to transpose a particular IPF or hour triad onto every note of another IPF or hour triad. This process can occur at deeper structural levels, as steering groups can themselves be steered. McLeod describes this as akin to the musical life principle and it is agreed to be the single most important aspect of tone clock theory.⁷

De Groot provides a dissenting voice. While asserting the beauty and simplicity of the system, he questions its relevance to musical perception, as the constantly shifting musical surface may blur rather than clarify the divisions created by triad grouping and steering.⁸ The principle of steering also creates ambiguities which work against Schat's stated ideal of equality of all notes; and whether interval colours can really do everything that a 'tonal glue' ought to is questionable. It seems as if Schat is equivocating at times – using the term *tonality* in different senses when the same sense ought to be required. Both of these points will be discussed at length within the later chapters of this thesis.

Baker divides views on the prolongation question into the strict constructionists – those such as Ernst Oster, Adele Katz and Joseph Straus who do not consider as tonal anything which deviates from the rigorous norms established by Schenker – and more liberal theorists who find traces of prolongation and other aspects shadowing conventional tonal form in atonal or post-tonal music. These theorists include Felix Salzer, Roy Travis and Robert Morgan.⁹

⁷ Schat, p. xvi; Norris, 2006a, p. 77; Ibarz, p. 15,

⁸ De Groot, 1984b, pp. 27-28.

⁹ James M. Baker, 'Schenkerian analysis and post tonal music', in *Aspects of Schenkerian Theory*, ed. by David Beach (New Haven, CT: Yale University Press, 1983), 153-186.

These liberal theorists as outlined by Baker can be subdivided into three categories. Firstly, those who regard prolongation as the generator of tonality.¹⁰ This is such that tonality may be defined as “prolonged motion within the framework of a single key-determining progression”¹¹ – or even more broadly, tonal music is music whose motion “unfolds over time a particular tone, interval or chord.”¹² In other words, progressions of a different nature to a conventional *ursatz* can be key-defining and capable of assuming structural significance.¹³ Many of these theorists provide analyses of existing music to justify the claim that, not only is dissonant prolongation possible, but that composers have been doing just this for some time – as the emphasizing and prolongation of unconventional structural elements was typical of much 19th century music – and that just such a prolongation of dissonant sonorities is “one of the outstanding revolutionary techniques of contemporary music.”¹⁴ For example, the introduction to Liszt’s *Faust* Symphony is analysed by Morgan as a prolonged augmented chord.¹⁵ As “it is almost a general principle of musical coherence that those chords which mark the beginning or end of a given procedure of motion tend to serve a more structurally important capacity [...]”,¹⁶ Travis detects similar structures in Stravinsky’s *The Rite of Spring*, where an octave-filling sequence begins and ends with the same sonority in different registers is classified as a prolongation of that sonority, and in pieces from Bartók’s *Mikrokosmos*.

However, many of the analyses of these liberal theorists more often show a conventional triad prolonged by dissonant embellishing chords rather than a true dissonant prolongation.¹⁷ Their approach breaks down as they lack definitive rules for determining musical functions: “no closed system [of functions of varying

¹⁰ Roy Travis, ‘Towards a new concept of tonality?’, *Journal of Music Theory* 3/2, 1959, 257-284; Robert P. Morgan, ‘Dissonant prolongation: Theoretical and compositional precedents’, *Journal of Music Theory* 20/1, 1976, 49-91; Felix Salzer, *Structural Hearing: Tonal Coherence in Music* (New York, NY: Charles Boni, 1952).

¹¹ Salzer, p. 227.

¹² Travis, p. 261.

¹³ Salzer, p. 204.

¹⁴ Salzer, p. 193.

¹⁵ Morgan, p. 60.

¹⁶ Travis, p. 266.

¹⁷ Baker, nd, p. 155.

structural weight] has been disclosed for any system of post-tonal music.”¹⁸ Their claims to tonality also suffer from omitting discussion of whether these theories do in fact have an effective and satisfying criteria for tonality as their basis.

Broadly, these theorists argue that unfolding or prolongation creates structure and structure requires tones to fulfil different functions, hence creating tonality. But it is unclear without further investigation whether all the steps in this argument are in fact the case.

Next in Baker’s system come those who take a less doctrinaire approach to the forms prolongation may take, considering it a broader perceptual function whereby some pitches are retained in a listener’s mind.¹⁹ This form of prolongation is not related necessarily to tonality, as Lerdahl has argued that a theory of this kind is necessary to reflect listeners’ experience of all music, including atonal or post-tonal music. He proposes a generative theory of atonal music, incorporating prolongation and structural hierarchies, to do this.

While this less doctrinaire approach does enable a theorist to approach greater perceptual relevance, instances such as Lerdahl’s theory risk irrelevance to the condition of prolongation. This is because prolongation requires a set of conditions to determine structural hierarchy, something normally determined by the resolution of dissonances. In music which does not discriminate between consonances and dissonances, another determining marker must be found. Lerdahl proposes substituting a scale of ‘salience conditions’ to determine which events are perceived as more structurally important and hence are retained more strongly in a listener’s mind. This, however, causes a lack of clarity regarding the role of structural hierarchies, as mere salience is not enough to determine prolongation and structural hierarchy: “an event hierarchy of salience does not necessarily result in an event hierarchy of stability.”²⁰ Thus, a perceptual retention may not always result in tonal perception.

¹⁸ Baker, p. 168.

¹⁹ Edward R. Pearsall, ‘Harmonic progressions and prolongation in post-tonal music’, *Music Analysis* 10/3, 1991, 345-355; Fred Lerdahl, ‘Atonal prolongational structure’, *Contemporary Music Review* 4/1, 1989, 65-87.

²⁰ Larson, 1997, p. 117.

Lastly according to Baker, there come those who propose that pseudo-tonal remnants of common-practice techniques, such as voice-leading, still remain in post-tonal or atonal music.²¹ These remnants – for instance, the voice-leading patterns of the interval of a tritone – may still retain their discharge quality and show signs of having been deliberately crafted for this effect.²² This perspective emphasizes the complexity of tonality as a phenomenon, implying a significant grey area between the condition of tonality proper and atonality or post-tonality and demonstrating that voice-leading may not form a necessary pre-condition of tonality. Instead, it seems that tonality in this context relates to the presence of a single pitch as a musical center. An example of this type of theory is Joseph Straus’ ‘fuzzy transformations’ whereby a parsimonious voice leading is created by transforming “the greatest number of pitches in one chord [...] onto their correspondents in the next by the same semitonal distance, while the remaining pitches are related by a dissimilar one.”²³ This preserves a tonality-like hierarchy of chord-types, as the nature of the transformation can act as a method for evaluating the relationships between atonal sonorities: those he classifies as *dissonant, unstable* and *compact* and those classed as *consonant, stable* and *even*.²⁴

However, a theory such as Straus’ fuzzy transformations risks perceptual irrelevance, as it deals with transformations upon pitch classes abstracted from their musical embodiment. While other instances of a tonal remnant theory may cultivate a closer link to perception, it is difficult to see how the expressive meaning of a tonal remnant can be maintained in music in an idiom which there is no fixed point in reference to which direction can acquire meaning.²⁵

²¹ Neil Newton, ‘Some aspects of functional harmony in Schoenberg’s early post-tonal music’, *Music Analysis* 33/1, 2018, 1-36; Joseph N. Straus, ‘Voice Leading in Atonal Music’, in *Music Theory in Concept and Practice*, ed. by James Baker, David Beach, and Jonathan Bernard (Rochester, NY: University of Rochester Press, 1997), pp. 237-274; ‘Uniformity, balance, and smoothness in atonal voice leading’, *Music Theory Spectrum* 25, 2003, 305-352; ‘Voice leading in set-class space’, *Journal of Music Theory* 49, 45-108.

²² Newton, p. 2.

²³ Yi-Cheng Daniel Wu, ‘An issue between contemporary theory and modern compositional practice: A study of Joseph Straus’s laws of atonal voice leading and harmony using Webern’s Op. 12/2 and Crawford’s String Quartet mvt. 3’, *Revista Vórtex*, Curitiba, n.2, 2013, 1-29 (p. 4).

²⁴ Straus, 2005, p. 77.

²⁵ Rokus De Groot, 1984a, p. 8.

On the other hand, there are those ‘strict constructionists’ who argue that applying the term ‘prolongation’ to post-tonal music stretches the term beyond all usefulness.²⁶ Their reasoning is that prolongation presupposes conditions which cannot be supplied by post-tonal music – be it the conventional tertial triad as the originating principle of prolongation,²⁷ or the greater importance of other factors which make alternative analyses more convincing.²⁸ For instance, Joseph Straus provides a list of relevant conditions for prolongation as follows:

“Condition #1. The consonance-dissonance condition: A consistent, pitch-defined basis for determining relative structural weight”²⁹ – in other words, criteria of consonance and dissonance.

“Condition #2. The scale-degree condition: A consistent hierarchy of consonant harmonies”³⁰ – that is, a hierarchy must subsist in the relationships between the sonorities themselves.

“Condition #3. The embellishment condition: A consistent set of relationships between tones of lesser and greater structural weight.”³¹

“Condition #4. The harmony/voice leading condition: A clear distinction between the vertical and the horizontal dimensions.”³²

The strict constructionists have been criticized for their emphasis on naturalizing elements of music such as the triad, as well as being limited by a bias towards complete, closed systems of analysis.³³ Their accounts of prolongation are also controversial – as mentioned, many of the liberal theorists would affirm that it is

²⁶ Steve Larson, ‘The problem of prolongation in ‘tonal’ music: Terminology, perception, and expressive meaning’, *Journal of Music Theory* 41/1, 1997, 101-136 (p. 127).

²⁷ Ernst Oster, ‘Re: A new concept of tonality (?)’, *Journal of Music Theory* 4, 1960, 96.

²⁸ Adele T. Katz, *The Challenge to Musical Tradition: A New Concept of Tonality* (New York, NY: Alfred A. Knopf, 1945; New York, NY: Da Capo, 1972).

²⁹ Straus, 1987, p. 2.

³⁰ Straus, 1987, p. 4.

³¹ Straus, 1987, p. 4.

³² Straus, 1987, p. 5.

³³ Baker, nd, p. 155.

prolongation which determines conditions of consonance-dissonance, even in tonal music, as well as the system of hierarchies subsisting between sonorities.³⁴

This debate illustrates some of the complexities faced when attempting, as I will, to combine tonal motions with musical building blocks or sonorities which are not conventionally tonal. As mentioned, most of these which set out to uncover a new, enlarged sense of tonality suffer from omitting discussion of whether they have effective and satisfying criteria for tonality as their basis. Further readings were therefore motivated by an attempt to understand the concept of tonality in general. William Thomson's *Tonality in Music: A General Theory* provided summary accounts of all major theories of tonality, which Thomson divides into five classes:

1. **Harmonic tonality:** This is the tonality created by the succession of chords, such as Rameau's harmonic theories.
2. **Functional tonality:** A form of harmonic tonality characterized by a trinity of contextually-defined chord 'functions' – tonic, dominant, subdominant – associated with the writings of Hugo Riemann.
3. **Scalar tonality:** The tonality created by patterns of attraction between the pitches within a collection, as in Fétis' tonal theory.
4. **Colour tonality:** The description of tonality as consisting of different musical 'tints' within a pitch collection.
5. **Centrist tonality:** Any music which possesses a perceptual centre is centrically tonal.³⁵

Each class of tonality will be outlined in greater depth in Chapter 3 of this thesis, along with Thomson's refutations of each. These focus largely upon the arbitrary restrictiveness of each genera's theoretical criteria and their irrelevance to how music is perceived. He proposes the 'tonality frame' as a more satisfactory account of the phenomenon of tonality. Briefly, a tonality frame is a systematic description of the structural hierarchy created within a collection by what Thomson labels 'framing motions': musical motions which establish the relative strength of pitches. Further background to this theory is provided in several other

³⁴ Larson, 1997, p. 128-9.

³⁵ William Thomson, *Tonality in Music: A General Theory* (San Marino, CA: Everett, 1999).

articles by Thomson.³⁶ These explain the perceptual ‘bunching’ by which certain pitches are framed to be more structural than others. This can be metaphorically compared to the way a higher order of sets of tens emerges from the decimal system. Thomson also attempts an explanation of the mysterious framing motion, contributing factors for which are a pitch’s formal and rhythmic and contoural prominence within a phrase, how often it occurs, and the support it receives from harmonic relationships.³⁷ In spite of this explanation, framing motions remain obscure, particularly their function within a texture of more than one voice. The natural basis which Thomson assumes for his theory is also problematic, as he argues that “the act of hearing imposes a potential vectoring, a congealing tendency upon pitch inputs that channels them into ‘most probable’ structurings.”³⁸ These most probable structurings relate to the model provided by the harmonic series, which is problematic when one considers music that is intuitively tonal, but makes use of microtones or unusual intonation, such as the *slendro* or *pelog* of Indonesian gamelan.³⁹ Simple plagal frames are also problematic, as on this approach the dominant pitch would be reinforced as the tonic, not vice versa, by the stronger fifth relationship compared to the fourth.

Despite this, Thomson’s tonality frames are still more satisfactory than other competing accounts of tonality, his critiques of which justify my acceptance of the tonality frame as the framework with which I conceptualize tonality. The goal of this thesis is thus to attempt to investigate a true tonality of emancipated intervals by exploring the common ground between tone clock principles and Thomson’s tonality frames.

Methods

As stated, the hypothesis around which this thesis is based is that a synthesis between the exotic intervallic groupings of the tone clock and Thomson’s tonality

³⁶ William Thomson, ‘From sounds to music: The contextualizations of pitch’, *Music Perception* 21/3, 2004, 431-456; ‘Pitch frames as melodic archetypes’, *Empirical Musicology Review* 1/2, 2006, 85-102.

³⁷ Thomson, 2006, p. 90.

³⁸ William Thomson, ‘Colloquy’, *Music Theory Spectrum* 24/2, 2002, 307-310 (p. 307).

³⁹ See William P. Malm, *Music Cultures of the Pacific, the Near East and Asia*, 2nd edn (Englewood, NJ: Prentice Hall, 1977), pp. 46-47.

frames has the possibility of forming a true tonality of emancipated intervals. To achieve this end, my interlinked research goals are:

- Firstly, to understand the raw materials: I will attempt to come to an understanding and satisfactory definition of tonality in music, and of the principles of the tone clock.
- Secondly, to synthesis them, demonstrating how music of emancipated intervals can still remain definitively tonal.

In this instance the research output goal is a method and conceptual model of composition, a compositional ‘praxis’, meaning the success of my theorizing will be contingent upon a successful demonstration in practice. As Elliott Eisner notes, “What one needs to research in a situation must be appropriate for the circumstances one addresses and the aims one attempts to achieve.”⁴⁰ Thus, an action-based methodology –

“a form of self-reflective enquiry undertaken by participants [...] in order to improve the rationality and justice of their own practices, their understanding of these practices, and the situations in which the practices are carried out”⁴¹ –

seemed a highly suitable approach to develop this synthesis of principles.

An underlying assumption of this approach is that there is a diversity of forms of knowledge, and therefore, practitioners are in the best position to engage in inquiry about their practice, as they possess privileged insights into what Barbara Bolt refers to as ‘praxical knowledge’.⁴² It is just this kind of praxical knowledge “that arises from our handling of materials and processes” which makes an action-based approach more valuable for me as a composer than a demonstration biased towards either ideas or action.⁴³ It forms what Kemmis and McTaggart call ‘ideas-in-action’: linking theory and practice into a cohesive, meaningful whole.⁴⁴ As Jenny McLeod stated in her own writings on the tone clock, the purpose of a

⁴⁰ Elliott Eisner, ‘Art and knowledge’, in *Handbook of the Arts in Qualitative Research*, ed. by J Gary Knowles and Ardra L. Cole (Thousand Oaks, CA: Sage, 2008), pp. 3-12 (p. 4).

⁴¹ Wilfrid Carr and Stephen Kemmis, *Becoming Critical: Education, Knowledge and Action Research* (London, UK: Routledge, 1986), p. 162.

⁴² Sheri R. Klein, ‘Action Research: Before You Dive In, Read This!’, in *Action Research: Plain and Simple*, ed. by Sheri R. Klein (New York, NY: MacMillan, 2012), pp. 1-20 (p. 3).

⁴³ Bolt, p. 30.

⁴⁴ Stephen Kemmis and Robin McTaggart, *The Action Research Planner* (Waurin Ponds, Vic: Deakin University Press, 1988), p. 93.

composer in learning to know and understand any musical system is necessarily different from that of a pure theorist.⁴⁵ Schön and Argyris note that another advantage of an iterative approach incorporating both theory and practice is that it results in a deeper level of learning.⁴⁶ This is referred to as ‘double-loop learning’, as the accompanying loops of practice, feedback and critique interweave to create a more intensive cognitive experience, necessary to change beliefs and behaviour.

The research process undertaken in this thesis was informed by Smith and Dean’s *research-led practice, practice-led research* paradigm, as this provided a practical methodology to achieve both my theoretical and creative research goals. Smith and Dean helpfully represent this approach in their iterative cyclic web diagram of interacting research methods (Figure 1). An outer circle consists of the stages of practice-related research, while the smaller circles demonstrate the ways any particular stage may involve iteration. At any stage within the cycle, it is possible to revert to earlier stages, as when the selection of an idea instigates a return to the idea generation stage.⁴⁷ At any stage it is also possible to leap across the cycle to any other point, and the cycle is reversible whereby “theories developed through creative practice on the right-hand side of the cycle might be refined and generalised as part of the research process at the left-hand cycle side [...]”⁴⁸

The process I followed began with Smith and Dean’s anti-clockwise *research-led practice*. The stage of my research which described tone clock theory, established a definition for tonality and began conceptually synthesising the two, can be modelled by a move anti-clockwise towards investigating the ideas and relevant theory then onwards towards developing new data or ideas. This section of my research made heavy use of the philosophical method in critiquing the concepts drawn from reading texts. I used this method as the meaning of terms – or the scope of particular senses of a word – were under investigation, and clarifying terms is a vital “symptom of the philosophical” – “to select the right words is to

⁴⁵ McLeod, 1994, p. ix.

⁴⁶ Donald Schön and Chris Argyris, *Theory in Practice: Investigating Professional Effectiveness* (San Francisco, CA: Jossey-Bass, 1974), p. 19.

⁴⁷ Smith and Dean, p. 21.

⁴⁸ Smith and Dean, p. 21.

clarify the meaning and sharpen and refine the ideas being expressed.”⁴⁹ Baggini and Fosl compare a definition to the boundary line of a property:

“it establishes the limits marking those instances to which it is proper to apply a term and those instances to which it is not. The ideal definition permits application of the term to just those cases to which it should apply – and no others.”⁵⁰

This is of vital importance in determining in what instances the description ‘tonal’ should apply.

Each stage of the iterative cyclical web usually involves making selections from iterations, a process Smith and Dean compare to the selective pressures of evolutionary biology.⁵¹ In this instance, the praxical sense of whether something ‘fitted’ or not was a key driving force in this process as my research continued across the web to testing empirically through analysis, and anticlockwise to application in creative work, in this case experiments with simple and otherwise conventional small compositional exercises. I anticipated the requirement for iteration to occur most frequently during this phase of testing and application, as each new analysis or small composition has the potential to generate new problems, which may have required a return to the stage of developing ideas. To that end, the testing stage was carried out as a series of repeated passes through the iterative cyclic web as analyses and compositional experience motivated the development and revision of ideas. These iterations gave ample opportunity to revise, review and develop my concepts based upon the experience of ideas-in-action. This process resulted in the eventual research output of the theory of steering tree tonality outlined in Chapters 4 to 6.

⁴⁹ Estell Jorgensen, ‘On Philosophical Method’, in *MENC Handbook of Research Methodologies* ed. by Richard Cowell (Oxford, UK: Oxford University Press, 2006) pp. 176-198 (p.176-177).

⁵⁰ Julian Baggini and Peter S. Fosl, *The Philosopher’s Toolkit: A Compendium of Philosophical Concepts and Methods*, 2nd edn (Malden, MA: Wiley-Blackwell, 2010), p. 33.

⁵¹ Smith and Dean, p. 22.

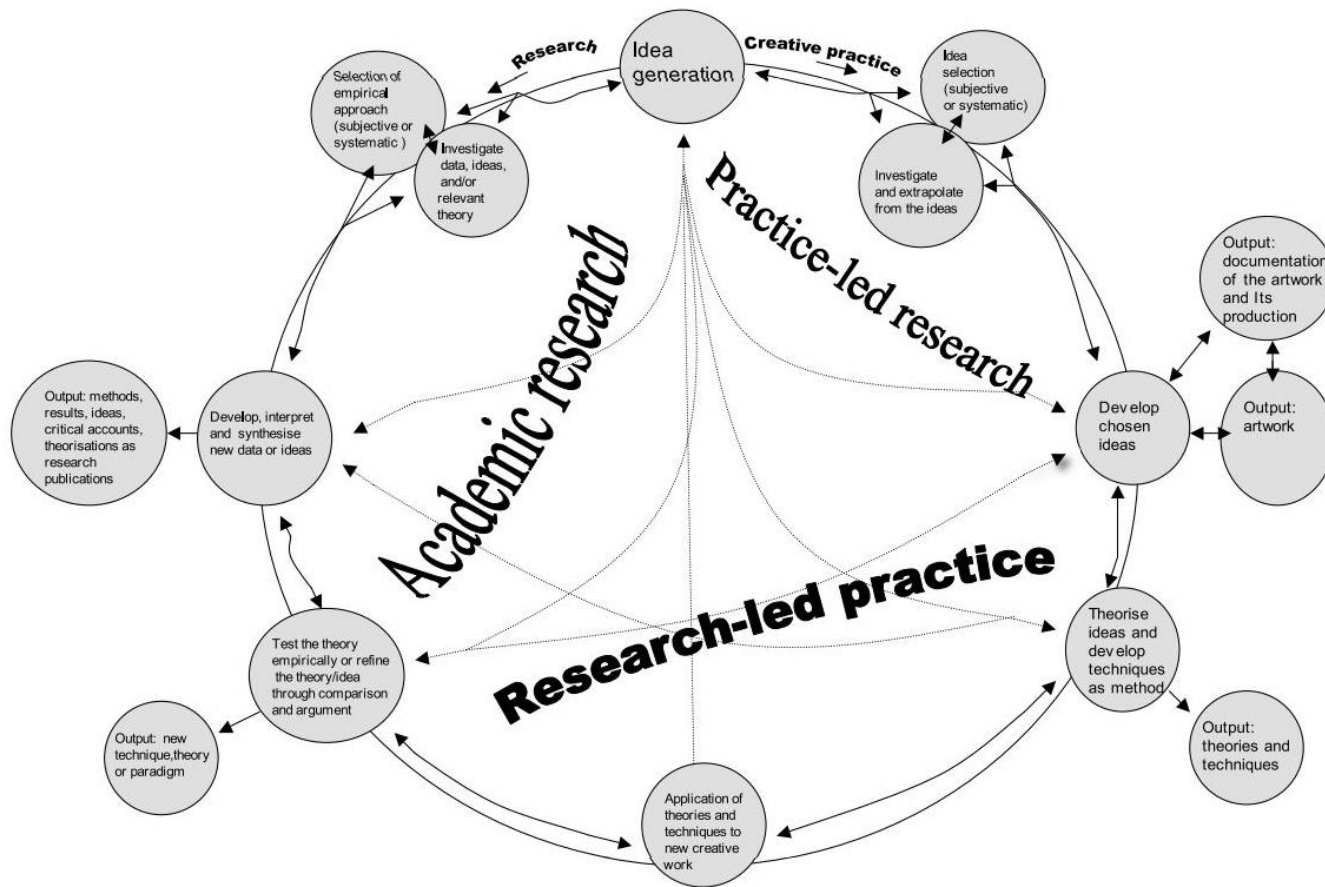


Figure 1: The iterative cyclic web⁵²

⁵² In Smith and Dean, p. 20.

One feature of the form of this thesis that requires explanation is the Intermezzi placed between some chapters. These act as depositories for the compositions through which theoretical ideas were worked out, so that they do not disrupt the body of numbered chapters but can be easily referred to. The placement of each piece reflects the order of their composition but does not necessarily match the section of the thesis to which they have relevance. Some are followed within the intermezzo by their analysis; other analyses with greater relevance have been integrated in the numbered chapters. I recommended referencing the analyses contained in the intermezzi only when the relevant chapters have been read. This will be clearly noted when it occurs.

Chapter 1: The Tone Clock in Context

This chapter aims to provide an account of the historical context which led to the development of tone clock theory. As the development of the tone clock was provoked by Schat's dissatisfaction with the avant-garde music of the 1950s and 1960s, this chapter shall begin by outlining the phenomenon of the New Music.¹ Criticisms of this music will then be considered – Schat's and others – and the relevance of these criticisms will be evaluated in light of some recent trends in the aesthetics of musical expression.

The New Music

While the developments which led to the New Music were complex and many-faceted, its immediate historical context can be seen as a result of post-Wagnerian musical trends. Building upon the achievements of the New German School of Franz Liszt and Richard Wagner, composers such as Alexander Scriabin, Gustav Mahler and Richard Strauss continued pushing the boundaries of expression in all aspects of music. Pitch may serve as a paradigmatic example. Much late-19th-century music follows the Wagnerian paradigm of channeling expression through the forces of tonal attraction at work between melody and harmony. Musicologist Ernst Kurth used the term *absolute effect* to describe the effects of this tendency. Absolute effect was caused by a combination of 1) chord alteration, where a chord note would be displaced from its usual position by a semitone; 2) melodic displacement, where a dissonant neighbour tone would replace a more usual chord tone; 3) chromatic progression, whereby the previously conventional progressions of the bass by leaps of a fourth or fifth came to be replaced by stepwise chromatic movement.² All of these factors “occlude reference to the tonic and obliterate the distinction between chromatic figure and diatonic ground.”³ For Kurth, this was driven by the directional, melodic power of semitones such as the third degree of

¹ The capitalized term “New Music” is here used as an equivalent for Rochberg's “new music” – a label for the avant-garde music of the third quarter of the twentieth century and its numerous stylistic descendants. See, for instance, ‘Indeterminacy in the new music’ in George Rochberg, *The Aesthetics of Survival: A Composer's View of Twentieth-Century Music*, rev. edn (Ann Arbor, MI: University of Michigan Press, 2004), pp. 3-15.

² Quoted in Brian Hyer, ‘Tonality’, in *OMO* <<https://www.oxfordmusiconline-com>> [accessed 17 May 2021], p. 15.

³ Hyer, p. 15.

the major scale rising to the fourth degree. Taruskin concurs, finding a dissolution of conventional harmonic relations between chords which seem to glide into each other, note-by-note, according to this kind of smooth chromatic voice leading.⁴

The dissolution of conventional tonal form this engendered also atomized musical structure, as the new oblique chromaticism could no longer be directed according to conventional tonal relationships. Composer Anton Webern provides a first-person account of working in this new musical environment:

“At first one still landed in the home key at the end, but gradually one went so far that finally there was no longer any feeling that it was necessary really to return to the main key [...] The fact that cadences were shaped ever more richly, that instead of chords of the sub-dominant, dominant and tonic, one increasingly used substitutes for them, and then altered even those – it led to the break-up of tonality [...] “Where has one to go, and does one in fact have to return to the relationships implied by traditional harmony?” – thinking over points like that, we had the feeling “We don’t need these relationships any more, our ear is satisfied without tonality too.”⁵

In such a complex harmonic environment, musical coherence had to turn from a harmonic basis to a melodic basis.⁶ Examples of this were already found in the *Leitmotiven* of Wagner and thematic transformation of Franz Liszt. Arnold Schoenberg formulated his twelve-tone or serial method as a “new procedure in musical construction which seemed fitted to replace those structural differentiations provided formerly by tonal harmonies.”⁷

Social pressures also determined that a backwards-looking art seemed

⁴ Richard Taruskin, *The Oxford History of Western Music*, 5 vols. (New York, NY: 2010), IV, p. 17.

⁵ Anton Webern, ‘The Path to Twelve-Note Composition’, in *Modernism and Music: An Anthology of Sources*, ed. by Daniel Albright (Chicago, IL: University of Chicago Press, 2004), pp. 292-213 (p. 206).

⁶ Hyer, p. 15.

⁷ Arnold Schoenberg, ‘Composition with Twelve Tones’, in *Modernism and Music: An Anthology of Sources*, ed. by Daniel Albright (Chicago, IL: University of Chicago Press, 2004), pp. 194-201 (p. 198).

unacceptable. In the early 20th century, this seemed to be necessitated related by the speed of progress in the fields of science and technology. In the words of Edgard Varese,

“At a time when the very newness of the mechanism of life is forcing our activities and our forms of human association to break with the traditions and the methods of the past in the effort to adapt themselves to circumstances, the urgent choices which we have to make are concerned not with the past but with the future. We cannot, even if we would, live much longer by tradition. The world is changing, and we change with it. The more we allow our minds the romantic luxury of treasuring the past in memory, the less able we become to face the future and to determine the new values which can be created in it.”⁸

This search for new values was given ever greater urgency by the paradigm-shifting events of two world wars and the onset of the atomic age. If it had been the traditional values of the past that led to Hiroshima and Auschwitz, then it seemed unconscionable not to seek a fresh start with new values. The break with the past represented by Schoenberg’s system of serializing musical pitch provided exactly the kind of aesthetic tabula rasa the generation of young European composers affected by the second world war – Pierre Boulez, Karlheinz Stockhausen, Luigi Nono – felt was necessary.

First, however, every suggestion of the past had to be removed from the serial method. Boulez declared the music of Schoenberg and Berg unsatisfactory – “a stream of infuriating clichés and formidable stereotypes redolent of the most wearily ostentatious romanticism”⁹ – because it maintained a parasitic relationship with the forms and expressive language of the past rather than embracing the full ramifications of serial technique. They demonstrated an “inability to envisage the world of sound brought into being by serialism.”¹⁰ Instead, the serial technique had to be considered on its own terms as the single, unifying principle of musical

⁸ Edgard Varese, ‘New Instruments and New Music’, in *Modernism and Music: An Anthology of Sources*, ed. by Daniel Albright (Chicago, IL: University of Chicago Press, 2004), pp. 185-187 (p. 185).

⁹ Pierre Boulez, ‘Schoenberg is Dead’, in *Stocktakings from an Apprenticeship*, trans. Stephen Walsh (Oxford, UK: Clarendon, 1991), pp. 209-214 (pp. 212-213).

¹⁰ Boulez, p. 212.

organization. Series were now applied to duration and timbre, and the style which emerged – ‘total serialism’ – encapsulated all aspects of the New Music.

Serial Thinking and Musical Structure

Italian musicologist Enrico Fubini characterized the aesthetics of the New Music in four central and interrelated concepts:

1. The New Music was made by “listening in” to the sounds, rather than imposing on them.
2. Composers attempted to work inclusively, without considering the scale of values which had accrued to the materials of music historically.
3. The New Music denied all links to language or linguistic analogies.
4. All scales of value were considered irrelevant.¹¹

Markus Bandur interprets this aesthetic stance as constituting ‘serial thinking’.

This serial thinking can be described as creating artificial forms based on a special relationship between uniqueness and similarity, focusing on avoiding repetition and aiming for completeness.¹² This relationship is expressed as the systematic presentation of elements, related by a pre-determined, pre-compositional system, but emphasizing diversity (the ‘moment of identity’) in their presentation.¹³

Furthermore, these pre-compositional systems determine not only a single parameter – pitch, duration, timbre – but the relationships between ontological parameters as well, such as the range of perceivable values between music and noise, or between different cultures.¹⁴ Thus, “the abstract principles of serial thinking logically resulted in a system of integration which made it possible to see cultural styles and methods of performance as a central part of musical substance [...] Integration [...] allowed working with heterogenous musical material of all kinds.”¹⁵ An example of this is Stockhausen’s World Music of pieces such as *Hymnen*, where the principle of integration is applied to different styles.¹⁶

Aleatoricism, far from being an entirely different path to serialism, can be seen as

¹¹ Enrico Fubini, *The History of Music Aesthetics*, trans. Michael Hatwell (London, UK: Macmillan, 1990), p. 511.

¹² Markus Bandur, *The Aesthetics of Total Serialism: Contemporary Research from Music and Architecture* (Basel: Birkhäuser, 2001), p. 7.

¹³ Bandur, p. 55.

¹⁴ Bandur, p. 62.

¹⁵ Bandur, p. 49.

¹⁶ Bandur, p. 73.

merely an outgrowth of serial thinking as both rely upon dividing parameters into sets of discrete elements – the series or gamut – which is then ordered.¹⁷ The only difference is how this order is achieved – by chance processes in aleatoricism, and through composerly judgement or numerical processes in serialism.

Bandur also conceives that human perception is fundamental to serial art.¹⁸ As the scale or gamut into which the material is constituted and then serialized, randomly or otherwise, is based upon the limits of perception, The steps which constitute this scale cannot be too small or too large, otherwise they cannot be perceived by the listener. “As a consequence serialism is changing the idea of music into a systematic and broad concept of sound perception tending to integrate all acoustic events, all modes of aural human perception, and all audible phenomena.”¹⁹

Spectralism, like aleatoricism, can also be seen as an outgrowth of basic serial thinking and its approach to managing the relationship between different musical parameters – for example timbre, pitch, rhythm – as part of a single whole.²⁰ In this way, serialism also opens the way to a unified theory of the arts, based upon the idea of the human capabilities of sensual perception, as all perceptual modalities can be treated in the same way.²¹ This results in art of such complexity that “conventional forms of organization in arts – quite apart from the concentration of the capability for depicting or the question of content” – must be judged as too simple” in comparison.²²

Composer George Rochberg noted the significant implications for musical structure caused by serial thinking. Due to the liberation of the sound material from the limits and connections of prior musical thinking – such as melodic and harmonic links – the sound material enjoyed an autonomy never before accorded it.²³ This permitted the sound material to create its own context as a collection of concrete, quantitative entities in themselves rather than be shaped by a pre-

¹⁷ Bandur, p. 47.

¹⁸ Bandur, p. 61.

¹⁹ Bandur, p. 64.

²⁰ Bandur, p. 47.

²¹ Bandur, p. 6.

²² Bandur, p. 51.

²³ George Rochberg, *The Aesthetics of Survival: A Composer's View of Twentieth-Century Music*, rev. edn (Ann Arbor, MI: University of Michigan Press, 2004), p. 19.

existing musical context. Rochberg traces this trend to atonality's consequences for pitch and chord construction, and a growing preoccupation with timbre as chords of a higher cardinality became tonally overloaded and closer to timbral colours in themselves. Beginning with Schoenberg's *Klangfarbenmelodie*, this led through pointillism and electronics to "the realm of free potentiality".²⁴

Serial Thinking and Musical Time

The new kinds of musical structure described by Rochberg had great significance relating to the treatment of musical time and motion, as the projection of sound as an object requires the suppression of pulse.²⁵ This radically affects the perception of time in music and means the musical discourse must partake of discontinuous motion.²⁶ Rochberg labels the unifying force behind this new treatment of time as the *spatialization* of music as "the sound substance forms itself as the primary object of perception, its motion secondary, contingent on the structure of the sounding forms themselves."²⁷ This means "time as duration becomes a dimension of musical space."²⁸ For Rochberg, this is the defining characteristic of the New Music: "It is in the tendency toward the spatialization of music that the larger purpose of the chief developments of this century reveals itself."²⁹ This spatialization of music constitutes a break between the older *time-space* music, which generated dynamic architectural forms in a continuous discourse, and newer *space-time* music, which generated forms in which spatial projection, freed from periodicity, created a time structure outside of beat and metre.³⁰

Likewise, for Enrico Fubini the aesthetics of the New Music had greatest significance as a re-alignment of musical values relating to the treatment of musical time. An analogy from Nietzsche may be useful as a demonstration. For most of its history, western music has conceived of time as something "frozen and immobilized" within its formal structure.³¹ This is Nietzsche's Apollonian: time is

²⁴ Rochberg, p. 19.

²⁵ Rochberg, p. 20.

²⁶ Rochberg, p. 20.

²⁷ Rochberg, p. 23.

²⁸ Rochberg, p. 24.

²⁹ Rochberg, p. 21.

³⁰ Rochberg, p. 107.

³¹ Fubini, p. 505.

not experienced immediately but processed into a structure through the creation of images. For Fubini, the New Music attempted something closer to the opposite, the Dionisiac: time was now a succession of moments or instants, each with its own life and value, and not forced into any relation with the surrounding moments.³² The music now exists ‘in time’, as it were, rather than creating its own time. Fubini first detects this new musical time in the works of Debussy, one of Boulez’ musical ‘father figures’: “we can glimpse the beginnings of a new type of musical argument, the first attempts to portray music as other than an ongoing linear discourse [...] we see the simultaneous presence of different time-flows [...]”³³ In Bartolotto’s words,

“the aim of modern composers is quite certainly that of eliminating the particular vision of time that had been set up in European music during the seventeenth, eighteenth and nineteenth centuries, the highest expression of which was found in Beethoven [...] Music now places itself at time’s disposal, as it were; it allows itself to run on, it lives and it observes itself as it lives.”³⁴

George Rochberg restates this Apollonian/Dionysian shift in terms of Wyndham Lewis’ Subjective Man, the lover of time, back to the Classical Man of Ancient Greece, the occupier of Pure Present with no sense of time.³⁵ In other words, it represented a shift towards viewing time as Being rather than time as Becoming.

The new vision of time, for musicologist Giselle Brélè, was a liberation which allowed reality to break free from the stultifying structural clichés it had been forced into by Classical Rationalism.³⁶ As a consequence, time in the new music became a point where the distinction between art and life was irrelevant, as “all distinction between the musician and the music vanishes. The sound material is revealed to the composer (or the listener) without having been encapsulated in form, with no note-length or volume or timbre or pitch having dominance over any other. The composer (or listener) becomes a passive receiver, but in his very

³² Fubini, p. 506.

³³ Fubini, p. 506.

³⁴ Mario Bartolotto, *Fase Seconda* (Turin: Einaudi, 1969), p. 21. Quoted in Fubini, p. 506-507.

³⁵ Wyndham Lewis, *Time and the Western Man* (Boston, MA: Beacon, 1957).

³⁶ Quoted in Fubini, p. 507.

passivity he regains an absolute freedom.”³⁷ Rochberg, early in his career, echoed these sentiments when he stated this new vision of musical time and motion “opened up to exploration uncharted, infinitely expanding areas of new sensations and qualities, to have discovered, invented, or both, viable new relationships and forms.”³⁸ However, after a personal and artistic crisis following the death of his son in 1964, Rochberg turned away from serial composition as inadequate. Rochberg’s criticisms will be compared with those of the Dutch composer Peter Schat in the following sections.

The New Music and Perceptual Confusion

Rochberg, basing his criticisms upon John Von Neumann’s book *The Computer and the Brain*, noted certain perceptual patterns underpin how the human mind works.³⁹ The human nervous system and brain unify a *parallel* system – a system of more parts, functioning more slowly, but picking up more information at a single time – and a *serial* system composed of fewer, more powerful parts picking up information successively.⁴⁰ For Rochberg, music had historically mirrored this unification of parallel and serial functionings, embodied in coexistence of vertical and horizontal dimensions such as the melody-harmony split. Human perception is also better suited for making sense of structures with a high degree of self-perpetuation, or internal, structural repetition of parts. Rochberg claimed it may be this relationship to the nervous system which gives music expressive power and the status of a pseudo-language. Following Von Neumann, Rochberg postulated a ‘fundamental language’ of the nervous system expressed in ‘pulse-trains’ which function as patterns in time. As music also functions in this way, it may be possible music interacts with and influences the nervous system through this mechanism. Rochberg stated “Whatever the ultimate truth of my speculations may be, I think it entirely reasonable to suggest that the sources of coherent musical structure lie deep in the human body, in the central nervous system, and that, just as performers perform with their bodies and listeners listen with their bodies,

³⁷ Fubini, p. 507.

³⁸ Rochberg, p. 230.

³⁹ John Von Neumann, *The Computer and the Brain* (New Haven, CT: Yale University Press, 1958).

⁴⁰ Rochberg, p. 231.

composers compose with their bodies.”⁴¹ Rochberg’s essential requirement of a musical system was, regardless of its context, it must correspond to the central nervous system in fundamental and direct ways, “clarity and coherence being the necessary ingredients of that correspondence and relationship.”⁴²

The New Music was flawed precisely because it did not mirror this pattern. Therefore, it frustrated the human nervous system, causing a temporary ‘breakdown’ in perception where “we don’t get it” – a perceptual breakdown relatable to the new approach to musical time.⁴³ Due to the spatialization of music discussed above, serialism and aleatoricism require the same processes which govern musical space also apply to musical time. This means duration, which Rochberg defines as “an internalized process [...] in itself, an unmeasurable flow insusceptible to limits or demarcation”,⁴⁴ becomes objectified in a series of concretized segments or lengths of ‘clock time’: “Duration as process in musical time is cast aside in favour of controlled lengths of microcosmic time.”⁴⁵ As taking on the qualities of the spatial constituents of music means becoming static, arrested and incapable of directed flow,⁴⁶ this results in formlessness as duration is forced to become directionless, antidynamic and incapable of articulating form⁴⁷ as “sound events designed in time but not rhythm.”⁴⁸

“When the beat becomes merely a referential point in time, as it does in much of Webern and later in serial music, it is no longer dynamic; it has assumed a purely mechanical function by means of which a structure may be spread out in time but lacking the impetus of periodicity whose very life depends on the metric pulse.”⁴⁹

Because of the close relationship Rochberg posited between structure, content and expression as conveyed by musical gestures, spatialization empties music of any meaning, and for him denies the validity and possibility of music as an art.⁵⁰

⁴¹ Rochberg, p. 240.

⁴² Rochberg, p. 239.

⁴³ Rochberg, p. 230.

⁴⁴ Rochberg, p. 66.

⁴⁵ Rochberg, p. 66.

⁴⁶ Rochberg, p. 76.

⁴⁷ Rochberg, p. 67.

⁴⁸ Rochberg, p. 142.

⁴⁹ Rochberg, p. 102.

⁵⁰ Rochberg, p. 20.

Space-time, as Rochberg called it, also determined the abandonment of periodicity in all musical parameters. This meant the formal elements of a piece of the New Music – intervals, rhythms – had too low a definition to be recognizable in their later occurrences. As a result, there was no way formal elements could achieve identity. As Rochberg puts it,

“there is nothing to remember. They can only be heard as dissociated aural sensations in passing; they cannot be listened to – if listening means actively focusing attention for the purpose of perceiving an order or structure with the tacit faith that there is something there to grasp, to take in and hold on to.”⁵¹

Thus, the New Music is processed cognitively as if it belongs to a category other than music, and the New Music’s attempt to overturn and replace conventional forms of musical organization was ineffectual, only resulting in confusion on the part of the listener.⁵²

For Schat, all the techniques of the New Music, be they aleatoric or serial, produced the same result: a world without cohesion – “For if everything can connect willy-nilly with everything else, then *all* connection has vanished, save one: the fact that we are then all in the soup together.”⁵³ While the New Music seems to be characterized by a more complete and rigorous organization in a greater diversity of methods than common-practice tonality, not every kind of order is automatically also a musical one:

“Never can a non-musical, a literary, scientific, political, religious, mathematical or visual order take over in music the deep-structural tonal function of the (symmetrical) tone-skeleton, which is in fact the bearer of what we call ‘tonality’.”⁵⁴

It may make sense of Schat’s terminology he held music to possess content, but only musical content:

“what the sound structures mean, what their semantic connection is,

⁵¹ Rochberg, p. 236.

⁵² Rochberg, pp. 236-7.

⁵³ Schat, 1993, p. 100.

⁵⁴ Schat, 1993, p. 107.

cannot be expressed in words or images. That does not mean, however, that music ‘can express nothing’, as a sally of Stravinsky has it. For some combinations of notes grip us violently, and others just not at all. It means simply that what music expresses can be expressed in no other way.”⁵⁵

Further, “Anyone who wants to say anything valid about music must attend to the notes.”⁵⁶ Schat’s belief can be reformulated as that music must have a comprehensible musical order if it is to express musical meaning, not an arbitrary serial or numerical order or programmatic content. “Compared with tones, numbers are paper tigers; they do not have the slightest significance for musical experience.”⁵⁷ This is similar to an argument made by Edward T. Cone - that encoding musical meaning through the process of composition rather than the composition itself is comparable to the more outlandish kind of program notes fashionable in the nineteenth century.⁵⁸

For Schat, cohesion in music was due to ‘tonal glue’, whereby the expressive power of each note is determined by its context, its tonal family or origin.⁵⁹ Serial technique had stripped the separate tones down to numbered, isolated units in Schat’s view and therefore was, “directly responsible for the barren formal rhetoric that threatened to engulf post-war composition.”⁶⁰ This constituted a bureaucratic seizure of power from the Muse,⁶¹ the results of which, on reflection, did not constitute ‘viable music’:

“Viable music is music that not only leaves an impression, calls up a ‘Gestalt’, puts a stamp on time [...] but also leaves a trail [...], tone paths that one keeps wanting to tread again because of the pleasurable feelings they arouse: the melodic power of music.”⁶²

As a new kind of ‘constitution’ or social order among the tones, the New Music was incapable of justifying itself as it remained incapable of defining the place of a note from within, of providing a reason for the notes’ existence which took

⁵⁵ Schat, 1993, p. 75.

⁵⁶ Schat, 1993, p. 75.

⁵⁷ Schat, 1993, p. 207.

⁵⁸ Edward T. Cone, ‘Music: A view from Delft’, *The Musical Quarterly* 47/4, 1961, 439-453 (p. 453).

⁵⁹ Schat, 1993, p. 25.

⁶⁰ Schat, 1993, p. 25.

⁶¹ Schat, 1993, p. 9.

⁶² Schat, 1993, pp. 222-223.

account of their nature *as notes*. “Only a serial check, an administrative operation, can bring mistakes to light. But the ear does not administer, it registers.”⁶³

Essentially, Schat accused the New Music of appealing to forms of perception which were unrelated to the experience of music-as-music, to the musical experience. A comment of Schat’s on the serial treatment of rhythm is representative of this view: “it is with rhythm as it is with love, you must feel it, physically experience it, it does not exist on paper, ratio hardly enters into it.”⁶⁴ Treating notes in this way was tantamount to killing them, and Schat voiced serious doubts about the artistic worth of innumerable ‘calculation’ scores,

“whose inhabitants, the notes, were dumped in this, that or the other ‘graphic’ corner, with the help of serial data banks. Scores in which the individual tones (and thus their mutual relationships) perished pathetically in glissandi, noise and technological speculations. Scores that were full of dead voices.”⁶⁵

Both Schat and Rochberg take a perspective on the New Music closely related to the structuralist anthropological critique given by Claude Lévi-Strauss. For Lévi-Strauss, music operates according to two grids, one ‘natural’, the other ‘cultural’. By ‘natural’, Lévi-Strauss means those aspects of music which can be attributed to common patterns of intercultural human perception. For instance, Lévi-Strauss interprets music as mapping onto the human body such that musical expressiveness relates to embodied experience of movement. This, for Lévi-Strauss, is common to all music. The second grid, the ‘cultural’, is composed of those sound resources such as pitch collections and rhythmic patterns onto which the first grid is mapped. Unlike the natural grid, the resources which make up the cultural grid may differ widely between cultures – one need only think of the intonational differences between Indonesian gamelan and Western equal temperament.⁶⁶

On Lévi-Strauss’ view, un-naturalization was the defining characteristic of the

⁶³ Schat, 1993, p. 15.

⁶⁴ Schat, 1993, p. 115.

⁶⁵ Schat, 1993, p. 9.

⁶⁶ See Malm, 1977, pp. 46-7.

New Music. It removed the ‘natural’ grid meaning that musical syntax had to be relocated entirely to the second ‘cultural’ grid, reformed arbitrarily for each new composition. This leads to a musical world where

“through the power of the ever new, internal logic, each work will rouse the listener from his state of passivity and make him share in its impulse, so that there will no longer be a difference of kind, but only of degree, between inventing music and listening to it.”⁶⁷

While seemingly an empowering feature of the New Music, this had negative consequences. This was music which seemed “to be deceived by the utopian ideal of the century [...] trying to construct a system of signs on a single level of articulation” and thus invited crisis through an aesthetic position which resisted any appeal to undeniable universals of perception.⁶⁸

A Diversion into Aesthetics

What Schat and Rochberg hinted at in their critiques of the formlessness and meaninglessness of the New Music is reinforced by contemporary theorising on the subject of musical expression. Two prominent theories are the contour theory and the process theory. These two theories can be seen as representative examples of two historically prominent, opposing approaches to the problem of expression. Contour theory shares many aspects of the historical tradition of formalism as the interpretation of music as an *analogue* of feeling, able to reproduce an abstract image of it without having a direct connection with it.⁶⁹ Contrastingly, the process theory can be seen as representative of expressionism, describing music as capable of communicating genuine feeling in all its nuances and degrees of intensity.⁷⁰

Peter Kivy and Stephen Davies promote slightly different versions of the contour theory.⁷¹ Kivy argues that to hear music as expressive is to recognize it as

⁶⁷ Claude Lévi-Straus, *The Raw and the Cooked* trans. J. and D. Weightman (London, UK: Cape, 1970), p. 34. Quoted in Fubini, p. 497.

⁶⁸ Lévi-Straus, 1970, p. 32. Quoted in Fubini, p. 498.

⁶⁹ Fubini, p. 319.

⁷⁰ Fubini, p. 320.

⁷¹ Stephen Davies, *Musical Meaning and Expression* (Ithaca, NY; London, UK: Cornell University Press, 1994).

resembling the behavioural expression of human emotions. In his own example, a person looking at a Saint Bernard dog will animate the dog's expression with the human emotion of sadness due to their recognition of a similarity between the dog's expression and human facial expression characteristic of sadness. Even something as apparently inanimate as a willow tree can possess this 'looks-like' quality, hence the description of 'weeping' willow. It is in this way Kivy describes music as expressive "in virtue of its resemblance to expressive human utterance and behavior."⁷² Kivy describes the *Lamento d'Arianna* from Monteverdi's opera *l'Incoronazione di Poppea* as "a perfect icon in sound of the fall of the human voice when it expresses sadness."⁷³

"As we see sadness in the Saint Bernard's face because we see its features as resembling those of our own appropriate to the expression of sadness, we hear sadness in this complex musical line, we hear it expressive of sadness, because we hear it as a musical resemblance of the gesture and carriage appropriate to the expression of our sadness. it is a "sound map" of the human body under the influence of a particular emotion."⁷⁴

However, Kivy denies the possibility of listeners themselves experiencing the emotions music is expressive of, for example, how a person listening to happy music may themselves feel happiness.⁷⁵ He only goes so far as to offer the possibility that it may occur through arbitrary association of the emotion with the music in question.

Stephen Davies presents a similar account of the contour theory, whereby musical works "present emotion characteristics, rather than giving expression to occurrent emotions, and they do so by virtue of resemblances between their own dynamic structures and behaviours or movements that, in humans, present emotion characteristics."⁷⁶ However, Davies *does* allow that music can arouse the emotions it expresses in listeners. He solves the problem Kivy's contour theory

⁷² Peter Kivy, *The Corded Shell: Reflections on Musical Expression* (Princeton University Press, 1980), p. 56.

⁷³ Kivy, 1980, p. 51.

⁷⁴ Kivy, 1980, p. 54.

⁷⁵ Peter Kivy, *Music Alone: Philosophical Reflections on the Purely Musical Experience* (Ithaca, NJ; London, UK: Cornell University Press, 1990), p. 175.

⁷⁶ Stephen Davies, *Themes in the Philosophy of Music* (Oxford, UK: Oxford University Press, 2003), p.181.

falls into by proposing ‘mirroring’ responses. Mirroring is explained as the tendency among humans, through some kind of sociality or empathetic reflex, to ‘catch’ the emotions which others are expressing through their behaviours, although the mechanism by which this occurs is left mysterious.⁷⁷

In contrast, Jenefer Robinson advocates a process theory of musical expression.⁷⁸ According to this theory, human emotions are the result of two levels of judgement interacting in a feedback loop. The first is a basic, automatic physiological response while the second is a more complex cognitive monitoring evaluation. This involves a person making judgements about what emotional state they are in and changing their actions regarding that state, which in turn feeds back into the first level of judgements. Robinson describes the process like this:

“A person walking in the wood hears a crackling sound; the amygdala defends against a rattlesnake; and the person jumps back before the slower cortex reports that indeed there is a rattlesnake and the person should walk around it at a safe distance (or there is no rattlesnake, only a stick, and no special action is required). In short, there is an immediate instinctive reaction, followed by cognitive monitoring of the situation, and behaviour is adjusted accordingly.”⁷⁹

Musically, this process is embodied in a rough, pre-cognitive physiological experience of music which induces a mood state – what Robinson labels the ‘Jazzercise effect.’⁸⁰ The second cognitive stage is self-realization that the listener is experiencing a mood state, and their labelling it in the most contextually-appropriate way. For instance, as sadness if they are listening to sad music. This judgement in turn influences the mood state towards the genuine emotion of sadness. For Robinson, “we can describe this process as ‘confabulation’, but what starts out as a fable may end up coming true.”⁸¹ However, Robinson’s account risks circularity as it essentially requires a listener to identify what they feel in order to feel it.

⁷⁷ Davies, p. 88.

⁷⁸ Jenefer Robinson, *Deeper than Reason: Emotion and its Role in Literature, Music and Art* (Oxford, UK: Clarendon, 2005).

⁷⁹ Robinson, p. 61.

⁸⁰ Robinson, p. 392.

⁸¹ Robinson, p. 403.

Complementary theories are also proposed by Aaron Ridley and Roger Scruton.⁸² Ridley's melismatic theory of musical expression is a version of the contour theory, whereby musical motives are heard as embodying resemblances to human expressive behaviours both verbal and gestural, but Ridley theorizes this process as related principally to the melodic aspect of music. Melodic gestures are thus interpreted sympathetically and identified according to the emotion they arouse in the listener. Roger Scruton's 'dance of sympathy' is more complex, arguing that the necessary metaphors of space, depth and movement which listeners channel the musical experience through leads them to animate music as a kind of 'first person' narrative persona, a fictional 'life of the tones'. Through their engagement in the musical experience, listeners will sympathise with, and move with, this musical persona as it moves through metaphorical space. For both Ridley and Scruton, however, why listeners respond to these particular aspects of music in this particular way remains mysterious.

A Conclusion, of Sorts

The theories described very briefly above are noticeably contrasting, yet a consensus emerges, namely that music gains expressive meaning for a listener when it engages their body. This is comparable to Rochberg's description of listening, and even composing, with the body. Thus, music which suspends pulse and a sense of perceivable motion, scrambling the embodied experience of a listener, will not be able to speak clearly with any force or appeal. This is clearly a loss of immense significance. The New Music, and much post-tonal music since, lost exactly this. Even so, much of what this music achieved is extremely positive:

"it cannot be denied that their [the composers of the New Music] rejuvenation of sounds and instrumental qualities, their complete break with the forms and structures of music as it was traditionally understood have opened up new avenues towards a renewal of music and an enrichment of the traditional means of producing sounds."⁸³

For Schat, as for Fubini,

⁸² Aaron Ridley *Music, Value and the Passions* (Ithaca, NY; London, UK: Cornell University Press, 1995); Roger Scruton, *The Aesthetics of Music* (Oxford, UK: Clarendon, 1997).

⁸³ Fubini, pp. 498-499.

“what was ultimately needed was that the new sounds and noises should acquire a significance, and that the new kind of open-ended performance, the infinitude of different interpretations that the new music offered should not turn into mere indeterminacy, into vagueness and confusion, into sheer noise, but should progress beyond the stage of mere experimentation and be structured into a new organic musical language.”⁸⁴

An ideal solution would be a synthesis: music based upon the expanded resources of the emancipated dissonance while still maintaining the kind of meaning described above. Schat’s solution to this problem was the theory he dubbed the *tone clock*, discussed in detail in the next chapter.

⁸⁴ Fubini, p. 499.

Intermezzo I

Etude

Vivo e Rubato ♩=190

always bring out treble

Piano Left Hand

p, impending

etc.

6

Pno. L.H.

mp *mf*

10

Pno. L.H.

f, con forza

15

Pno. L.H.

p *piu espress.*

20

Pno. L.H.

poco piu agitato!

Detailed description of the musical score: The score is for the left hand of a piano. It consists of five systems of music, each with a treble clef and a 4/8 time signature. The first system starts with a piano dynamic (*p*) and the instruction 'impending'. The second system has a mezzo-piano (*mp*) dynamic and a mezzo-forte (*mf*) dynamic. The third system is marked *f, con forza*. The fourth system starts with a piano (*p*) dynamic and includes the instruction 'piu espress.'. The fifth system is marked 'poco piu agitato!'. The tempo is 'Vivo e Rubato' with a quarter note equal to 190 beats per minute. The key signature has one sharp (F#). The score includes various musical notations such as slurs, ties, and dynamic hairpins. There are also some markings like 'g#b' and 'etc.'.

24

Pno.
L.H.

molto *p* *molto* *piu calmo*

29

Pno.
L.H.

sp *sp* *impending*

g#b

33

Pno.
L.H.

cresc.

g#b *g#b* *g#b*

38

Pno.
L.H.

42

Pno.
L.H.

dim.

g#b *g#b*

→ ***Relevant to Chapter 5, pp. 121-128***

Bars 1-2 establish A# as the tonic pitch of the first frame, shown in Figure 2, through repetitions which saturate several registers with the pitch. In bb. 3-4, B functions as an adjunct embellishing the A#, then acting as a bridging tone in the linear progression from A# to C at 5. This is followed by a structural leap down to A# and back. In bar 6, another linear progression from C to F via the bridging

tone E completes the statement of the hour IX structural subset A#-C-F. The F is affirmed further by lower and upper adjunct motions in bars 8 and 9; to E and then to G#, returning to F at the beginning of bar 10. This return initiates a further linear progression from F up to A# – briefly dwelt upon – which winds its way through the bridging tones G# and A. Bars 11 to 17 are largely taken up with leaps between the pitches of the structural sub-set: C down to F, then down to the lower C forming a linear progression via E. This lower C then leaps to the lower A#, which is dwelt upon to conclude this brief episode of leaping. The tonality frame describing this collection of motions is shown in Figure 2, while its accompanying steering tree is given below.

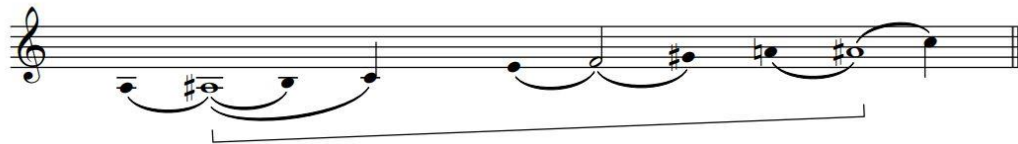
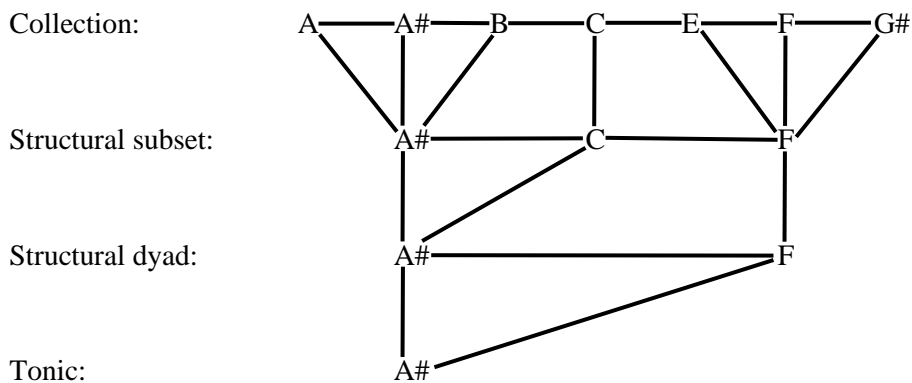


Figure 2: Etude, frame 1



A shift between frames takes place in the transition between bars 17 and 18. The melodic line lowers to an A. Dwelling upon this pitch causes an ambiguity, as this pitch has previously led to A#. In bar 19, the pedal point shifts to match this A, achieving a modulation between frames via inducing ambiguity regarding the structural role of a shared element. This new frame forms what might be called a *sub-frame* – a different transposition of the initial steering/framing subset within the collection. The same pitches are in play, but their structural roles have been altered by transposing the steering group, akin to a modulation such as that from C major to D dorian. Figure 3 shows this frame, followed by its steering tree.

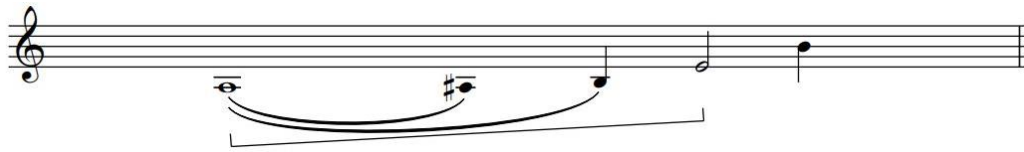
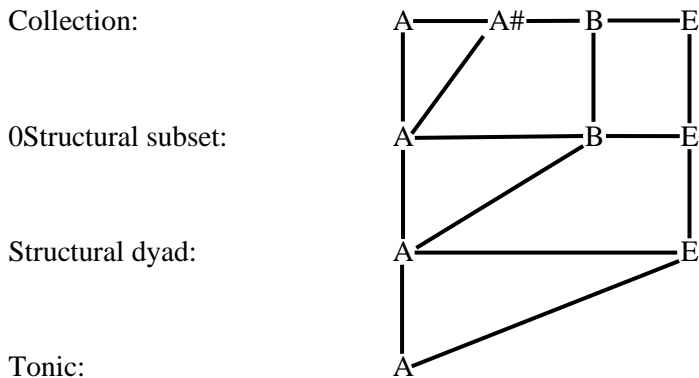


Figure 3: Etude, frame 2



Initially in bar 19, a small linear progression occurs which moves from the tonic A to B, a member of the structural sub-set, via A#. However, leaps dominate the motions of this new frame, affirming the remainder of the subset. From B, E is leapt to in bar 20, followed in bar 21 by a leap to a higher B, which is dwelt on considerably. It is clear that this B is a member of the structural subset, but its direction of support is indeterminate. In the frame diagram above, it has been left unbound to indicate this. It would be expected from the motions in the lower part of the frame that, were more music to be written for this frame, it would resolve to a grouping around the tonic. However, without unequivocal evidence it cannot easily be assigned to any role other than a free-floating member of the structural set.

A second modulation occurs at bars 22-23. The tonic now shifts to F#, and the frame which emerges can be seen to be similar to the lower grouping in frame 1 but transposed. It is shown in Figure 4, followed by its steering tree. There are no shared elements between the second frame and this third frame, meaning the modulation can only be achieved suddenly. The tonic A simply shifts down to F#, with a slight overlap of the B as an anomaly in the new frame.

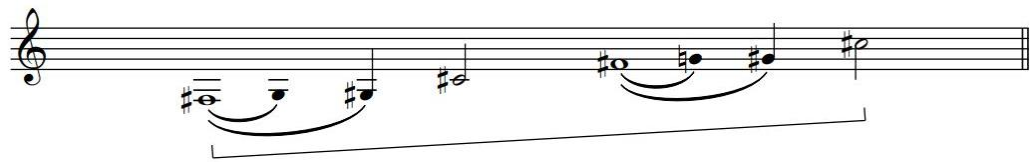
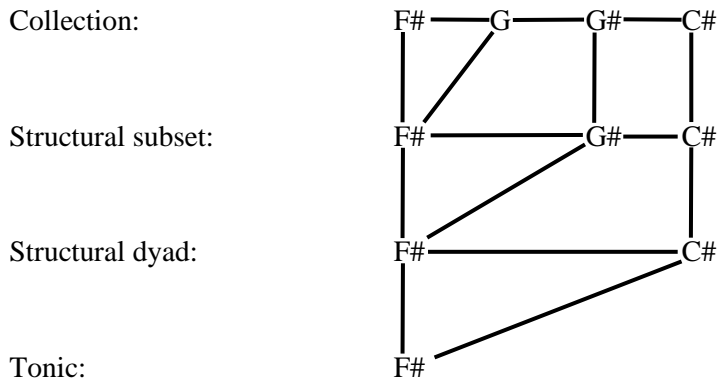


Figure 4: Etude, frame 3



Melodically, G sharp is immediately affirmed as structural by an adjunct movement to its lower neighbour and back in bar 23. A series of leaps from G# to C# and back down to F# in bar 25 then affirm the structural set. At bar 26, the melody references the set of motions which began the piece. G acts as an upper adjunct to the tonic F#. Leaps follow: up to C# at bar 29, then down to G# and F# at bar 30. Bars 30-31 are made up of leaps between G# and F#, with a single F natural acting as a lower adjunct to F# at bar 32. This F natural serves to enable the final modulation of the piece, back to the first frame centred upon A#, as the F natural blurs its role as adjunct to F# and ‘dominant’ to A#. At bar 35, a note-for-note repetition of the motions of bars 3-7 ensues, with repetitions acting as a coda.

Chapter 2: The Tone Clock in Focus

The tone clock is a tool for scanning the relations between the different notes of our equally-tempered, 12-note tone-system.¹ It is an attempt to develop a systematic approach to chromatic composition, typically – but not always – using all twelve pitches and focusses on pitch collections that are economical in their constituent intervals.² In this chapter, I will focus in on the workings and functions of the tone clock.

The Tone Clock

At its heart, Schat described the tone clock as “an essay to put the relationship between the twelve tones of our tonal system into a different perspective, and to formalize a harmonic order which does not exclude but, on the contrary, embraces the established one.”³ As De Groot notes, the lack of intervallic differentiation within the chromatic scale creates problems when it is used as the fundamental pitch collection for music-making.⁴ Schat’s solution was to define an intervallic tonality with a triad and its repetitions, transposed to make up the entire chromatic aggregate.⁵ This method can be seen emerging slowly in Schat’s own music and writings. Jenny McLeod noted Schat’s “thinking of the note-row in terms of symmetry, of chromatic triads and their inversions, and of an inner mobility within the series, all of which were later to become integral elements of the ‘tone clock proper’” as early as the 1960s.⁶ However, De Groot notes that in Schat’s essay *The Dream of Reason; The Reason of a Dream* (1976) “considerations of pitch relationships still imply the fragmentation of the chromatic scale into individual intervals.”⁷ In his *First Symphony*, fixed combinations of two intervals appear: the triads.⁸ By the time of the opera *Monkey Subdues the White Bone Demon* (1980), the steering principle, explained below, has begun ordering interval patterns on a higher level.⁹

The Hours

Schat bases the system upon triads or the ‘hours’ that make up the tone ‘clock’.

¹ Peter Schat, 1993, p. 57.

This use of triads was a decision he justifies in a number of ways.

“I proceed, just as Rameau did, from the proposition that to determine the ‘key’, the tonal ‘family’, a minimum of three notes is required (with Rameau it was the major triad). A single note can give no decisive answer, any more than the interval between two notes. With a metaphor borrowed from geometry, one might say: one note determines the position (the point in space), two notes, the relationship (the line, or shortest distance between two points), and three notes, the field, or the nature of the relationship (three points describe a plane).”¹⁰

Firstly, tonal depth was required. Intervals alone lack tonal depth,¹¹ meaning they are unable in practice to reach the tonal bedrock, which tetrads overshoot.¹² In this way, Schat compares the necessity of triads to the architect Aldo Van Eyck’s comparison of the numbers 3 and 4. It would appear that a triad possesses an unavoidable verticality because of the symmetry of its tones around a central point, however the horizontalizing force of its two intervals means that a three dimensional quality emerges. Similarly, the apparent horizontality of a tetrad is accompanied by the verticalizing force of a trio of intervals.¹³ Ibarz compares this depth identity of triadness to diatonic tertial harmony, where a chord is only definable as major or minor when three notes are present.¹⁴

Secondly, triads were also needed to break the links with serialistic intervallic thinking which persisted with the use of dyads.¹⁵ Thirdly, triads are highly characteristic due to their limited number (12), and the character of the triad changes fundamentally if the relationship between any of its constituent elements

² Michael Norris, 2006a, p. 74.

³ Peter Schat, ‘On harmony and tonality’, *Key Notes* 19, 1984, 2-4 (p. 2).

⁴ Rokus De Groot, 1984a, p. 8.

⁵ De Groot, 1984a, p. 8.

⁶ Mcleod in Schat, 1993, p. xi-xii.

⁷ De Groot, 1984a, p. 7.

⁸ De Groot, 1984a, p. 7.

⁹ De Groot, 1984a, p. 7.

¹⁰ Schat, 1993, p. 26.

¹¹ Schat, 1993, p. 57.

¹² Schat, 1993, p. 10.

¹³ Schat, 1993, p. 234.

¹⁴ Ibarz, 2015, p. 25.

¹⁵ Schat, 1993, p. 274.

is altered.¹⁶ Lastly, the hours are also a useful mnemonic. Schat described them as “a good way to memorize a synopsis of the unforeseeable number of possible combinations in the chromatic scale.”¹⁷ Similarly, McLeod values the hours mainly as simplifiers. Because of the obvious metaphorical parallel with a clock face, Schat called these triads the hours, which are generally shown in a circular ‘Zodiac’ similar to a clock face. The hours are arranged within the Zodiac to create an intervallic “opening up” from hour I’s minor seconds to the augmented chord of the hour XII.¹⁸



Figure 5: The hour triads

Steering

Schat discovered each hour can be transposed and, if necessary, inverted, in such a way that every note of the chromatic scale is generated exactly once.¹⁹ This process, of transposing one pitch collection onto every note of another, is known as *steering* as it directs or ‘steers’ a triad through all of its transpositions.²⁰ This saturates the resulting pitch collection with the constituent intervals of its triad, in a way that is intended to create “a high degree of self-contained musical unity, as the same intervals are heard constantly, even though the pitches vary greatly”. Each of the hours, except for 4-note hour X, is steerable by a symmetrical tetrad. Not only melody, but also chordal sonorities are completely determined by the tonalities resulting from the steering of the hours.²¹ “Proponents of tone clock

¹⁶ Schat, 1993, p. 274.

¹⁷ Schat, 1993, p. 82.

¹⁸ Norris, 2006a, p. 78.

¹⁹ Norris, 2006a, p. 74.

²⁰ Ibarz, p. 34.

²¹ De Groot, 1984a, p. 8.

theory argue that this creates a lower-level, more perceptible harmonic structure than serialist techniques, while allowing for greater freedom in the way the generative material is treated."²²

Steering may also occur on many structural levels. Ibarz notes that “the steering principle does not simply derive twelve distinct pitch classes using the tone clock hours: it is also used to generate a network of interrelated material from which an entire work may be composed.”²³ This includes the potential of modulation achievable by transitioning between two different hours with the same steering group. Jenny McLeod describes steering as a “musical equivalent of the ‘life principle’, as the power of a group of notes to manifest itself again and again at any point in the system by ‘sprouting’ from an already existing note.”²⁴ For Michael Norris, the aspect of tone clock theory with the greatest significance is its detailed examination of steering process as one of its theoretical cornerstones.²⁵ Table 1 shows the steering compatibilities of the hour triads.



Figure 6: The steering of hour I by hour IX (I/X⁴)

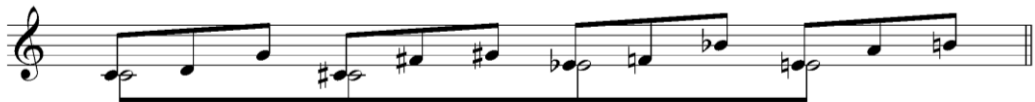


Figure 7: The steering of hour VIII by hour II (VIII/II⁴)

Table 1: The hours and their steerings²⁶

<i>Tone clock hour</i>	<i>Number of steerings</i>	<i>Steering hour(s)</i>
I (IPF ²⁷ 1-1)	1	X ⁴ (IPF 333)
II (IPF 1-2)	1	VIII ^{m4} (IPF 242) ²⁸

²² Norris, 2006a, pp. 76-77.

²³ Ibarz, p. 43.

²⁷ For an explanation of IPF notation, see p. 40.

²⁸ Here, m=minor and M=major, indicating whether the smaller (if minor) or larger (if major) interval is on the bottom of the IPF.

III (IPF 1-3)	2	V ⁴ (IPF 151), VII _m ⁴ (IPF 232)
IV (IPF 1-4)	3	VI ⁴ (IPF 222), VIII ⁴ (IPF 242), X ⁴ (IPF 333)
V (IPF 1-5)	1	IIM ⁴ (IPF 212)
VI (IPF 2-2)	2	V ⁴ (IPF 151), X ⁴ (IPF 333)
VII (IPF 2-3)	1	VIII ⁴ (IPF 242)
VIII (IPF 2-4)	3	III _m ⁴ (IPF 131), IV ⁴ (IPF 414) ²⁹ , XI ⁴ (IPF 434)
IX (IPF 5-5)	2	II ⁴ (IPF 242), X ⁴ (IPF 333)
X (IPF 3-3)	1	I (IPF 1-1) steering X ⁴ (IPF 333)
XI (IPF 3-4)	3	VI ⁴ (IPF 222), VIII ⁴ (IPF 242)
XII (IPF 4-4)	4	I ⁴ (IPF 111), IIM ⁴ (IPF 212), V ⁴ (IPF 515), VII _m ⁴ (IPF 232); McLeod also identifies steerings by X ⁴ and IPFs 123 and 115

²⁶ From Ibarz, p. 39

²⁷ For an explanation of IPF notation, see p. 40.

²⁸ Here, m=minor and M=major, indicating whether the smaller (if minor) or larger (if major) interval is on the bottom of the IPF.

²⁹ Schat does not include this steering (See Schat, 1993, p. 66).

The Tone Clock and Serialism

Linking tone clock theory to serialist thinking, Rokus De Groot summarizes Schat's conceptualization of the tone clock – what I have called the 'classic tone clock' – in seven fundamental postulates:

1. Schat takes a position which antedates the New Music's treatment of tones as individuals. Individuality and stability of pitch.
2. Schat accepts the evolution of the 12-note, equally-tempered octave as the result of a necessary historical development
3. Schat accepts the Schoenbergian dictum that tones must be related only to one another. This necessitates the interval as the smallest musical unit.
4. The octave must be excluded because it is only a replicate of a tone and may also cause a tonicizing effect.
5. Also in the Schoenbergian manner, all intervals are to be treated as equals
6. To avoid a tonicizing effect, all structures must include all 12 pitch classes, otherwise tonicizing may occur.
7. The characteristic relationship between pitches must be perceptible, and the smallest unit for which this is possible is the triad – thus the triad is the carrier of tonality.³⁰

When the tonalities are applied musically, there is general freedom of succession of pitches within the triad and triads within the tonality. While similar to the later serialist technique of permutation,³¹ this indicates that there are significant differences between the tone clock and serialism. Norris points out several, firstly that "the ordering of [pitches] is not part of tone clock theory; in fact, tone clock theory has no concept of order, only using the terms 'collections', 'groups' and 'fields' rather than 'rows'."³² Serialism also

"fails to place restrictions upon the choice of intervals in a row, which can lead to intervallic overabundance [...] In this sense, tone clock theory is less constrictive than serialism, and, it could be argued, more 'integrated' due to the emphasis placed on the perceptibility of intervallic content as a primary unifying force."³³

³⁰ De Groot, 1984a, p. 7.

³¹ De Groot, 1984b, p. 19.

³² Norris, 2006a, p. 76.

³³ Norris, 2006a, p. 76.

Jenny McLeod and the Tone Clock

New Zealand composer Jenny McLeod first encountered the tone clock when she met Peter Schat at a new music festival in Louisville, Kentucky in 1987. McLeod recalls:

“I knew Peter Schat was some kind of serial theorist, and was prepared to dislike his ideas from the outset: serialism was a complete no-no for me – I’d been there, done that. We started off by arguing furiously, but then I began to pay more attention to what he was saying, and found he wasn’t talking about serialism at all: he was talking about an entirely new system of tonality.”³⁴

At this time, McLeod was becoming dissatisfied with her own approach to composition. Her early career had seen her travel to Europe as a pupil of Messiaen and become a fixture of the New Music scene. However, the lack of real understanding the New Music created, even among its adherents, left her bemused: “Reading *Die Reihe* in English I was puzzled by certain passages, so carried the journal round and began asking everyone I met (people began avoiding me). But I found that nobody else understood them either!”³⁵ She had turned to a third stream approach incorporating elements of rock music into classical forms, but by the late 1980s felt she had reached the limits of this style: “I had no idea where I might strike out next, was in a state of despair, ready to turn up my toes, when I met the Dutch composer, Peter Schat.”³⁶

Jenny McLeod’s approach to the tone clock, based upon connections with Allen Forte’s pitch-class set theory, constitutes an extension of both well beyond their initial conceptions.³⁷ It also draws upon her own intuitive concepts of harmonic structure, as she had been subconsciously using principles similar to the tone

³⁴ Sarah Shieff, *Talking Music: Conversations with New Zealand Musicians* (Auckland, NZ: Auckland University Press, 2002), p. 71.

³⁵ Jenny McLeod, *Prosaic Notes from an Unwritten Journal* (Wellington, NZ: National Library of NZ, 2016) in RNZ Concert <https://www.rnz.co.nz/concert/programmes/appointment/audio/201825762/the-lilburn-lecture-2016> [accessed 05 June 2021], 13’05”-13’20”.

³⁶ McLeod, 2016, 42’12” – 42’22”.

³⁷ Norris, 2006a, p. 74.

clock as early as 1968.³⁸ McLeod breaks down the tone clock into the following list of core principles:

- That chromatic as well as diatonic tonalities are possible
- A grouping principle expressed in the triads, and transferrable to larger groups such as tetrads.
- Mobility – that notes within a group such as a triad are unordered, and groups within a steering can occur in any order.
- Steering itself, which allows tonalities to generate each other and a deep-level structure to emerge.
- That steering gives rise to deep-level harmonic symmetries.³⁹

McLeod extended Schat's discoveries to pitch collections other than triads, systematically examining every one of the set classes in Forte's catalogue and cross-referencing her findings with other chromatic techniques and theories such as those of Messiaen, Boulez and Xenakis.⁴⁰ In her own words, "I sensed at the outset of my explorations [...] that these various techniques form the 'bones' of a larger whole – that in fact none of them is 'opposed' to any other."⁴¹ Thus she arrived at a theory of chromaticism, based upon the tone clock, which incorporated common-practice tonality, polytonality and atonality, all forms of dodecaphony, Messiaen's modes, Babbitt's hexachords, set theory, sieve theory and Boulez' frequency multiplication.⁴² Norris describes the result of this exploration – McLeod's *Chromatic Maps I and II* – as "an extremely important, if little-known, contribution to chromatic musical theory"⁴³ which constitutes "a development and repackaging of pc set theory, with extensive additional observations and information."⁴⁴ She also replaced Allan Forte's pitch-class set taxonomy with *Intervallic Prime Form* (IPF) notation based upon the constituent intervals, in semitones, between the pitches of a set. A major triad would be described as 3-4M – the major form (largest interval in the lowest position) of the IPF constructed by stacking dyad 4 (4 semitones) on top of dyad 3 (3 semitones).

³⁸ John Croft, 'Earth and Sky: The music', *Music in New Zealand* 22, Spring 1993 (20-24), p. 20.

³⁹ McLeod in Schat, 1993, p. xxi.

⁴⁰ Norris, 2006a, p. 75.

⁴¹ Jenny McLeod, 1994, p. xiii.

⁴² McLeod, 1994, p. xiv.

⁴³ Norris, 2006a, p. 75.

⁴⁴ Norris, 2006a, p. 75.

Norris notes that “this has the immediate advantage that it does not require mental transposition [...] nor the use of lookup tables [...] because of the emphasis on *intervals*, rather than *itches*.”⁴⁵ For McLeod, this intervallic description was also more musical, as it emphasized the structural possibilities of each IPF.⁴⁶

This focus upon structural properties is seen McLeod’s terminology. *Hour groups* are any intervallic form which can be interpreted as belonging to a single hour. Asymmetrical hour groups which can be subdivided into transpositions of the same asymmetrical subgroup are known as *Oedipus groups*, as their uneven intervallic structure causes them to ‘limp’. Larger symmetrical hour groups are called *Gemini groups* when their structure pivots around a central shared tone. McLeod consistently uses the term ‘field’ to refer to the group of IPFs, usually just one or two, which define the harmonic content or chromatic tonality of a section of the music.⁴⁷

However, McLeod’s expansion of the theory required some adjustments to the original premises. Not all of the complete set of IPFs can form a classic tone clock steering, where repetitions of the same IPF generate all twelve tones of the chromatic scale. Norris describes the situation as follows:

“To reach chromatic saturation, most IPFs require another IPF to complete saturation without repeating pcs. The use of two IPFs to reach saturation, in which one IPF appears multiple times and the second only once, is called an ‘anchor form’.”⁴⁸

This is because “we can see that the remainder IPF (called the ‘anchor’) forms an axis of symmetry around which the transpositions [of the other IPF] (called the ‘shells’) are arrayed in a mirror-like fashion.”⁴⁹

An Analysis

At this point, an analysis may be helpful to demonstrate the tone clock at work

⁴⁵ Norris, 2006a, p. 75.

⁴⁶ McLeod, 1994, p. 6.

⁴⁷ Norris, 2006a, p. 78.

⁴⁸ Norris, 2006a p. 78.

⁴⁹ Norris, 2006a, p. 78.

musically. Jenny McLeod's *Tone Clock Piece IV* was written in 1988 and first performed at the New Zealand Embassy in Paris in March 1990, by New Zealand-born pianist Jeffrey Grice. McLeod refers to this piece as 'The Sea and Me':

"I didn't realize I was writing about the sea until after the piece was written. And then I realized that [...] the two waves that sort-of like come up like an arpeggio each time, and there's a little tune in between. And I sort-of realized that the little tune in between was me, and the big waves were the sea. So it was the sea and me, basically."⁵⁰

Michael Norris analyzes the work as being constituted of three tone clock fields, which he labels A, B and C.⁵¹ Field A is based upon the hour VIII tetrad, 232 in IPF notation. Its first form, A₁, is heard in bars 1-4 where it is steered by dyad 4 and is sounded as the arpeggiated 8-note chordal aggregate 22-111-22. This aggregate is pitched D-E-F#-G-G#-A-B-C# and voiced to emphasize two hour VIII triads made up of D-G-A and F#-B-C#. These are McLeod's wave chords.



Figure 8: Field A₁

A second form of A, A₂, is heard in bars 5-6. In this form, the hour VIII tetrad is steered by the dyad 1. It forms another 8-note aggregate, 111-22-111 – the minor form of A₁ – pitched A#-B-C-C#-D#-E-F-F#. Norris describes this field's musical treatment as chorale-like, and it is clearly structured as a rocking repetition of different voicings of the two VIII hour tetrads, A#-C-D#-F and B-C#-E-F#. The top line is decorated rhythmically to form the chorale tune. This is the little tune which forms the 'me' in 'The Sea and Me', and is followed by a recurrence of field A₁ as the wave chords in bars 7-8.

⁵⁰ 'New Album Marks Milestone,' *Upbeat*, RNZ Concert, 16 November 2016, 1:30pm. (4'47"-5'13").

⁵¹ Norris, 2006a, p. 81-82.



Figure 9: Field A₂

Field B is heard for the first time in bars 9-11. Norris analyzes this field as hour VIII tetrad 232 steered by the hour II tetrad 121. These three bars are essentially an expansion of the ‘me’ chorale tune of bars 5-6: the same tetrad is emphasized vertically, with the uppermost line forming a chorale tune. However, it is not given the same rocking treatment, as the hour VIII tetrad instead progresses through its hour II tetrad steering. Described in terms of transpositions of the hour VIII tetrad, it is heard pitched A#-C-D#-F, followed by a transposition up a minor third pitched C#-D#-F#-G#, then transposition down a semitone to D-E-G-A, then finally transposition down a minor third to pitches B-C#-E-F#. This is followed by another repetition of the A₁ wave chords, still in the same arpeggiated aggregate, in bars 12-13



Figure 10: Field B

A second form of field B, field B₁, is heard in bars 14-15. Again, this is based upon the ‘me’ chorale tune treatment in bars 5-6, however in this instance the hour VIII tetrads are steered by dyad 3. The two VIII hour tetrads which the chorale rocks between are pitched C#-D#-F#-G# and A#-C-D#-F. This is followed in bars 16-17 by another recurrence of field A₁’s wave chords.



Figure 11: Field B₁

Comparing the chorale sections heard so far, there is a striking similarity in their steerings. It seems as if the hour II steering underpinning the appearances of the hour VIII tetrads, made up of a minor third and a semitone, has either been ‘split’

Intermezzo II

Prelude

Slow ♩ = c.65-70

Piano

8va

pp

pp poco

pp p

pp

3

8va

loco

pp

pp

p

sff

15mb

5

loco

p

pp

ff

loco

p

p

8vb

7

Pno.

p *pp* *8va*

p *mp* *mp* *f*

(8)

9

Pno.

mp *mf* *molto*

ff *8va* *mp* *loco* *mp*

(8)

12

Pno.

mf *mf, espr.*

mp *p* *mf, espr.*

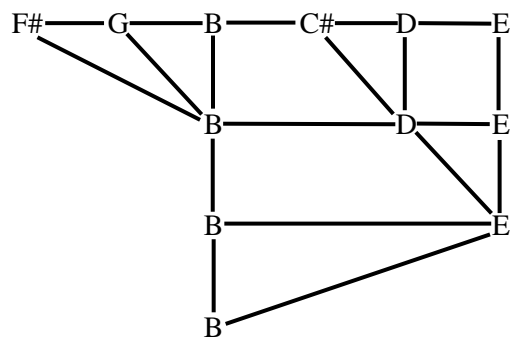
mf *8va*

→ *Relevant to Chapter 6, pp. 137-139*

In the following analysis, relevant octave doublings have been disregarded and collapsed into a single voice. My analysis simply lists the framing motions at their position within the music, in order to avoid monotony:

Figure 13: Prelude, frame 1

Collection:



Steering Group:

Structural Dyad:

Tonic:

1(1) – Tonic pitch (B) in lowest voice.

1(2)-1(3) – C# adjunct to a structural D in the tenor.

1(4)-1(6) – Motion between E-D as members of the structural set in the alto voice.

1(7) – Tonic pitch (B) in the uppermost voice.

- 2(1) – Lowest voice initiates a linear progression by moving to G.
- 2(2)-2(3) – C#-D adjunct motion repeats in the tenor.
- 2(4) – Structural E in the alto.
- 2(5) – Tonic pitch in the uppermost voice.
- 2(6) – Lowest voice carries on its linear progression, moving from G to F#.
-
- 3(1) – Lowest voice terminates the linear progression initiated at 1(1) on an E.
- 3(2)3-3(3) – C#-D adjunct motion in the tenor.
- 3(4)-3(5) – Motion between structural D-E in the alto voice, re-ordered from 1(4)-1(5).
- 3(7) – Tonic pitch in uppermost voice.
-
- 4(1) – lowest voice leaps through the structural subset/steering group to the tonic, B.
- 4(2)-4(3) – C#-D adjunct motion in the tenor.
- 4(5) – tonic in the uppermost voice.
- 4(6) – the entire structural set is stated as a chord, stretched over several registers.
-
- 5(2)-5(3) – C#-D adjunct motion in the tenor, this time in a lower register.
- 5(5) – structural E in the alto.
- 5(7) – modulation to a chordal statement of a new frame. Based upon the prototype of frame 1 (see Figure 13, followed by its steering tree), frame 2 (see Figure 14, followed by its steering tree) has a C# tonic with E and F# as supporting members of the structural subset/steering group.
- 5(9) – brief return to E and B, implying frame 1.

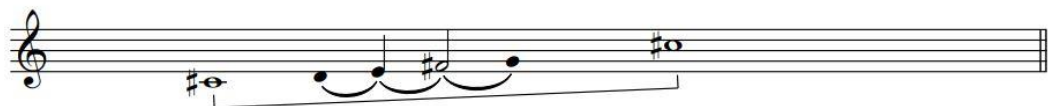
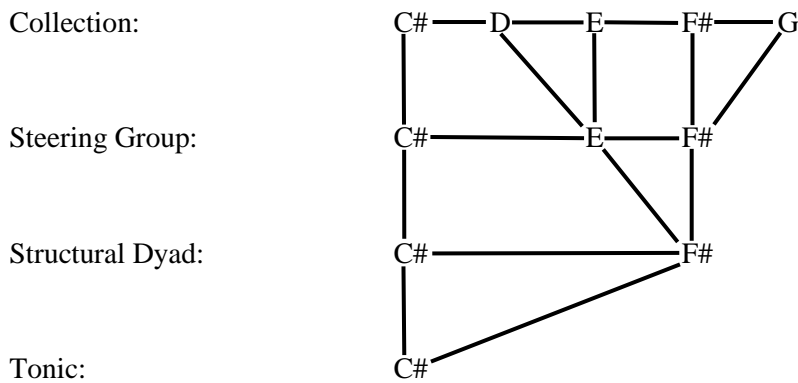


Figure 14: Prelude, frame 2



6(1) – C# tonic of frame 2 in lowest voice.

6(2)-6(3) – stacked adjunct motions: D -E in lower tenor voice and D-C# in upper tenor voice.

6(5) – F#, the remaining member of the structural subset/steering group, in uppermost voice.

6(7)-6(8) – D-E adjunct motion in alto.

7(1) – lowest voice leaps through the structural subset/steering group to an E.

7(2)-7(3) – D-E adjunct motion in alto.

7(5)-7(6) – G-F# adjunct motion in uppermost voice.

8(1) – Lowest voice continues to leap through the structural subset/steering group to F#.

8(2)-8(3) – G-F# adjunct motion in tenor

8(6) – Tonic C# in uppermost voice.

8(7) – Chord of stacked structural Es and F#s in tenor range.

8(9) – Lowest voice moves to G, which seems slightly anomalous.

9(1) – The anomaly of the preceding G is resolved as the lowest voice carries on moving to a B. This is the G's neighbour in the collection, and also articulates a modulation back to frame 1 as B is the tonic.

9(2) – Structural D (of frame 1) in uppermost voice .

9(4)-9(5) – C#-D adjunct motion in tenor.

9(6) – Chord E-B-E in high treble register.

10(1) – Lowest voice moves down to G, initiating some ambiguity as to that pitch’s structural role.

10(2) – The supporting tones of the structural subset/steering group stated as a stacked chord, ranging across four octaves of the treble clef.

10(3)-10(4) – Tenor leaps from G to D. This continues to emphasize the structural value of the G. Leaping from it implies it is a member of the steering group.

10(6) – Structural E in upper treble clef.

11(1)-11(2) – Structural pitches E-D in low treble/mid bass clef range. Together with the G which has been implied as tonic, these imply frame 3 shown in Figure 15.

11(4)-11(6) – F#-E adjunct motion in upper treble.



Figure 15: Prelude, frame 3

Collection:

G — D — E — F#

Steering Group:

G — D — E

Structural Dyad:

G — E

Tonic:

G

12(1) – G tonic of frame 3 in lowest voice

12(2) – anomalous A in uppermost voice.

12(3) – lowest voice moves to E. This was a supporting pitch within the structural subset/steering group of frame 3.

12(4) – B-A adjunct motion in uppermost voice, strengthening the structural role

of the A. Frame 3 must therefore have been shifted from, as A is not a structural pitch within frame 3.

12(6) – A chord of stacked Gs and As encompasses most of the bass clef and the lower treble. motion moving A to G takes place in the tenor. Compared to the prototypical motions of the previous frames, this can be made sense of as a chord composed of the supporting pitches of a structural subset/steering group.

13(1) – The bass voice returns to G

13(2) – A chord is stated encompassing the entire treble clef, consisting of stacked A-E fourths. This confirms a new frame has been modulated to, with an E tonic and supporting subset pitches of G and A. This frame 4 is shown in Figure 16.

13(4)-13(5) – B-A and F#-G adjunct motions are stacked across multiple octaves in the treble clef. This continues to affirm G and A as members of the structural subset/steering group.

13(7)-13(8) – motion between structural pitches A-G in the lowest voice.

13(9) – B in high treble clef.

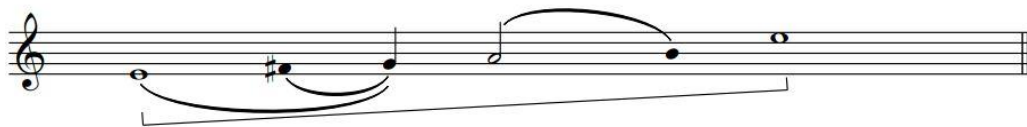
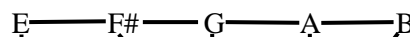
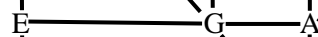


Figure 16: Prelude, frame 4

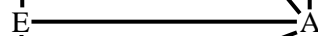
Collection:



Steering Group:



Structural Dyad:



Tonic:



14(1) – lowest voice leaps to an F#.

14(2)-14(3) – apparent adjunct motion from tied B in upper treble clef to C and back. This, along with the emphasis given to the bass F#, implies a further modulation.

14(5)-14(6) – voice in upper treble leaps down to G, then moves to F#. This apparent adjunct implies that the G is now an embellishing the more structural F#.

14(7) – chord of stacked As and Bs across the bass clef and lower treble clef. Based upon the prototypical motions of previous frames, this affirms them as supporting members of the structural subset/steering group and confirms that a new frame upon F# has been modulated to. This is frame 5 (see Figure 17).

14(8) – Structural A of frame 5 in lowest voice.

14(9) – C in uppermost voice, acting as an implied adjunct to B from 14(9) to 15(1)

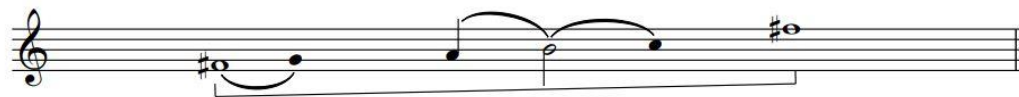
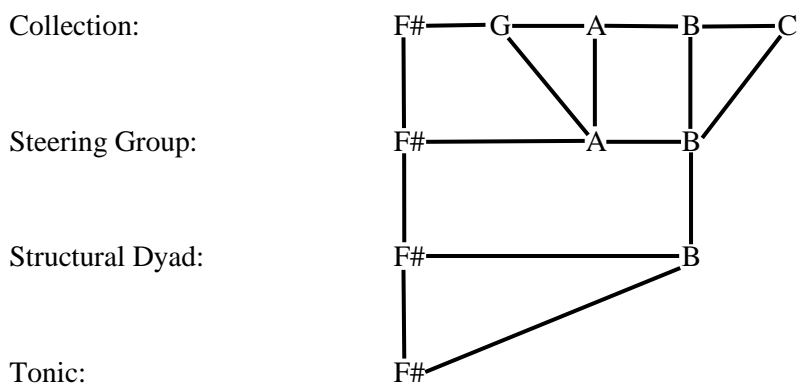


Figure 17: Prelude, frame 5



15(1) – Lowest voice moves by step to B, matched by a B in the uppermost treble voice.

15(2)-15(3) – C#-D adjunct motion in mid-bass clef voice. The emphasis given to B and the thematic reminiscences imply a return to frame 1.

15(5) – B tonic in high treble, in a lower register to 15(1).

15(6)-15(7) – Statement of structural pitches D-E in the lower treble clef and mid

bass clef.

16(1) – Tonic pitch in lowest voice.

16(2)-16(3) – C#-D adjunct motion in mid bass clef

16(3) – Structural E in lower treble clef

16(5) – Tonic pitch in lowest voice, in a lower register.

Chapter 3: Tonality in Focus

Earwitness descriptions grant the tone clock's intervallic demarcation of form is clearly audible. Jenny McLeod was convinced it could function as a fully differentiated harmonic system,¹ and Michael Norris has said of McLeod's Tone Clock Piece III:

“I think that we *do* get some sense of harmonic narrative, as the music ranges from relative consonance through an extended passage of dissonance and chromatic complexity, resolving in a passage of relative ‘stasis’ and sense of resolution.”²

But do these descriptions qualify the tone clock to be elevated to the status of a tonality? A judgement cannot be made in this regard until a satisfactory definition of tonality has been found. This will be the focus of this chapter, in which I explore theories of tonality with the purpose of finding a suitable definition.

What is Tonality?

William Thompson has divided theories of tonality into five genera – *harmonic*, *functional*, *scalar*, *colour*, and *centrist*.³ The following exposition of tonality will be based upon this division, outlining and evaluating examples of each in turn.

Harmonic Tonality

The first of Thompson's tonal genera is *harmonic tonality*. Bukofzer defines it as “a system of chordal relations based upon the attraction of a tonal centre”⁴ while Dahlhaus states that “tonal harmony rests upon two assumptions; first, that a triad constitutes a primary, direct unit, and second, that the progression of chordal roots establishes a key.”⁵ The paradigmatic harmonic theory of tonality was that of Jean-Philippe Rameau, and although the term ‘tonality’ postdates Rameau's

¹ McLeod in Schat, 1993, p. xxiii.

² Norris, 2006a, p. 81.

³ William Thomson, *Tonality in Music: A General Theory* (San Marino, CA: Everett, 1999), p. 9.

⁴ Manfred Bukofzer, *Music in the Baroque Era* (London, UK: Dent, 1948), p. 12.

⁵ Carl Dahlhaus, *Studies on the Origin of Harmonic Tonality*, trans. Robert O. Gjerdingen (Princeton, NJ: Princeton University Press, 1990), p. 3.

theory, his work forms the basis for later formulations of the genera.⁶

Rameau's theory of harmony has its basis in two fundamental chordal sonorities: the arithmetic-derived triad or 'perfect chord', and the dominant seventh derived in turn from the triad. All other chordal sonorities treated by Rameau such as altered sevenths of the augmented fifth, ninths, chords of the added sixth and elevenths are shown to be derived from these two chords. This is achieved either by addition of extra tones, including addition of bass notes by 'supposition' as when the dominant seventh G-B-D-F is transformed into a ninth by addition of G; by altering tones; or by borrowing tones from outside the chord, as when he derives a chord equivalent to the diminished seventh by exchanging the fifth degree for a flattened sixth in a dominant seventh chord.

Unlike some of the later theorists discussed below, Rameau theorized the subdominant (*sousdominante*) and dominant (*dominante*) not as specific tonal regions or functions, but rather as chordal types.⁷ 'Dominant-ness' is simply determined by bearing a seventh chord, while 'subdominant-ness' consists in bearing an inversion of the perfect chord, with or without an added sixth. 'Tonic-ness' is created by reserving the root triad without additional tones, to characterize the triad built upon the fundamental scale degree.

"In Rameau's system, the thesis that the tonic, dominant, and subdominant establish a key means that in order to unite into a progression, chords must form a chain of dissonances that terminates in a consonance – the *accord parfait* of the *note tonique*."⁸

In Rameau's words, "the entire harmonic progression of dissonances consists solely of a chain of dominants."⁹

Rameau conceived of all relations between harmonies in terms of cadences.¹⁰ As the dominant seventh is derived from the triad, in such a way that the triad or could be seen to contain the dominant seventh within it, in Rameau's conception

⁶ Hyer, p. 6.

⁷ Dahlhaus, p. 31.

⁸ Dahlhaus, p. 31.

⁹ Rameau, p. 288.

¹⁰ Hyer, p. 7.

the dominant seventh naturally leads back to its source in the tonic triad. these two chords form his harmonic paradigm as the perfect cadence. As all chords are derived from the perfect chord, so all harmonic progressions are derived from transformations, inversions and diversions from the perfect cadence. This can be seen in the imperfect cadence, where the basic form is simply reversed and transposed to move from the subdominant to the tonic, and the deceptive cadence, where a perfect cadence is evaded by a substitution of the root.

While all three chords of later functional theory (explained below) are present in his harmony – forming what Rameau calls the ‘mode’¹¹ – this acts rather as a generator of the scale than of tonality, as the three chords together contain all of the notes which constitute the scale. Tonal motion is firmly focused upon prototypical cadences directed by the resolution of dissonance through voice-leading.

This voice-leading based upon simple principles. Firstly, Rameau requires the bass move by consonant interval and progress towards the more perfect intervals as a phrase comes to rest. Secondly, as the progression of a dissonant sound is determined by the consonance nearest to it, major dissonances resolve upwards while minor dissonances resolve downwards. Dahlhaus notes that, while the resolution of dissonance and the progression of the fundamental bass determine a chord's meaning,¹² the resolution of the bass is in fact determined by the resolution of the dissonance.¹³ Thus, it would seem that harmony in Rameau's conception emerges from voice-leading. This is implied in Rameau's assertion that, when extended chords containing dissonances are not used, harmonic context and function cannot easily be distinguished.¹⁴ The supposed projection of a non-existent fundamental bass is also evidence that ‘function’ is the result of voice-leading. Even if the fundamental bass is not present, if the relevant voice-leading is present the chord can still be identified as fulfilling the same musical role. Thus, it is the relevant voice-leading which is perceptually important in identifying what

¹¹ Hyer, p. 7.

¹² Dahlhaus, p. 25.

¹³ Dahlhaus, p. 24.

¹⁴ See Rameau, p. 229.

later theorists would describe as a chord's harmonic function.

Thomson criticizes harmonic tonality on the grounds its requirements are largely arbitrary. Firstly, our own listening experience provides evidence against the claim that at least two chords are required to establish a tonality. Thomson cites the single chord of the first-act Prelude to Wagner's *Das Rheingold* as just such evidence. Secondly, the necessary requirement of chords is questionable. If these chords have roots, which are capable of representing their resultant chords, it should be possible for a string of bare pitches to create a satisfying harmonic tonality. The demands for both chords and harmonic roots are contradictory. Thirdly, many harmonic progressions muddy the tonical waters, so to speak. In Thomson's example, a I-V-vi-iii progression in C major may be heard as consisting of C major followed by G major, then followed by A minor and E minor. It is unclear which chord forms a tonal centre; to determine this is essentially an assumption, meaning tonicity must simply be assumed in many cases. Lastly, the acoustical grounding of the theory is problematic, particularly regarding the status of the minor third, and the supposed subsidiary status of the subdominant to the tonic chord. Similarly to the example related above, what prevents I-IV in C from being heard as a perfect cadence V-I in F is unclear.

Functional Tonality

It will be clear from the frequent use of the term 'function' in relation to harmonic tonality, these two genera are closely related. *Functional tonality* is essentially a re-formulation of harmonic tonality to accommodate the context-related criticisms such as that regarding tonicity and the status of chord IV mentioned above. Functional tonality states similar elements within a collection can be distinguished by what they do, in this case the chords posited by harmonic tonality, and is primarily associated with the writings of Hugo Riemann.¹⁵

Riemann re-formulated Rameau's harmonic mode of tonic, dominant and subdominant as a trinity of basic functions regulating tonality. Basing his approach upon the three stages of Hegel's dialectic, for Riemann the tonic acts as

¹⁵ Thomson, 1999, p. 113.

a mediator between the opposing poles of subdominant and dominant – tonic providing the thesis, subdominant a contrasting antithesis, and the dominant, including a cadential return to the tonic, forms the synthesis.¹⁶ Each pole of this harmonic triangle can assume the function of either of the other two poles. Thus a dominant may be tonicized, allowing further expansion into a secondary dominant, or similarly with the subdominant into secondary subdominants. This means the two poles of subdominant and dominant achieve significance with regard to the circle of fifths, as their tonicization provides a means of movement through the circle to more harmonically distant regions. Riemann also proposed the categories *parallel-chords* and *leading-tone-change chords*, which allowed other chords, with shared notes, to temporarily ‘borrow’ any of the three harmonic functions. For instance, chord VI may function as a parallel to the tonic, as they share two notes, the tonic and the mediant. Likewise, VI may substitute as IV, as a leading-tone-change chord.

Evidence has already been provided, for two chord harmonic tonality, that any theory claiming that multiple chords are necessary to establishing a tonality is unsatisfactory. Functional tonality also continues many of the acoustical excesses of harmonic tonality, as Riemann attempted to explain the major/minor split as generated by the overtone series and a speculative undertone series which has never been shown to exist.

Scalar Tonality

Scalar tonality is any theory of tonality which assumes a scale, mode or other pre-existing pitch collection as a generator of tonality through the kinematics of the relationships between the tones, as some tones are drawn towards others. A paradigmatic theory of scalar tonality was that of François Joseph Fétis. It was Fétis who first popularized the term ‘tonality’,¹⁷ although it had been coined by Choron in 1810 to describe the arrangement of dominant and subdominant around a tonic.¹⁸ For Fétis, “tonality resides in the melodic and harmonic affinities of the sounds of the scale, which determine the successions and aggregations of these

¹⁶ See Thomson, 1999, p. 116.

¹⁷ Hyer, p. 3.

¹⁸ Hyer, p. 1.

sounds.”¹⁹ To put this another way, tonality is “the necessary connection between the notes of the tone system.”²⁰ Fétis conceived these relations as forces of attraction between the notes of the scale and categorized each scale degree in terms of relative attraction and repose.²¹ For example, the tritone between 4 and 7 forms an *appellative dissonance*, because both notes summon (Fr: *appeler*) their note of repose, these being 3 and 1 respectively. Hyer notes these melodic tendencies are charged with harmonic implications, as notes of attraction function like the needles of a musical compass pointing towards the tonic as a point of repose.²² Thompson sums up: “what he [Fétis] seems to be saying is that the set is itself a brew of procreative powers, powers transferrable (by those who know how) to strings of tone, producing analogous musical results.”²³

Fétis divided the history of harmonic practice up until his own time (c.1844) into four eras. The earliest was the *Unitonic*, also known as *tonalité ancienne*. This was the tonality of plainchant. Due to the taboo placed upon the interval of a tritone, modulation was supposedly impossible. Thus, music was kept within the bounds of a single tonal centre. The Unitonic was followed by the *Transitonic*. This harmonic order began with Monteverdi and Zarlino around 1600 and is characterized by the introduction of familiar cadences and treatment of harmonic rhythm, and the functional dominant seventh chord embodying the forces of attraction described above. Third came the *Pluritonic*. Fétis identifies this order with the music of Mozart. Enharmonism allowed for a greater range of modulation, which became an important expressive device. Use of diminished chords and augmented sixths was also characteristic. Finally, Wagner is a representative composer of the *Omnitonic*. Chord alterations and note substitutions have become so ubiquitous that it becomes impossible to identify fundamental chords. As the music has no easily identifiable single tonic, it supposedly occupies all possible tonics.

The last three harmonic orders make up what Fétis labels *tonalité moderne* –

¹⁹ Quoted in Thompson, 1999, p. 163.

²⁰ Quoted in Schat, 1993, p. 99.

²¹ Hyer, p. 3.

²² Hyer, p. 3.

²³ Thomson, 1999, p. 163.

equivalent to harmonic tonality. Dahlhaus summarizes the features Fétis describes as characteristic of *tonalité moderne* as

“first, the dominant seventh chord, and second, the method of using sixth chords to mark the half-step degrees 3 and 7 of the major scale as *notes de tendance*. The definition of *tonalité moderne* as the ‘trans-tonic order’ means no more than that the dominant seventh chord, which establishes the key, is at the same time a means for introducing a modulation.”²⁴

A significant aspect of Fétis’ thinking is these mechanics of musical attraction were not to be attributed to natural forces or mathematical law.

"But one will say, 'What is the principle behind these scales, and what, if not acoustic phenomena and the laws of mathematics, has set the order of their tones?' I respond that this principle is purely metaphysical. We conceive this order and the melodic and harmonic phenomena that spring from it out of our conformation and education."²⁵

Thus, the force felt between notes of attraction and their notes of repose is culturally-determined.

“The mathematical division of a string and the numerical ratios that determine intervallic proportions are powerless to form a musical scale because, in their numerical operations, intervals occur as isolated facts without requisite connections among themselves, and without anything that determines the order in which they should be linked together; whence he [Fétis] concluded that every gamut or musical scale is the product of a metaphysical law born of certain human needs or circumstances.”²⁶

As both Dahlhaus and Thompson point out, the relationship between tonality and its supposed foundation of the scale is troublesome. “On the one hand, tonality is the ‘regulating principle’ (*principe regulateur*) of relationships among tones [...] On the other hand, tonality ‘results’ from the scale.”²⁷ While it seems easy to accept that scales are generative, this in fact sidesteps the question of how the

²⁴ Dahlhaus, pp. 12-13.

²⁵ Quoted in Dahlhaus, p. 8.

²⁶ François-Joseph Fétis, *Biographie Universelles des Musiciens*, 2nd edn (Paris, 1862). Quoted in Dahlhaus, p. 14.

²⁷ Dahlhaus, p. 11.

hierarchies of less-stable tones pulling towards stable tones came to be.²⁸ The possibility of different hierarchies existing within identical scales, as in the church modes, poses an unresolvable problem for any tonal theory positing a pitch collection as a cause.²⁹ This means scalar tonality cannot provide a satisfactory account of tonality.

Colour Tonality

The account of tonality as colour is based upon the metaphorical connection between the overall ‘shade’ of the pitch collection of a piece of music and the palette of colours an artist may use to characterize a painting. In this way, “to be considered ‘tonal’ the general colour scheme of a painting must be of a dominant hue (or key) with each subordinate hue in the composition harmonized by mixing it with a tinge of the dominant hue.”³⁰

An example of colour tonality is found in the theories of Graham George. Drawing on Riemann’s functional tonality, he believed the subdominant-dominant opposition embodied a contrast of colour. A move around the circle of fifths towards the dominant or ‘sharp’ side increased the brightness of the music. A move in the opposite direction, through the subdominant, ‘flat’ side of the circle of fifths, produces the opposite – a darkening of the music. This same effect could also be felt in the contrast between major and minor keys, as the sharper qualities of major keys make them brighter in contrast to the darker, flatter minor keys. For George, these contrasts were absolutes, meaning for instance that music written in E major will always be brighter than the same music transposed into A flat major.

Other approaches to colour tonality include what Moritz Hauptmann referred to as *pitch meaning*: the different tint the same pitch can possess as it fulfills different roles within the scale. For instance, B as leading tone to C has a very different tint to B as mediant of G. Thomson also cites the precedent of Classical Greek music, where a different arrangement of intervals within tetrachords surrounding a

²⁸ Thomson, 1999, p. 163-164.

²⁹ Thomson, 1999, p. 200.

³⁰ Harvey L. Jones, *In Twilight and Reverie: California Tonalist Painting 1890-1930* (Oakland, 1995), p. 2. Quoted in Thomson, 1991, p. 186.

common centre, or *mēse*, defined the modes, each possessing its own *êthos* equivalent to *mood* or *colour*. These colours were further enhanced by the availability of different qualities of tetrachord – diatonic, chromatic and enharmonic – which allowed an immense variety of tonal tints.

While colour may be an illuminating and necessary aspect of tonality, an account of tonality which restricts itself to mere colour is begging the question. For, as can be seen from the example of Moritz Hauptmann’s pitch meaning, the colour of a pitch or pitch collection is dependent upon the hierarchy which is projected within that collection. A clear instance of this is the medieval church modes. Ostensibly made up of an identical pitch collection, different colours emerge from treating different pitches as tonic and as leading to that tonic. Thus, it is meaningless to speak of a tonality of colours, when in fact what is meant are the colours of tonality. Thomson also notes that, when tonality is exclusively a colour matter, it becomes “depressingly vague, in that other properties (timbre, loudness levels, and texture) leak into the conveyed meaning quite as much as pitch.”³¹

Centrist Tonality

The last of Thomson’s genera of tonality is also the most basic: *centrist tonality*. This can be very simply defined as “a winding of melodic contour around a pivotal pitch, either in local batches or throughout a whole.”³² It is also often taken to mean the assertion of a single chord as a musical centre. This assertion of a perceptual centre is usually achieved through techniques of emphasis such as repetition, and the placement of the central pitch or chord at structurally significant moments.

This genera is controversial, as the claim pitch centricity constitutes a kind of tonality seems to be contradicted by the numerous twentieth-century examples of atonal or post-tonal music written with deliberate centricity. The symmetries in the music of Bartók and Webern are examples, for instance the mirror forms which populate much of Webern’s Symphony, Op. 21. The composer and theorist

³¹ Thomson, 1999, pp. 190-191.

³² Thomson, 1999, p. 212.

George Perle makes use of the concept of centrality in his argument for the presence of tonal centres in atonal music, or twelve-tone tonality. Perle based his system upon arranging cycles of the twelve pitch classes into arrays, which are then create array families and give rise to what he calls ‘master arrays’.³³ Certain chords will take on a tonical role when they possess unique connections within this system of arrays and cycles.

Centricity is central to tonality – as Thomson claims, “centricity, in the focal sense, is the *sine qua non* of tonality. But it is not everything.”³⁴ While all tonal music is centric, not all centric music is tonal. To classify a certain chord as a tonic centre according to a limited set of criteria – such as structural position or position within the texture, without considering what may be occurring alongside the supposed tonic – is an oversimplification. Furthermore, many instances of supposed centrality occurring in atonal or post-tonal music imply that a pitch class is functioning as the centre in an abstracted, idealized and transposed geometric space. This is not reflected in the sounding musical surface. For Thomson, centrality must apply to the perception of actual pitches, not pitch classes.³⁵ Larson concurs: “Musical forces involve distance and direction [...] These distances and directions exist in the world of pitches, not in the world of pitch classes.”³⁶

Tonality Frames: A General Theory

Thomson, as an improvement upon and synthesis of the preceding theories, proposes the *tonality frame* as a universal theory of tonality. His argument proceeds as follows.

Thomson holds the musical act is undergirded by what he calls “the objectification of sound.”³⁷ This originates in the human survival instinct, and its resultant drive to find order within sensory perceptions. Taking a structuralist position, Thomson argues that many aspects of the objectification of sound as

³³ See Thomson, 1999, p. 235.

³⁴ Thomson, 1999, p. 242.

³⁵ Thomson, 1999, p. 230.

³⁶ Steve Larson, 1997, p. 123.

³⁷ Thomson, 1999, p. 249.

music are shared among all cultures globally, resulting in common musical patterns. Principally among these is monotonic chant. These chants possess “a distinct harmonic shape: the harmonic content of each singular pitch. The envelope of that timbral baggage defines its *colour*, its *scale*; the ‘function’ of the one pitch is that of an indubitable hierarchical nucleus, a *root* or *Tonic*.”³⁸ In chants with a greater variety of pitches, pitches begin to carry not only elaborative functions but associative as well, occupying a hierarchical ‘middle ground’.

The projection of pitches within these relationships are determined in part by Otto Ortmann’s functions of directionality and disjunction – that is, whether pitches are approached from a single direction or both, and whether by step or leap.³⁹

Approaches from both above and below and by step project a pitch most strongly. For Thomson, the harmonic series also plays a role, although a precise definition of what this may be is not given. It appears that pitches are parsed according to similarity with the series, meaning that intervals such as the fifth and third seem stronger than intervals higher up the series.

In a monophonic melody, the musical treatment of pitches within these perceptual channels – the framing actions – create what Thomson labels a *tonality frame*. Structurally emphasized pitches act as ‘pillars’ for others within their span, and movement through the frame is influenced by the relative strengths of the structural pitches. These frames are created entirely through the musical events constituting a musical work and are not in any way predetermined by a scale or mode. Tonality frames constitute a synthesis of the three genera listed above: colour tonality, scalar tonality and centrist tonality.

Tonality frames are demonstrated in diagrammatic form. Semibreves represent tonic pitches, while minims represent non-tonic secondary pitches. Crotchets are structurally insignificant participants in the tonality frame, and stemless note heads represent pitches of elaboration, with the direction of support indicated by slurs. This is demonstrated in Figures 18 and 20. Figure 18 is a plainchant of the

³⁸ Thomson, 1999, p. 254.

³⁹ Otto Ortmann, ‘On the Melodic Relativity of Tones’, *Psychological Monograph* 35, 1926, 1-47.

Agnus Dei for the Easter solemn mass, and Figure 19 is Thomson's tonality frame diagram for the same chant.⁴⁰ This analysis will be discussed further in the next chapter.

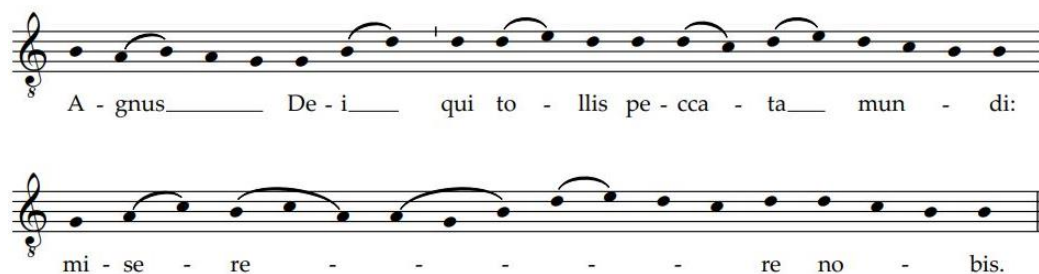


Figure 18: Agnus Dei, *Liber Usualis* 18



Figure 19: Thomson's tonality frame for the Agnus Dei

Tonality frames provide a more satisfactory account of tonality than any of the five genera, as the frames do not fall prey to many of the objections the other theories are subject to. Tonality frames are perceptually-based, they do not beg the question of assuming a tonic, nor do they require a pre-conceived pitch collection such as a scale to be 'created' by. They also do not require any specious theorizing of a 'necessary' collection of chords. However, Thomson's reliance upon the harmonic series, although indistinct, is troublesome for his theory. As mentioned earlier, it is not clear how it relates to the formation of common patterns shared among musical cultures but it seems to be implied that intervals are measured relative to the series, and those which are simplest or lowest in the series are preferred as more structural. This is troublesome, as Thomson here appears to argue against himself. He cites examples of tonality frames consisting of a 'dominant' pitch a fourth above the tonic, for instance a C tonic with an F 'dominant'. A comparison with the harmonic series would justify favouring F as the more structural, more fundamental tone. A similar problem occurs in tonality frames including the acoustically obscure minor third as a secondary pitch.

⁴⁰ In Thomson, 1999, p. 295.

However, the vagueness of Thomson's application of the series means that it can easily be displaced in favour of simple acculturation without doing harm to his theory as a whole. An example of scales totally removed from acoustics, such as the slendro and pelog of Indonesian gamelan, seems to be evidence in favour of a cultural, not acoustical, process.⁴¹

What Tonality is the Tone Clock?

The tone clock has a number of similarities to harmonic and functional tonality. The four steered transpositions of the hour triad in the classic tone clock, which Schat calls the *quarters* of the hour, mirror the divisions of functional tonality – tonic, dominant and subdominant, expanded by the mediant.⁴² The symmetries which Schat describes as the bearers of Riemannian functional tonality can also be attributed to steering, as tonic, dominant and subdominant can be analysed as chords of hour XI, steered by hour IX. These steerings are mirrored around the diminished chord, which acts as a kind of tonal anchor and identifier and is perhaps related to the tritone of the dominant seventh chord. This can then be mirrored and inverted to create a minor form, as the inverted hour IX is transposed onto A, E and D, forming the tonal functions of the relative minor.⁴³

There are also similarities between the tone clock and both scalar and colour tonality. The connection to scalar tonality is seen in how the harmony of the hours and their steerings emerge from the inherent properties of the chromatic pitch collection in a similar fashion to Fétis' account of diatonic harmony. Colour tonality as the colour or tint of interval within each tonality is also what serves to mark the formal structure of tone clock music. This is seen in Schat's own description of the hours, where he speaks of the tonalities in terms of the 'tone colour' of their distinctive intervals. De Groot compares this colour to the *rasa* of classical Indian *rāgas* or the *êthos* of the Greek modes.⁴⁴ McLeod, too, describes the chromatic world as constituting "a rich and radiant world of colours, the

⁴¹ See Malm, 1977, pp. 46-7.

⁴² Schat, 1993, p. 108.

⁴³ Schat, 1993, p. 107.

⁴⁴ De Groot, 1984b, p. 25.

chromos from which our chromatic system takes its name.”⁴⁵

Nevertheless, significant problems emerge for an explanation of the tone clock as a tonality regarding each of the similarities noted. Firstly, the symmetries between the quarters of each hour, while similar to Riemann’s description of the tonal functions, in practice have not given rise to anything remotely like perceivable harmonic functions. This is because there is an innate contradiction between the principles of the tone clock and the principles of truly tonal motion. The tone clock can be seen as a recent development within the centuries-old tradition of chromatic cyclicity, or the practice of transposing any pitch structure onto any note of the twelve chromatic pitches. In most historical examples, this obscures the tonic pitch. According to De Groot, in order to compose more freely with chromatic cyclicity, “making use only of the laws associated with chromaticism, the connection with diatonicism must first be severed” – i.e. the tonic must be abandoned.⁴⁶

Secondly, challenges to the belief tonal properties emerge from any a priori collection of notes have already been noted, principally the link between the collection of pitches and the relationships between pitches which emerge. The tone clock may provide an encyclopaedic description of all possible arrangements of pitches within the chromatic system, their interrelationship and the patterns which result – certainly from the inherent properties of the chromatic collection – but this does not constitute a tonality. Fétis was not referring to the set of all possible geometries within the diatonic collection as necessary connections. He instead meant the relationships created by one set of musical framing motions within a single possible geometry of that set. Thus, the tone clock may be seen as an encyclopaedic description of the interrelationships between all possible geometric ‘grounds’ for tonalities, as each possible geometry in the chromatic system may give rise to a number of tonalities through different musical treatment.

⁴⁵ McLeod, 1994, p. xv.

⁴⁶ De Groot, 1984b, p. 18.

Lastly, while it cannot be argued the distinctions between interval colour *do* serve to demarcate the form of a musical work using the tone clock, whether this deserves the label ‘tonality’ or ‘tonal glue’ is problematic. The demarcation of form is something which any parameter of the music could achieve – dynamics, timbre, rhythm. Describing this as a special property of the tones thus seems misplaced. It is also problematic because the colour of any pitch collection, in the broadest sense of the word, changes depending upon how it is treated musically. What each hour triad provides is therefore more of a family of colours than a clearly-defined colour tonality.

Expressive Complications

Another claim made on behalf of the tone clock by its inventors is troublesome. Schat appears to attribute a determinate expressive quality to each hour triad. This can be seen when he describes hour XI as “Gothic, pious [...] Sultry in the summer evening”,⁴⁷ or hour VIII as “Purple evening sky. The theatres are starting. Once upon a time.”⁴⁸ It seems that in Schat’s approach, a composer could control musical tension by progressing through hours with contrasting inherent tensions and expressive qualities. McLeod’s view is similar. She refers to the chromatic groups as “individuals with different characters, histories, capabilities and propensities.”⁴⁹ A troubling theoretical bugbear emerges from this approach. As Rochberg noted, the New Music as ‘Space-Time music’ projected new types of sound relationships as tensions in themselves,⁵⁰ which rendered the New Music static, antidynamic and incapable of articulating a form. This insistence upon the archetypal character of intervals as a force not only for structuring music but also for regulating musical tension and expression would place Schat’s new musical utopia within the bounds of mere rhetoric and would present no improvement upon the New Music’s lack of tonal glue.

A Conclusion and a Proposal

A short summary of how the argument has progressed will be helpful at this point.

⁴⁷ Schat, 1993, p. 69.

⁴⁸ Schat, 1993, p. 66.

⁴⁹ McLeod, 1994, p. 36

⁵⁰ Rochberg, p. 180.

We have seen how developments in the first half of the twentieth century created entirely new approaches to music, embodied in the aptly-named New Music. But some composers reacted against the New Music, with its abandonment of an appeal to perception. We have seen that a consensus among other theorists shows the relevance of the critiques levelled at the New Music by composers such as George Rochberg and Peter Schat.

Schat created the tone clock theory in an attempt to reach a synthesis – emancipated intervals used in a way that was still comprehensible and still possessing a tonal glue. His theory was based upon two principles. The first was limited interval content, embodied in the hours, twelve triads made up of all possible combinations of two intervals the chromatic system offered. The second was the steering principle, a system of transposing hours onto each note of another pitch collection, usually a tetrad. This allowed twelve note aggregates to be generated and could take place on deeper structural levels. New Zealander Jenny McLeod expanded his theory into a comprehensive, all-encompassing theory of chromaticism by making connections with Alan Forte’s pitch-class set theory. However, tonal glue is best described by William Thomson’s tonality frames – or would be, with revisions to account for vertical combinations between voices in a texture. According to this description, the tone clock does not constitute a true tonality.

A caveat is necessary. There is no doubt that the tone clock, particularly in Jenny McLeod’s conceptualization, is a rich and comprehensive system of music-making. A concise statement of the point argued for above would merely be that not all musical systems are tonalities. To argue so, as Schat does, is to use the term tonality in different senses, i.e. to equivocate. To claim that systematization is sufficient for expression is to make a similar argument: not all musical grammars are expressive grammars.

With this in mind, a proposal can be put forward: that an expanded tonality of emancipated intervals can be explored by using Thomson’s framing principles but described according to the principles of tone clock groupings and steering. This

will easily allow framing structures to be maintained in contexts of exotic intervallic makeup. The intention of this is not to ‘improve’ the tone clock. Rather, it is to use the tone clock as a tool for generating an expanded form of tonality, in order to populate an expanded musical territory with the expressive possibilities tonality is already known to possess. But first, a closer look must be taken at the mysterious framing motions which Thomson places at the core of his theory, in an attempt to refine the tonality frame to a more determinate form.

Intermezzo III

Largo

Largo (♩=80) **rall.** . . .

f, maestoso *f*

5 *a tempo* *pp* *dolce* *rall.* *a tempo*

9 *molto* *p* *mf* *piu forza*

13 *f* *p*



→ *Relevant to Chapter 6, pp. 137-139*

In this work, rhythmic groupings which emerge repeatedly allow the greater number of bars to be carved into three-beat halves. The following analysis lists the framing motions occurring in each voice.

- 1(1)-1(3):** Soprano: G
 Alto: leaps from G to C, implying these pitches as likely members of the structural steering group.
 Tenor: leaps from C to F, also implying that these are members of the structural steering group.
 Bass: silent.
- 1(4)-1(6):** Soprano: Leaps to C establishing the previous G as structural, with adjunct motion to embellishing D and back to the C.
 Alto: sustains C.
 Tenor: apparent adjunct motion to G returning to F. That the G has been leapt from in 1(1)-1(3) implies that this is in fact a structural leap through the steering group.
 Bass: silent.
- 2(1)-2(3):** Soprano: repeats structural leap G-C.
 Alto: D-C adjunct motion.
 Tenor: sustains F, with structural leap to G at 2(3)
 Bass: C tonic.
- 2(4)-2(6):** Soprano: C-D adjunct motion.
 Alto: C-D adjunct motion.
 Tenor: sustained structural C.

- Bass: leaps up through the structural steering group to F
- 3(1)-3(3):** Soprano: sustained D-C adjunct motion.
 Alto: leaps through the structural steering group from C to G.
 Tenor: sustains F.
 Bass: sustains F.
- 4(1)-4(3):** Soprano: leaps through the structural subset/steering group to a sustained G.
 Alto: G-C structural leap.
 Tenor: E-F adjunct motion.
 Bass: completes its passage through the structural steering group by moving to a G
- 4(4)-4(6):** Soprano: silent
 Alto: initiates the ascending linear progression C-D-E-F.
 Tenor: F-C structural leap.
 Bass: sustains G.
- 5(1)-5(3):** Soprano: silent.
 Alto: linear progression from 4(4) terminates on F.
 Tenor: linear progression C-D-E-F-G, initiated by C at 4(4)
 Bass: G-C structural leap.
- 5(4)-5(6):** Soprano: silent.
 Alto: sustains structural F, but leaps anomalously down to D at 5(6); Anomalously as this pitch is not a member of the steering group/
 Tenor: linear progression initiated at 4(4) terminates on G
 Bass: sustains C tonic.
- 6(1)-6(3):** Soprano: silent.
 Alto: continuation of the linear progression, apparently initiated by the anomalous D at 5(6) via D# to E. D# is a foreign tone to the collection of the previous frame of bars 1-5 (shown in Figure 20, followed by its steering tree), so this change implies a shift of frame
 Tenor: silent.
 Bass: Shifts downwards to a B. That this pitch is leapt both to and from implies that it is a member of the structural steering group of

the new frame.

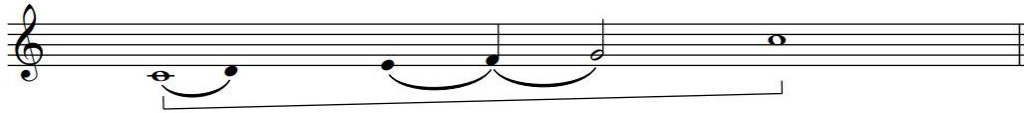
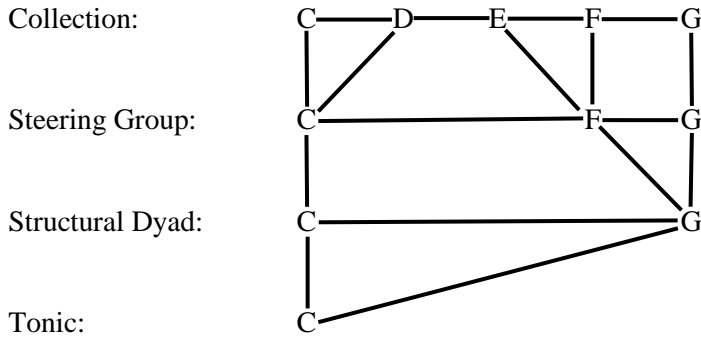


Figure 20: Largo, frame 1



6(4)-6(6): Soprano: rhythmic and registral embellishment of the pitch E, implying it as structural.

Alto: sustains E.

Tenor: leaps from B to F#, affirming them as members of the steering group.

Bass: sustains B.

7(1)-7(3): Soprano: continues the embellishments of the pitch E begun at 6(4).

Alto: sustains E.

Tenor: sustains F#.

Bass: F#-B leap, confirming their role as members of the new steering group established at 6(4)-6(5). The motions so far in the soprano and alto imply that E is the third member of this group.

7(4)-7(6): Soprano: motion between apparently structural E-F#.

Alto: apparent structural leaps E-F#-B-F#.

Tenor: sustains F#.

Bass: B-C# adjunct motion.

8(1)-8(3): Soprano: F#-B structural leap.

Alto: apparent B-C# adjunct motion.

Tenor: sustains F#.

Bass: C#-F# leap, implying a more structural role for the C# as a member of the structural subset/steering group. This means that the E in the soprano and alto voices in 6(2)-7(3) can be re-evaluated as an extended adjunct motion leading to F# at 7(4) rather than a member of the steering group

9(1)-9(3): Soprano: B-C# structural leap.

Alto: C#-F# structural leap.

Tenor: F# initiates a linear progression F#-E-D#C#-B.

Bass: silent.

9(4)-9(6): Soprano: C-B# structural leaps

Alto: C#-B structural leap.

Tenor: continues the linear progression initiated at 9(1).

Bass: silent.

10(1)-10(3): Soprano: B-F# structural leap.

Alto: structural motion B-C#.

Tenor: terminates the linear progression, begun at 9(1), on B.

Bass: silent.

10(4)-10(6): Soprano: F#-B structural leap.

Alto: sustains C#, then initiates what appears to be a linear progression via the foreign tone D.

Tenor: sustains B.

11(1)-11(3): Soprano: leaps to a C natural. This pitch is foreign to the frame of bars 6-10 (shown in Figure 21, followed by its steering tree), and the leap gives it structural force.

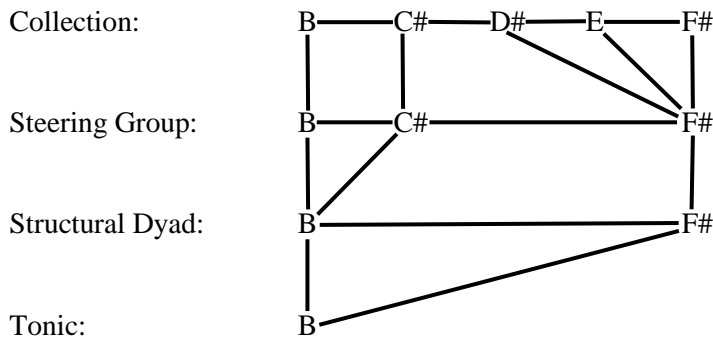
Alto: continues the linear progression from C# upwards via E and F natural, another foreign tone to frame 2.

Tenor: silent.

Bass: silent.



Figure 21: Largo, frame 2



12(1)-12(3): Soprano: sustains C.

Alto: linear progression initiated by D at 10(6) terminates at G, before leaping down to C. This implies G and C are members of the structural subset/steering group of a new frame.

Tenor: apparent structural leap C-F.

Bass: silent.

13: *All voices repeat their motions from the previous bar, but with a triple meter emphasis rather than duple. That the tenor leaps both to and from the F affirms it as a member of the structural subset/framing group. This C-F-G group is identical to that of frame one, meaning a modulation has been achieved back to the initial frame of bars 1-5.*

14: *This bar is also voiced to emphasis triple meter rather than duple.*

Soprano: C-G structural leap.

Alto: D-C adjunct motion. This C then initiates a linear progression via D and the foreign note D# at 14(6). This was the same approach used for the initial modulation to frame 2

Tenor: sustains F.

Bass: sustains tonic C.

15(1)-15(3): Soprano: sustains F#.

Alto: the linear progression initiated at 14(5) terminates at F#, followed by a leap down to B.

Tenor: sustains E, as part of an E-F# adjunct motion terminating at 15(4)

Bass: sustains B.

The leaping between F# and B, as well as the motions which emphasize them structurally, identify this bar as belonging to frame 2.

15(4)-15(6): Soprano: F#-C#-B structural leaps.

Alto: sustains B tonic.

Tenor: terminates adjunct motion from 15(1) on F#.

Bass: sustains B.

16: *As with bar 13, all voices repeat their motions from the previous bar but with a triple meter emphasis rather than duple. This is with two slight changes:*

Alto: the E-F#-B pattern of 15(1)-15(3) is altered by eliminating the F#, leaving just E-B. This makes the motion anomalous, as a non-structural tone which cannot be classed as an adjunct – unless to a pitch present in another voice – is being leapt from.

Tenor: the rhythm of the adjunct motion is altered slightly to match the triple meter.

17: Soprano: apparent structural Leap C-G. These are both pitches foreign to frame 2 but belong to the structural subset/steering group of frame 1 and imply a modulation

Alto: silent.

Tenor: sustains apparently structural G.

Bass: D is sustained, leading to an apparent linear progression from D to F at 17(4)-17(6). This is troublesome, as D in frame 1 is a non-structural tone, so cannot initiate a linear progression.

However, the smooth stepwise movement from the C# in bar 16 – which is structural within frame 2 – implies a linear progression between structural pitches of different frames.

18: Soprano: like the bass in bar 17, this voice appears to initiate a descending linear progression from F which seems to terminate upon a non-structural adjunct tone D. Unlike the previous bar, this progression does not clearly terminate by step upon a structural pitch of a different frame, rather it leaps down to B at 19(1). A stretch of the listener's ear could perceive the alto motions B-C#-

D-C as providing long-range closure upon C, however this stretches the concept of framing motions a little too far beyond consistency to be relied upon as an explanation

Alto: silent.

Tenor: sustains G.

Bass: C-D adjunct motion.

19: *The vertical sonority and motions of this bar identify it as belonging to frame 2.*

Soprano: sustains B tonic.

Alto: B-C# adjunct motion.

Tenor: sustains F#.

Bass: C#-B adjunct motion.

20: *The vertical sonority and motions of this bar identify it as belonging to frame 1.*

Soprano: sustains F.

Alto: D-C adjunct motion.

Tenor: sustains G.

Bass: sustains C tonic.

Chapter 4: Framing in Focus

In this chapter, an attempt will be made to create a taxonomy of framing motions, in order to understand the concept of ‘tonal framing’ central to Thomson’s theory. The basis of this attempt will be a comparison of framing with different conceptions of prolongation. Thomson notes there is a significant degree of common ground between a tonality frame and a Schenkerian *ursatz*, as both are encapsulations of the whole musical object into a single defining melo/harmonic unit.¹ As such, an outline of Schenkerian analysis will provide a useful starting point.

Tonality Frames and Schenkerian Analysis

It is the concept of music as the art of elaboration which forms the core of Schenkerian theory.² Schenkerian analysis posits that, although tonal music is complex, it can be understood as the elaboration of simple structures that lie beneath the musical surface.³ In a similar fashion to the way a counterpoint exercise in fifth or fourth species hides beneath the surface a first species obscured by elaboration, Schenkerian analysis proposes that there are simpler and more fundamental structural ‘strata’ hiding beneath the surface of all tonal music: “A Schenkerian analysis aims to imagine the complexities of tonal music as elaborations of simpler layers beneath the surface of the music.”⁴ This can also be related to the way a variation may maintain the theme hidden beneath the surface. As Pankhurst notes,

“It is possible to understand a theme and variations as two layers: the theme is a simpler layer on top of which the embellishments of the variation are built. One of Schenker’s most important ideas is that even the most complex tonal music is layered in this way.”⁵

A Schenkerian analysis attempts to reach this fundamental layer by showing how

¹ Thomson, 1999, p. 278.

² Tom Pankhurst, *SchenkerGUIDE: A Brief Handbook and Website for Schenkerian Analysis* (New York, NJ: Routledge, 2008), p. 5.

³ Pankhurst, p. 5.

⁴ Pankhurst, p. 12.

⁵ Pankhurst, p. 10.

tonal compositions can be seen as the elaboration of a small number of basic patterns.⁶ It is by understanding these patterns that we can begin to identify what is distinctive about a given piece and its structure.⁷ This is achieved through reducing a determinate taxonomy of embellishment figures to particular underlying structural pitches. The relationship between the pitch and its embellishment figure is one of *prolongation*, whereby an embellished pitch is said to be prolonged by its embellishment.

The peeling back of these layers of embellishment figures is known as a Schenkerian reduction and takes place over a number of distinct structural levels. The *foreground* is reduced to several *middle ground* levels, which are in turn reduced to the simplest possible expression of the musical shape, which is the *background* or *ursatz*. The justification for this approach is that a Schenkerian analysis increases our understanding both of a musical work's larger-scale shape and its intricate details.⁸ Regarding the larger-scale shape, reduction of a musical work to more basic structural levels allows an analyst to see how tension and the resolution of dissonance are projected across large spans of music by being present at a more basic level.⁹ By following the resolution of these long-range patterns of resolution, the form of a musical work's tension and release, and its climactic point, become clearly visible. Charles Rosen notes that in this regard, Schenkerian analysis possesses a psychological accuracy to the experience of musical structure which is unchallengeable.¹⁰

Many theorists have criticized Schenkerian theory as being too reductionist, as structural analysis necessitates a reduction of some of the most artistically relevant details of a musical work – rhythm, melody, timbre – as they are regarded as merely details of prolongation.¹¹ Rosen goes so far as to dub this “a failure of

⁶ Pankhurst, p. 4.

⁷ Pankhurst, p. 4.

⁸ Pankhurst, p. 12.

⁹ Pankhurst, p. 27.

¹⁰ Charles Rosen, *The Classical Style: Haydn, Mozart, Beethoven*, expanded edn (New York, NJ: Norton, 1997), p. 34.

¹¹ Joseph Kerman, 'How we got into analysis, and how to get out' *Critical enquiry* 7/2 (Winter 1980), 311-331 (p. 325); Rosen, p. 34-35.

critical decorum”.¹² There is also the problem of whether the abstracted ursatz – discussed below – is relevant to the musical experience. Rosen notes that other, more fundamental principles may be present in a musical work which are not included in the reduced basic shape.¹³

In a strict Schenkerian analysis, there are a very limited number of shapes a fundamental shape or ursatz may take, These are the basic lines, which always consist of a downward arpeggiation of the tonic major triad, with or without passing tones.¹⁴ Simple forms of these are shown in Figs. 22 to 24.



Figure 22: 8-1 fundamental line

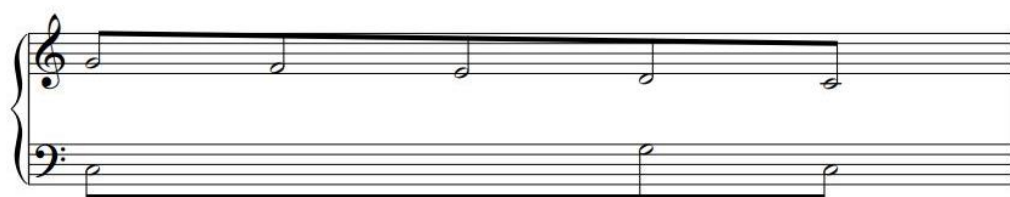


Figure 23: 5-1 fundamental line

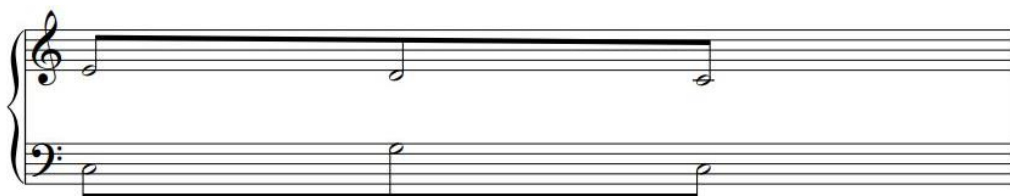


Figure 24: 3-1 fundamental line

Thomson relates these fundamental lines to the basic octave-fifth tonality frames which he proposes underpin all ‘naturally-tonal’ music, as both present a very simple structure which underlies complex musical motions.¹⁵ Other similarities between tonality frames and Schenkerian theory are that Schenkerian analyses and

¹² Rosen, p. 35.

¹³ Rosen, p. 9.

¹⁴ Nicholas Cook, *A Guide to Musical Analysis* (New York, NY; London, UK: Norton, 1987), p. 40.

¹⁵ See Thomson, 2002, p. 307.

tonality frames both represent a reduction of the musical surface; both reductions include descriptions of the structural relations, the hierarchies, between tones. This means that the tonality frame is just as guilty of violating ‘critical decorum’ through the sin of omission as a Schenkerian reduction although, unlike a Schenkerian analysis, the purpose of a tonality frame is not to provide a comprehensive understanding of the total musical work. Rather, it is only to analyze a musical work’s *tonality*, not form, rhythm, or timbre. Both types of analysis are also determined by the motions of the musical work, rather than pre-defined tropes as in harmonic analysis. However, a strict Schenkerian analysis seeks to relate the musical surface to increasingly archetypal background structures, in an attempt to find a prolongation of a single tonic sonority as the *ursatz*. In this respect, a Schenkerian may consider these deeper motions within the music as pre-determined in many respects, rather than assuming a different form in each musical incarnation.

The two theories differ regarding which of the types of hierarchy subsisting within a musical work they represent. Larson notes theorists have distinguished between diachronic hierarchies and synchronic hierarchies, i.e. those which subsist between events occurring across time, and those subsisting between events occurring simultaneously.¹⁶ Jamsheed Bharucha labels the former an *event hierarchy* and the latter a *tonal hierarchy*.¹⁷ What a Schenkerian analysis represents is the event hierarchy within a piece with respect to an assumed tonal hierarchy, while a tonality frame represents the tonal hierarchy which emerges from the motions of a piece. Tonality frames therefore represent an over-arching aspect of the music as a whole, an aspect which might be described as ‘outside-time’.¹⁸ Also, unlike tonality frames, Schenkerian analysis has developed determinate typologies of basic embellishment figures, in principle equivalent to framing motions, which serve as a kind of ‘dictionary’ during analysis, as the typology provides a guide to the structural relationship between an embellishment figure and the underlying, prolonged pitches to which it can be reduced.

¹⁶ Larson, p. 112-113.

¹⁷ Jamsheed Bharucha, ‘Event hierarchies, tonal hierarchies, and assimilation: A reply to Deutsch and Dowling’, *Journal of Experimental Psychology: General* 113 (1984), 421-425.

¹⁸ Iannis Xenakis, *Formalized Music: Thought and Mathematics in Composition*, revised edition. (Stuyvesant, NY: Pendragon Press, 1991), p. 183.

Theorists differ regarding their taxonomies of embellishment figures, though. Pankhurst provides a comprehensive set of these ‘basic patterns’, which can be listed as follows:

- An arpeggiation, or the horizontalization of a vertical sonority into a melodic figure. This is shown in Figure 25.



Figure 25: Arpeggiation

- A passing note, or the interpolation of a less-structural tone in between two structural tones

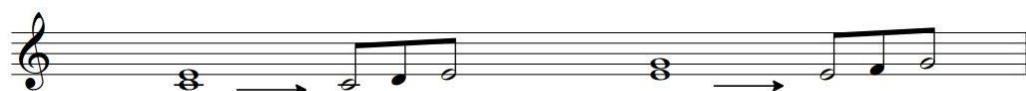


Figure 26: Passing notes

- A neighbour note or auxiliary, or the stepwise motion from a structural tone to its less-structural, embellishing neighbour;

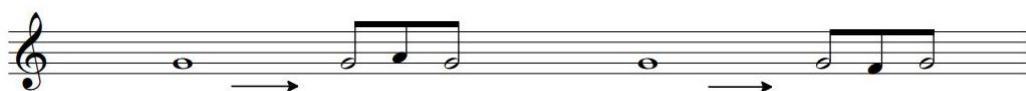


Figure 27: Neighbour notes

There are also patterns formed by combining these basic elements into something more complex:

- A linear progression - inserting one or more passing tones between two arpeggiated tones. This functions as an elaboration of a leap between notes that belong to different voices within a single chord.¹⁹



Figure 28: Linear progression

¹⁹ Pankhurst, p. 28.

- An unfolding: When a melody skips back and forth between two implied voices.²⁰



Figure 29: Unfolding

- A reaching-over: Leaping over a note to a neighbour tone on the far side.



Figure 30: Reaching-over

- Voice-exchange: When one voice unfolds the reverse of another at the same time.



Figure 31: Voice-exchange

Forte and Gilbert provide the following, contrasting description of basic prolongational motions:

1. Motion *from* a given note, normally a *descending* diatonic scale segment or arpeggiation (where prolongation *follows* the note that is prolonged);
2. Motion *to* a given note, normally an *ascending* diatonic scale segment or arpeggiation (where the prolongation *precedes* the note that is prolonged);
3. Motion *about* a given note, most frequently by means of upper and/or lower neighbouring tones (which may in turn be prolonged themselves).²¹

Larson states his taxonomy of prolonging transformations in broader language:

1. The addition of an affix or connective;
2. The registral shifting of a note;
3. The temporal shifting of a note;

²⁰ Pankhurst, p. 32.

²¹ Quoted in Larson, p. 118.

4. The elision or overlap of shared pitches;
5. The suppression of an implied tone.²²

By *affixes*, Larson means a single note added before or after a more structural tone, either ascending or descending, creating incomplete neighbours, repetitions, anticipations and embellishing leaps. *Connective* is here equivalent to passing tone, linear progression and neighbour tone.

The remaining transformations occur between structural levels. *Registral shifting* refers to the tendency to hear pitches in the derived background levels in a different register to that which they were in the musical surface. *Temporal shifting* is when the initial duration of a tone in the musical surface is altered at a deeper level. The *elision of shared pitches* refers to the transformation where multiple events are reduced to a single event at a more background level. This is how, at a deeper structural level, an embellishment figure can be reduced to the embellished or prolonged pitch. The *suppression of an implied tone* is where a note implied at a deeper level is omitted at a level closer to the foreground.

Fred Lerdahl also provides a broad contextualization of prolongational motions in terms of the ‘alphabets’ Diana Deutsch and John Ferroe derive from the tonal hierarchy.²³ Deutsch and Ferroe take the experimental investigations of Carol Krumhansl and her colleagues into listeners’ responses to the perceived proximity between pitches, chords and regions in relation to an induced tonic as their starting point.²⁴ Krumhansl uses a hierarchical pitch cone to represent the perceived hierarchy of pitches to one another. In Figure 32 this hierarchy is diagrammed in relation to a C tonic.

²² Larson, p. 119-121.

²³ Diana Deutsch and John Ferroe, ‘The internal representation of hierarchic pitch structure in tonal and atonal music’, *Music Perception* 12, 1994, (1-25).

²⁴ Carol Krumhansl, ‘Perceptual structures for tonal music’, *Music Perception* 1, 1983 (28-62); *The Cognitive Foundations of Musical Pitch*, (New York, NY: Oxford University Press, 1990).

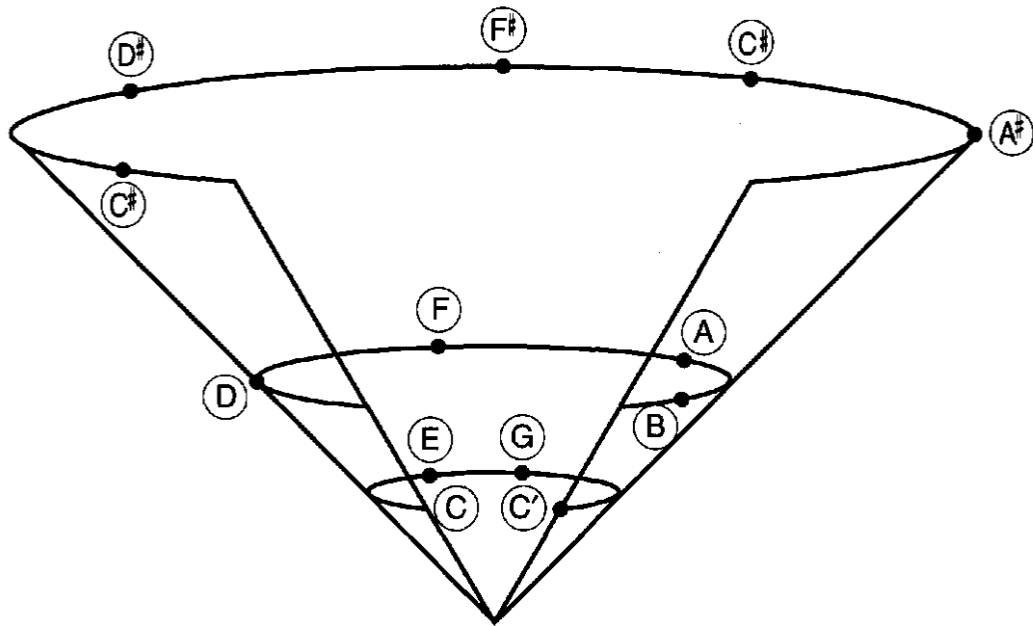


Figure 32: Krumhansl's cone of pitch hierarchy²⁵

This tonic pitch is implied as the very tip of the cone, with the tonic triad immediately above. This in turn is followed by the diatonic scale, then the uppermost level is formed by the chromatic scale. As Lerdahl states, “the content of one level elaborates the content of its immediately superordinate level.”²⁶

Deutsch and Faroe’s alphabets recur in different sets, at different levels equivalent to the layers diagrammed in the Krumhansl pitch cone. Under Lerdahl’s description, “the superordinate alphabet is the octave; then come triads and seventh chords, then the diatonic scale, and finally the chromatic scale.”²⁷ For Lerdahl, prolongation is a matter of preserving the integrity of these alphabets within the musical motions. For example, the structural distinction between the chordal set C-E-G and the scalar set C-D-E-F-G-A-B is maintained by distinctions of motion. The scalar set must only move by step, in groupings around or bounded by pitches of the triad set, while notes of the triad set may be leapt between. Thus, Lerdahl’s conception of musical motions rests upon the assumption that certain, more structural tones may move directly to one another – steps upon another level – while less structural levels may only pass to tones on more structural levels.²⁸

²⁵ Fred Lerdahl, *Tonal Pitch Space* (New York, NY: Oxford University Press, 2001), p. 46; Thomson, 1999, p. 125.

²⁶ Lerdahl, 2001, p. 46.

²⁷ Lerdahl, 2001, p. 45.

²⁸ Lerdahl, 2001, p. 49-50.

However, Lerdahl does not explain whether he considers these patterns of motion to be *caused by* a hierarchy or to *cause* the hierarchy. Given his insistence upon the lack of “stability conditions” – criteria of consonance/dissonance – in atonal music, it seems best to conclude that he considers these motions to be *caused by* the hierarchy.²⁹ However, the perspective taken in this thesis follows that of Thomson, Larson, Morgan and Travis et al: that it is motion which provokes a perception of hierarchy.

In contrast to these comprehensive, albeit slightly different, approaches to describing prolonging motions, Thomson provides only the following as his list of ‘Causes of framing motions’:

1. Formal prominence (unit endings or beginnings);
2. Rhythmic prominence (metric or loudness accentuation);
3. Frequency of occurrence (including durational dominance, repetition);
4. Contoural locus – a pitch’s positioning as highest, lowest and/or most pivotal within defining patterns;
5. Prominence of a simple harmonic relationship (8ve, 5th, 4th).³⁰

For anything more specific, Thomson simply refers readers to prior studies.³¹

However, theorists who define prolongation perceptually such as Schenker himself note that the function of a prolongation is to promote some notes perceptually in our awareness over others, something Pearsall describes as the ‘mental sustaining’ of a pitch.³² This is exactly equivalent to what Thomson proposes the tonality frame to represent. He quotes psychologist Eleanor Rosch on this point: “Within categories certain members are normative [...] These elements are given priority in processing, are most stable in memory, and are important for

²⁹ Fred Lerdahl, ‘Atonal prolongational structure’, in *Contemporary Music Review* 4/1, 1989, 65-87 (p. 73).

³⁰ William Thomson, 2006, p. 90.

³¹ W. V. D Bingham, ‘Studies in melody’, *Psychological Review Monograph* 36, 1910, 1-88; Ortmann, 1926; D. Huron and R. Parncutt, ‘An improved model of tonality perception incorporating pitch salience and echoic memory’, *Psychomusicology* 12, 1993, 154-171; D. Huron and M. Royal, ‘What is melodic accent? Converging evidence from musical practice’, *Music Perception* 13, 1996, 489-516; Lerdahl, 2001.

³² Pearsall, p. 354.

linguistic descriptions.”³³

Thus, it may be possible to import wholesale prolongation’s ‘perceptual promotional motions’ as a comprehensive list of framing motions. If the principles of Lerdahl’s description, Schenkerian prolongations and framing motions are compared, the pattern of similarities shown in Table 2 emerges.

Table 2: Conceptions of prolongation and framing compared

Lerdahl	Schenkerian analysis	Thomson’s tonality frames
Elaboration	Embellishment/prolongation	Framing motion, establishing support-embellishment conditions
Leaping between the basic collection	Arpeggiation	Leaping between the pitches of the framing sonority
Passing between pitches on the higher-level group, through intermediate pitches in the lower-level group.	Passing tone or linear progression	Passing from one framing pitch to another, through intermediate pitches in the greater collection.
A higher-level pitch is decorated by a neighbouring, lower-level pitch.	Neighbour note	Passing from a framing pitch to a supporting pitch and back.
A pitch from the lower-level group moves to a neighbouring higher-level pitch.	Appoggiatura	A less-structural moves to a pitch within the framing group.

³³ Eleanor Rosch, ‘Principles of categorization’, in *Cognition and Categorization*, ed. by Eleanor Rosch and Barbara B. Lloyd (Hillsdale, NJ: Lawrence Erlbaum Associates, 1978), pp. 27-48 (pp. 38-39). Quoted in Thomson, 1999, p. 268-269.

The more complex Schenkerian embellishments such as unfolding can be described as combinations of these basic motions. In this way, an unfolding is merely a repeated set of arpeggiations which shifts position within the collection.

Thus, a list of supposed framing motions:

- 1. Leaping between the pitches of the framing group.** The frequency of occurrences, registral position and position within the phrase are all factors at play and help to establish the relationships within this higher-level group of framing pitches, e.g. which pitch is functioning as tonic.
- 2. Linear progression.** Passing from one framing pitch to another through intermediate pitches in the larger group or collection. Duration and frequency of occurrences, as well as changes of direction, in the intermediate notes, may create ambiguities or establish structural and hierarchical relationships between the intermediate supporting pitches.
- 3. Adjuncts.** This covers relationships which would be classed as **neighbour tones** and **appoggiaturas**. These adjuncts are those motions which pass from a more structural pitch to an embellishing pitch and back, and when an embellishing pitch is leapt to and then resolves to a more structural pitch. These may subsist within the non-framing pitches of the collection, establishing relationships of support-embellishment at a lower level. In some cases it may also be possible to leap from the embellishing tones to another, higher-level structural tone.

Now, these framing motions will be demonstrated in analysis.

Framing Analyses

To begin, a selection of plainchant monophonies will demonstrate how simple these simple framing motions construct the tonal hierarchy. It may seem controversial to be using plainchant as an example of tonality. Many, including Manfred Bukofzer, Igor Stravinsky and Ernst Krenek have explicitly denied that any music pre-1600 exhibited traits that may be regarded as tonal, protesting that music of this era was “dictated not by a tonal or harmonic principle, but by the

melodic laws of part-writing.”³⁴ However, as has been seen, definitions of tonality such as Bukofzer or Krenek provide as a system of chordal relationships are reductive.³⁵ It has also been affirmed that the very same principles underly music composed of chords and monophonies such as plainchant. In line with Thomson’s definition of tonality adopted earlier, plainchant can be said to be tonal as it provokes the same kind perceptual ordering of tones into hierarchies as all other music which can be labelled ‘tonal’.

Absolution chant, *Liber Usualis* 119

Pa - ter no - ster et nos in - du - ces in ten - ta - ti - on - em
 ex - au - di Do - mi - ne Je - su Chri - ste pre - ces ser - vo - rum tu - o - rum et mi - se - re - re no - bis
 qui cum Pa - tre et Spi - ri - tu Sanc - to vi - vis et re - gnis in sae - cu - la sae - cu - lo - rum A - men
 Ju - be Do - mi - ne be - ne - di - ce - re be - ne - dic - ti - o - re per - pe - tu - a
 be - ne - di - cat nos Pa - ter ae - ter - nus A - men

Figure 33: Absolution chant, *Liber Usualis* 119

The preceding chant is composed of a very basic set of framing motions. The first three sections of the chant until the first minor division repeat a simple pattern of a monotone C terminating on the A a minor third below. C, through repetition is affirmed as the central pitch. This gives the A the effect of a pause; a motion away from the centre, functioning as a comma. After the minor division, this motion is changed slightly at “miserere nobis...” to a C-A linear motion filled in with the intermediate B.

³⁴ Bukofzer, 1948, p. 12.

³⁵ Quoted in Thomson, 1958, p. 40.

After the first major division, at the passage beginning “qui cum Patre...”, the original monotone-plus-leap returns. Then, at the first of the “Amen” figures, a new motion is introduced where B moves by step to C. This has the opposite effect to both the previous motions. The leap and the linear progression functioned like commas, or an imperfect cadence in conventional diatonic harmony. This new motion is more like a perfect cadence as it moves satisfyingly back ‘home’ to the tonal centre.

A new motion follows at “Jube Domine...”: a leap, akin to the first C-A motion, but this time reaching downwards further to an F. Repetitions of this motion, the linear progression and ‘Amen’ figure make up the rest of the chant.

This set of motions can be represented in Figure 34:

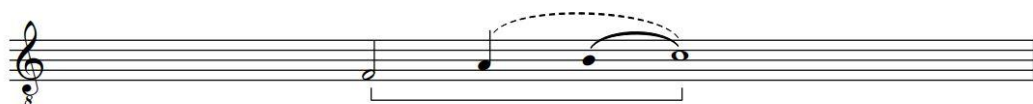


Figure 34: Tonality frame of Fig. 33

The linear progression composed of the notes C-B-A is indicated by the dashed slur, while the B itself is slurred to the C. This indicates that, whenever it occurs as a stand-alone pitch, the B always moves by step to the C. The greater weight of F than A is justified by the greater distance leapt to F from C. Intuitively, it seems like the greater the leap, the stronger the ‘pillars’ required to frame it. It may seem strange for the uppermost note of a triad to be analysed as the tonic. But analysing the C in this way is justified by the strength of its position as an initial and terminating pitch, and its continuous, monotonous repetition throughout the chant.

Agnus Dei, *Liber Usualis* 18

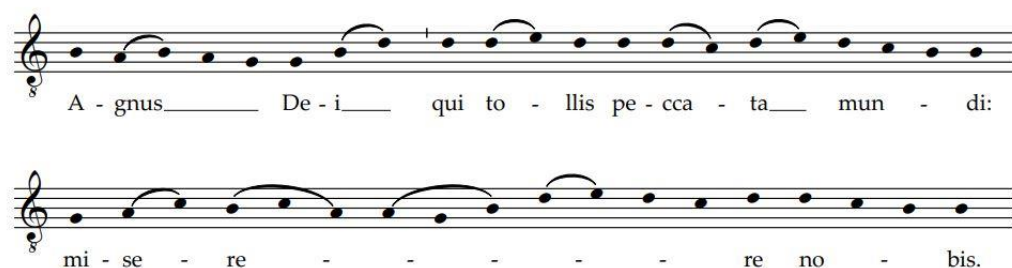


Figure 35: Agnus Dei, *Liber Usualis* 18

This is the chant shown in the discussion of tonality frames in Chapter 3. The first five notes of this chant make up an adjunct and linear progression movement. At first, A is functioning as a neighbour-note adjunct to B, then switching function – but not structural value – to an intermediary in the linear progression A-G. This serves to emphasize B and G as members of the more-structural sub-set within the collection, due to the B’s role as an embellished tone and their positions as border pitches framing the linear progression. This is affirmed further by a leaping motion G-B-D. According to the perceptual function of leaps, demonstrated in the Krumhansl pitch cone, this motion frames the G-B-D set as a more-structural triad group, given that later tones fill in the gap between B and D. Following the caesura, a number of repeated adjunct neighbour motions take place around the D in both directions, terminating in another linear progression back down to B.

Following the second small division, further motions take place about the G-B section of the more-structural sub-set. G moves to its adjunct neighbour A, followed by a leap across to B’s far-side adjunct neighbour, C. This C resolves down to the note it is embellishing, as would be expected, then reversing the initial leaping motion by returning to C, jumping down to A and then returning to G. Again like the end of the first subsection of the chant, the structural collection is then leapt through, ending on D. More repeated adjunct neighbour motions take place about this D, terminating in a linear progression from D to B.

A slight ambiguity is introduced immediately following the second small division, as the two leaps from adjunct neighbour tones (A to C, then C to A) imply a more structural role for these tones. If only the six notes following the second small

division were heard without the rest of the chant, it would indeed be perceived as if the G was an adjunct tone embellishing the A, while the B performed the same role to embellish the C. However, given the motions which immediately surround this passage, it is heard with the G-B-D set already established as more structural. It seems reasonable to conclude that, rather than implying a shifting of tonal motions, it is simply a slight blurring – a twisting of the established hierarchy, perhaps to fulfil a natural need for interest through variety.

Thomson gives the following framing diagram as a representation of those motions:



Figure 36: Tonality frame of Fig. 35

The repeated adjunct motions about the D are reflected in the slurring, indicating how C and E embellish and support the higher structural status of D. However, the C has been included twice – once to reflect its role supporting D, and again to reflect its role supporting B. This overcomplicates the diagram slightly, as it points to the possibility of an overload of ambiguity. If a single pitch can assume multiple roles without becoming any more structural, then why not three, four or even more repetitions of notes?

In opposite fashion, Thomson has marginalized the role of A as an adjunct to B, only linking it to G. To an extent, ambiguities like this will be unavoidable when a distinct direction of support is required. However, the following frame may be a simpler representation of the same information:



Figure 37: Revised tonality frame for Fig. 35

The role of A as an embellishment of G has been maintained, reflecting its role during most of the chant. However, C is contained between both B and D within a single slur, indicating the dual supporting roles it plays. Furthermore, slashed slurs indicate how the music is carved up by linear progressions. This also helps to

visualize the dual role pitches such as A sometimes play.

Kyrie Orbis Factor, *Liber Usualis* 85

The musical score is written on three staves in G major (one sharp) and 4/4 time. The lyrics are: Ky - ri - e - e - - le - i - son. Chri - ste. e - - le - i - son. Ky - ri - e - e - - le - i - son. Ky - ri - e - e - - le - i - son. The melody features a mix of eighth and quarter notes, with some notes beamed together. There are two double bar lines indicating final divisions. The first division is after the first staff, and the second is after the second staff.

Figure 38: Kyrie Orbis Factor, *Liber Usualis* 85

Kyrie Orbis Factor is a slightly more complex melody than the *Agnus Dei* analysed previously. However, it too can be successfully reduced to the same basic motions. The first section of the chant, up until the first small division, promotes the A-D fifth as structural. The pitches are leapt between, and the A is emphasized through B flat and G acting as adjuncts. F is added to this dyad to complete a structural triad sub-set following the caesura, as F is both leapt to and leapt from. An adjunct G which follows the A is leapt from (slightly enigmatically, as if it may be beginning to play a more structural role) but it leaps – via an appoggiatura-style adjunct – to a D firmly established as a member of the structural set by further adjunct motions.

After the first double bar line indicating a final division, the motions shift into a higher register. The G still retains its enigmatic quality as it seems to overwrite the mental retention of the A through a stepping movement and is then leapt from to a high D. This D is emphasized as structural through a C adjunct embellishment, which is leapt from to a still-structural A reinforced by a G adjunct. After a small division, this A then initiates a long linear progression, terminating in a low D enforced by a C adjunct.

Following the second final division, the first section of the chant repeats itself,

with identical motions with the exception of substituting a second G adjunct to the initial A, rather than a B flat. Then, after the third final division, motion remains in the lower register. D leaps to F then returns, demonstrating Lerdahl's principle of leaps as steps in a higher-order subset within the collection. This D is then further reinforced by a C adjunct, before leaping up to an appoggiatura-type G adjunct to F. This F then initiates a linear progression downwards, terminating at D. Following the small division, the D's lower adjunct C is leapt from, to its higher, E. This motion is akin to a conventional double-neighbour but the E, rather than resolving back to D, resolves upwards to F, introducing ambiguity. A small linear progression then leads back downwards from F to D, reinforced by a C adjunct.

These motions result in the frame shown in Figure 39:



Figure 39: Tonality frame for Fig. 38

The distinct role played by both C's as well as the B flat is here easily represented through their slurring, indicating direction of support and motion. The tendency for A-F and F-D to be filled with linear progressions is here indicated with dashed slurring, as for the *Agnus Dei*. Out of its twelve occurrences, the note A leads to G by step eight times. However, the jumps within the structural sub-set in which A participates justify its notation as the stronger of the two, hence G and A are linked by slurring with G as the embellishing tone. Statistics also provided a means for resolving the ambiguity introduced by the motion E-F which occurs just after the final small division. It occurs six times, and for all but this single instance resolves by step to D. This justified overriding this instance as an exception, implying not a different role for E but instead a kind of expanded adjunct motion, including a motion upwards to F which then reinforces the E's return to D as part of a linear progression. Hence, it transforms into something more satisfying for a terminal structural location.

Conclusion

In this chapter, I have focussed in on the role of tonal framing. The concept of tonal framing as outlined by Thomson is conceptually mysterious, and therefore I used the notion of Schenkerian prolongation and the *ursatz* as a guide. From the preceding analyses of three pieces of plainchant, it can be seen that the three framing motions outlined at the opening of this chapter – leaping between the pitches of the framing group, linear progression, and adjuncts – will suffice to describe the tonal framing of melodies. For problematic instances such as those above where the motions were ambiguous, it seems reasonable to conclude that truly ambiguous motions unaccountable in any other way will simply generate an ambiguous perception of tonality for a listener. Therefore, it can be concluded that framing is no longer mysterious, and is composed of structural leaps, linear progressions and adjunct motions.

Intermezzo IV

Gymnopédie

Lento ♩=60

Piano

p *poco* *mp*

8

Pno.

> molto > p *f* *p*

16

Pno.

piu mosso

23

Pno.

firmly *p*

The image displays a musical score for 'Intermezzo IV, Gymnopédie'. It is divided into four systems of music. The first system, labeled 'Piano', begins with a tempo marking of 'Lento' and a metronome marking of '♩=60'. The music is in 3/4 time and features a piano part with dynamics ranging from *p* to *mp*. The second system, labeled 'Pno.', starts at measure 8 and includes dynamics such as *> molto > p*, *f*, and *p*. The third system, also labeled 'Pno.', begins at measure 16 and features the instruction *piu mosso*. The fourth system, labeled 'Pno.', starts at measure 23 and includes the instruction *firmly* and a dynamic marking of *p*. The score uses a grand staff with treble and bass clefs, and includes various musical notations such as slurs, accents, and dynamic hairpins.

30

Pno.

→ *Relevant to Chapter 6, pp. 139-146*

What follows is the harmonic outline of the work, shorn of extraneous contrapuntal detail. Each chordal aggregate is labelled with its roman numeral in the context of the appropriate frame.

bb. 1-4 b. 5 b. 6 b. 7

b. 8 b. 9 b. 10 b. 11

b. 12 bb. 13-14 b. 15

To
Frame 2

16 17 18 19 20

IV II VI IV IV

21 22 23 24

I IV V I

25 26 27

I I VI To Frame 1

28 29 30 31

I IV I I

32 33 34 35 36

III I V I I

Proceeding in two bar units, this analysis will outline which elements of the voice leading tables each progression matches, how it may diverge, and what steps have been taken to bind the unsatisfying elements of progressions requiring care. It should be noted that discrepancies are likely, as the tables only list progressions in

three voices, while sometimes more voices are in play in this piece. Further discussion of this work is found in Chapter 6, while tables 2 and 3 are found at p. 184 and p. 199 of Appendix A respectively.

1-4: These four bars remain upon chord I, with a C-D motion adjunct in the lowest voice, a G-A linear progression in the next-lowest voice, and an appoggiatura-style D#-D adjunct motion in the second-highest voice.

4-5: A re-voicing of chord I. This introduces the melody in a new voice in the highest register at bar 5.

5-6: Chord I moves to chord III in a form matching the satisfying stand-alone progression labelled d) in table 2. A moves to A#, G to F and D to C.

6-7: Chord III moves to chord II in a form matching the progression labelled a) in table 2. A# leaps to G#, F moves to D# and C moves to A#. This is an unsatisfying progression as it requires parallelism, floating unbound F and D# adjuncts, floating unbound C and A# adjuncts, and leaps between unbound A# and G# adjuncts. These difficulties have been dealt with as follows:

- Here, parallelism is accepted as untroublesome
- Both floating motions F-D# and C-A# have already been bound to their upper structural neighbours (G and D respectively). In bar 8, it will be seen that the motions continue to their lower structural neighbours (D and A). This binds both motions into untroublesome linear progressions.
- Regarding the A#-G# leap, the A# was preceded by its structural neighbour A, and in bar 8 G# resolves to its structural neighbour, G. Thus, each is satisfyingly bound as an adjunct.

7-8: Chord II moves to chord I in a form matching the progression labelled a) in table 2. G# moves to G, D# moves to D and A# to A. As parallelism is here accepted as untroublesome the progression is satisfying.

8-9: Chord I moves to chord II in a form matching the progression labelled a) in table 2. D moves to D#, G to G# and A to A#. The pitches A and D are sustained through this bar in the lowest and highest voices, adding contextual dissonance.

9-10: Chord II moves to chord I in a form most closely matching the progression labelled a) in table 2. G# moves to G, D# to D and A# to A. This is accompanied by structural leaps in the outer voices. These voices sustain the contextually-dissonant tones in the previous bar, meaning these leaps sound as re-voicings of

chord I.

10-11: Chord I moves to chord II in a form most closely matching the progression labelled a) in table 2. A moves to A#, D to D# and G to G#.

11-12: Sustains chord II, with slight revoicing.

12-13: Chord II moves to chord I in a form most closely matching the progression labelled a) in table 2. D# moves to D and A# to A, but there is a hint of progressions c) and d) in that G# moves to A also, outlining an implied linear progression from the G of bar 10.

13-14: These two bars remain upon chord I, reiterating the figuration of bars 1-4.

14-15: Chord I moves to chord V in a form most closely matching the progression labelled e) in table 2. A moves to A#, G to F and D to D#. This is a satisfying stand-alone progression.

15-16: This is identified in the melodic analysis as the point of transition back to frame 1. Although a moment of porousness between the frames, it can be most simply analysed harmonically belonging to frame 2, where chord VI moves to chord IV in a form matching the progression labelled f) in table 3. This is a satisfying stand-alone progression.

16-17: Chord IV moves to chord II in a form matching the progression labelled d) in table 3. A# moves to A, F to G and D# to D. This is an unsatisfying progression as it requires floating unbound A and A# adjuncts, however these floating adjuncts can be seen as part of the long-range linear progression from the structural A in bars 13 and 14 to the now-structural C in bar 20.

17-18: Chord II moves to chord IV in a form matching the progression labelled e) in table 3. G moves to F, A to A# and D to D#. This is an unsatisfying progression as it adds floating unbound D and D# to the unbound A and A# continuing their long-range fluctuating progression. However, the D and D# were initiated by a structural pitch, C, in bar 16. This means that all they require to be bound correctly as a linear progression is a further structural pitch in bar 19.

18-19: These two bars sustain and re-voice chord IV. The floating D and D# are confirmed as a linear progression as D# moves to a structural F. The A# remains floating, however.

19-20: Chord VI moves to chord IV in a form matching the progression labelled f) in table 3. A# moves to C, D# moves to A# and F is sustained. This is an unsatisfying progression due to the leap between D# and A# adjuncts, but this

leap takes place in the melodic voice and both pitches are clearly directed towards and bound to the structural C, as was noted in the framing analysis of the melody on pp. 143-145.

20-21: Chord IV moves to chord I in a form matching the progression labelled f) in table 3. F moves to G and F is sustained. As the melodic voice has moved on from the A# prior to this progression, its resolution can be disregarded.

21-22: Chord I moves to chord IV in a form matching the progression labelled c) in table 3. F moves to C, C moves to F and G moves to A#. This unbound A# is satisfying, however, as it forms part of a linear progression between G in bar 21 and C in bar 23.

22-23: Chord IV moves to chord V in a form matching the progression labelled d) in table 3. A# moves to C, C moves to D and F moves to G. and F is sustained. As parallelism has already been accepted for the context of this piece, this is a satisfying stand-alone progression.

23-24: Chord V moves to chord I in a form matching the progression labelled b) in table 3. D moves to G, G moves to F and C is sustained. Hints of forms a), c), d) and f) are also present as in other voices D moves to C and G moves to C. As the D adjunct has been preceded and bound to C in bars 21-22, this is a satisfying progression.

24-26: These three bars sustain and revoice chord I.

26-27: Chord I moves to chord VI in a form matching the progression labelled c) in table 3. C moves to A#, G moves to D# and the F is sustained. As the D# is leapt to and unbound, it requires resolution to a structural neighbour. This is provided in resolution to D in 28 – now structural as frame 1 has been returned to.

27-28: This is identified in the melodic analysis as the point of transition back to frame A. As at bb. 15-16, this modulation is most simply analysed according to the motions of the target frame, frame 1. Chord V moves to chord I in a form matching the progression labelled e) in table 2. A# moves to A, D# to D and F to G. This is a satisfying stand-alone progression, but the melodic voice includes an anomalous leap from an F adjunct. However, this is made less troubling as the F is preceded by and can be heard as bound to G, a pitch structural in both frames.

28-29: Chord I moves to chord IV in a form matching the progression labelled d) in table 2. D moves to G, G moves to D and D moves to C. The lowest voice deviates from this pattern – it adds colour by moving from D to D in a motion

foreign to this progression. It should also be noted that the C requires binding to its structural neighbour D. This is achieved in the progression from bar 29 to bar 30.

29-30: Chord IV moves to chord I in a form matching the progression labelled b) in table 2. C moves to D, A moves to D and G is sustained. This is a satisfying stand-alone progression.

30-31: These two bars sustain and revoice chord I.

31-32: Chord I moves to chord III in a form matching the progression labelled d) in table 2. D moves to C, A moves to A# and G moves to F. This is a satisfying stand-alone progression.

32-33: Chord III moves to chord I in a form matching the progression labelled d) in table 2. F moves to G and A# to A. Any movement to D, however, is displaced until bar 34. Instead, the C is held suspended throughout the bar, and colour is added by a foreign motion – a contextually-dissonant D# – in the lower treble stave.

33-34: Chord I moves to chord V in a form matching the progression labelled e) in table 2. G moves to F, D moves to D# and A moves to A#. This is a satisfying stand-alone progression. The displaced movement to D mentioned above occurs in this bar, introducing a contextually-dissonant foreign motion.

34-35: Chord V moves to chord I in a form matching the progression labelled e) in table 2. F moves to G, A# moves to A and D# moves to D. This is a satisfying stand-alone progression.

35-36: These two bars sustain and revoice chord I.

Chapter 5: Steering in Focus

How do the foregoing definitions of tonality impact the principles of the tone clock? The question remains to be answered as to what relevance the foregoing clarification of tonality bears to the notion. In this chapter, a method of relating the principle of steering to the hierarchies of the tonality frame will be developed, along with a description of the resultant groupings using McLeod's IPF system.

Steering Freedoms

Many would affirm that a tone clock steering ought to be non-hierarchical.

Michael Norris: "In theory, a true tone clock steering should not promote one note over another, but of course it depends on how the composer voices and repeats elements."¹ This principle of equality between all the notes is firmly asserted by Peter Schat, as he insists that the tone clock is a *non-tonical tonality*. Speaking of possible routes out of the tonality problem, he describes his goals in the following terms:

"Should we simply abandon [...] technology in music? Drop out, back to nature, back to the tonic, whether or not decked out in the new clothes of the emperors of American minimal-mood music? [...] Of course not. [...] Rather, we must apply a homeopathic principle, confront the disease with its cause, defeat technocracy with technique."²

Clearly, Schat viewed a return to tonality as a regression. One can also see in McLeod's music how she deliberately avoids suggestions of tonal centres by constantly cycling through the constituent elements of a steering or IPF in an almost serial fashion.

However, certain instances even in a strict, classic usage of the tone clock necessitate some notes being 'more equal' than others. An example of this is the problem of asymmetrical hour tonalities which require some hour triads to be inverted. This includes the greater number of the hours: II, III, IV, VII, VIII, IX

¹ Michael Norris, personal communication via email, 25th June 2021.

² Schat, 1993, p. 9-10.

and XII. I will take the tone clock tonality formed by hour VII/II⁴ as an example (Figure 40).

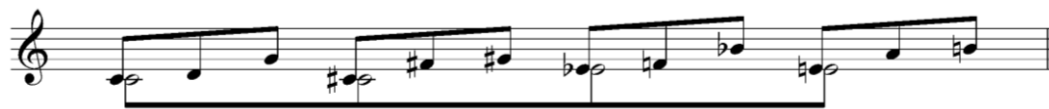


Figure 40: VII/II⁴

Consider the difference between what De Groot refers to as the *border pitches* and the *centre pitch*.³ The border pitches are those on the top and bottom of this notation, while the centre pitch is found between them, determining the inversion. This steering forms a satisfying tonality for Schat, and it should be emphasized that Schat considers this steering as characterized by the intervals which make up II⁴: minor second, major second, minor third; in IPF notation 121. The significant point is that this steering interval colour only pertains to the border pitches. The centre pitches in fact make up an entirely different hour colour: IIIM⁴ (IPF 313). There is no possible arrangement or transposition of this tonality whereby the centre pitches' steering by IIIM⁴ – shown as the middle group of Figure 41 – can become II⁴. In the form shown in Figure 41, the tonality constitutes a reverse steering where what was the steering becomes the harmonic cell, and what was the harmonic cell becomes the steering group.⁴ Here, the asymmetry results in an anchor form.



Figure 41: Steering inequalities between II⁴ and IIM⁴

It seems reasonable to conclude that, as the centre/anchor pitches have been excluded from relevance to this steering relationship, the border/shell pitches thus function as a kind of perceptual 'root group' within the tonality.

This is of course not a tonal hierarchy. Some would argue that it may not even be a relevant hierarchy at all. Michael Norris holds that the inequality in interval

³ De Groot, 1984a, p. 9.

⁴ Adrian Sheriff, 'Congruent aspects between approaches to pitch by Jenny McLeod and approaches to rhythm by Karaikudi R. Mani.' CANZ Composers Conference 2017, University of Canterbury, 29 April 2017. Powerpoint presentation. <https://sounz.org.nz/resources/21109?locale=en> [Accessed 20 November 2021], 13'05''-13'12''.

colour between border and centre pitches will only be heard when music is laid out linearly, and as this does not occur in most tone clock music it will not have the problematic effect outlined above. Also, as these inversions are always symmetrical, they tend to balance each other out. This means no particular inversion of the hour triad will stand out, and the triads will cohere into a single sonorous colour.⁵

What instances such as VIII/IIm⁴ do demonstrate is that, at a basic level, perceptual kinks cause hierarchy to seep into the steering concept as in some cases it relates only some notes and not others within a single tonality. This is reflected in McLeod's descriptions of steering as

“the power of any group of notes to manifest itself again and again at any point in the system by ‘sprouting’ from an already-existing note, i.e. by using that note as a ‘generator’ or steering note, and transposing itself accordingly so as suddenly to ‘appear from nowhere’ – or rather, *from the one note that was already there.*”⁶ [emphasis added]

She also refers to the roots of chords in diatonic harmony as their “steering-notes.”⁷ It would thus appear that McLeod accepts as legitimate instances of steering cases where only one note in the steered sonority has significance for the steering relationship. Consider also the cryptic comments in her *Chromatic Map* that a musical “‘weighting’ can be observed that is brought about by the steering-notes [...] of the various steering-groups for any one main group” – i.e. the recurrence of certain pitches within an IPF as steering-notes of possible subgroupings.⁸ This tends to promote them in the listeners’ perception. McLeod suggests these hierarchies are not worth pursuing, however, but does state that the steering principle itself is merely a useful hypothesis with no absolute or restrictive implications.⁹ An open approach to the steering principle is further justified when one considers McLeod’s affirmation that every steering can be reversed to generate a second, entirely legitimate steering.¹⁰ Therefore, the three

⁵ Norris, personal communication via email, 26th June 2021.

⁶ McLeod, in Schat, 1993, p. xvii.

⁷ McLeod, in Schat, 1993, p. xiv.

⁸ McLeod, 1994, p. 73.

⁹ McLeod, 1994, footnote to p. 73.

¹⁰ McLeod, 1994, p. 71.

groups of different hour colour shown in Figure 41 must be considered a legitimate steering of three tetrachords by a triad of hour VIII.

One possible interpretation of this muddying of the tone clock's theoretical waters is that there are subtle interrelationships between principles of hierarchical order and perceptual grouping. It is certainly not true that all groupings are instances of hierarchies. McLeod's cyclical treatment of the elements of her tone clock music indicates this. However, hierarchies *do* necessitate groupings, and the different centres which can exist within a collection of pitches necessitate different groupings. An examination of this, at a simple level, is provided below.

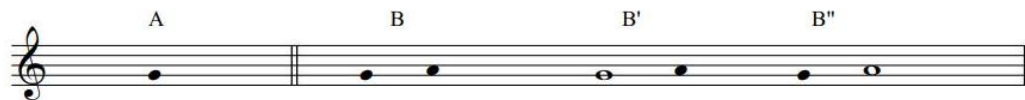


Figure 42: Dyadic groupings

A is a single note – G. It cannot possess, on its own, a structural value, a steering or a grouping as these are things which are only relevant to the relationships between multiple tones. B presents a simple dyad, the major second between G and A. This is still too small a collection of notes for grouping to be relevant, although different structural values become possible even at this level. Two simple structural relationships may subsist within this dyad: G as the stronger structural pitch/root or A as the stronger structural pitch/root. This can be visualized using the metaphor of a man with a limp. Either his *right leg* comes down more heavily (A is the root), or the *left* does (G is the root). It should be emphasized that the root position will be determined by the actual musical motions which take place within the pitches of the collection.

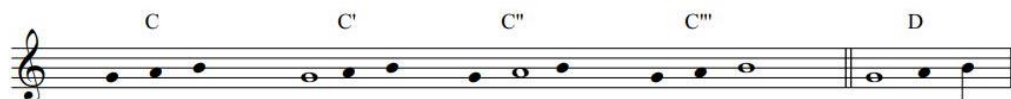


Figure 43: Triadic groupings

In the three-note group of C, there are three possibilities for positioning the structural root: either it is G, A or B, shown in Figure 43. When the root is A, the

less-structural notes tend to group around their central support as a single unified group. They seem to sprout from it like the branches of a tree. When the root is one of the border pitches of the three-note collection, however – as in C' and C''' - something unusual happens. Especially if the opposing border pitch (B in C'; G in C''') takes on a more structural role than the intermediate embellishing pitch (A for both C' and C'''), two sonorities start to emerge. These are the major third between the root and the opposite border pitch, and the major second between either of these pitches and the central intermediate pitch. This division between sonorities begins to suggest a steering, as the major second seems like an outgrowth of the pillars formed by the more structural border pitches. It is as if our limping man has grown another, smaller limping man out of one of his feet. A similar scenario occurs even when the intermediate note A is the more structural. In this case, the major second is the structural steering interval, sprouting the G or B which forms a major third as a less-structural embellishment. Again, which of the possibilities outlined above the music matches will depend entirely upon the motions which take place within the collection.

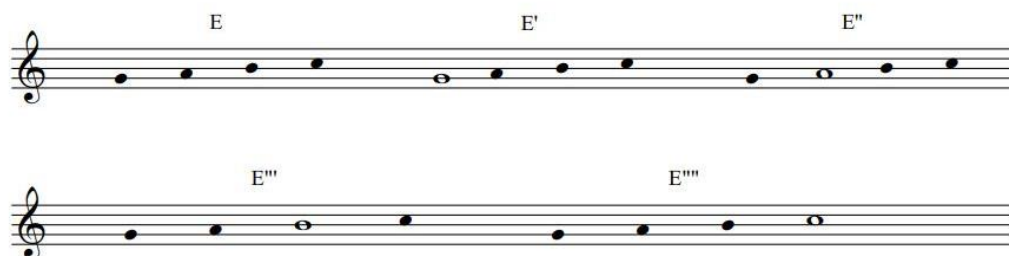


Figure 44: Tetrads groupings

This tendency to sprout sub-groupings becomes even more pronounced when the collection is expanded to four notes G, A, B and C, as in Figure 44. E', E'', E''' and E'''' demonstrate all four possibilities for root position within the collection.



Figure 45: Tetrads subgroupings

E'1 and E'2 show two of the three possible positions for a supporting, secondary structural pitch within E'. The grouping labelled E'1 suggests a true steering relationship, although E'2 is a little ambiguous. Because of the position of the

first-level supporting structural pitch as a border pitch, the entire four notes may be more readily grouped as a unit than the two seconds which branch internally. As much music makes use of linear progressions between structural pitches, it is likely that ‘shadow groupings’ such as this will introduce ambiguities into a steering of this kind, as notes which in one instance sprout on either side of a framing pitch forming a branching unit might at another time form a linear progression, creating a bridge grouping *between* rather than *around* framing pitches.

The significant point to be drawn from the foregoing discussion is that the motions which create hierarchies within a collection also establish sub-groupings, which can be described by a broad approach to the steering principle. This approach, based upon the freedoms McLeod’s single steering note hints at, can be simply summarized as:

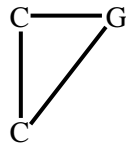
Whichever pitch is most prominent perceptually within a given collection or sub-grouping can function as a steering-note regardless of the nature of the collection it steers or its position within that collection.

It may be objected that this approach necessitates steerings whereby different colour emerge from different steering-notes. However, this too has been demonstrated as a legitimate aspect of McLeod’s freer approach to steering regarding the groupings shown in Figure 41.

The framing-driven groupings within a collection can be represented in a *steering tree* diagram. A kind of dendrogram, the steering tree takes as its basis the branching quality of the tonality frame and the principle of groupings at different structural levels seen in the Krumhansl pitch cone. This allows hierarchical levels to be seen more clearly than in the diagrams Thomson uses to represent his tonality frame analyses, and also allows the very general patterns of the pitch cone to be made closer to the particulars of a given musical work by indicating direction of support between tones.

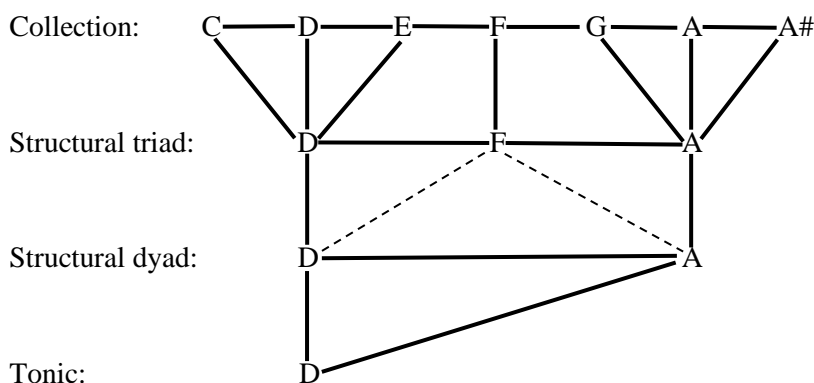
At its most basic level, the steering tree represents the groupings which emerge from one another as more elements are added to the background sets which are

more structural. As Larson notes, “There are no “degrees” of more “structural” – the only sense in which x could be “twice as structural” as y would be in terms of z (if x is more structural than z and z is more structural than y).”¹¹ These binary structural support relationships of embellished/embellishing are notated through branching as:



This indicates that C as the more structural pitch steers the dyad C-G, with G as a less-structural embellishing pitch. Every pitch is repeated in a vertical column from the level at which it is introduced, allowing the groupings which emerge from branching at each level to be easily seen amongst the members of the resulting collection. This resultant collection will always be the topmost horizontal row of the tree. The left-to-right positioning of the branches mimics the layout of a piano keyboard so that the lowest pitches are to the left while those to the right are higher in pitch.

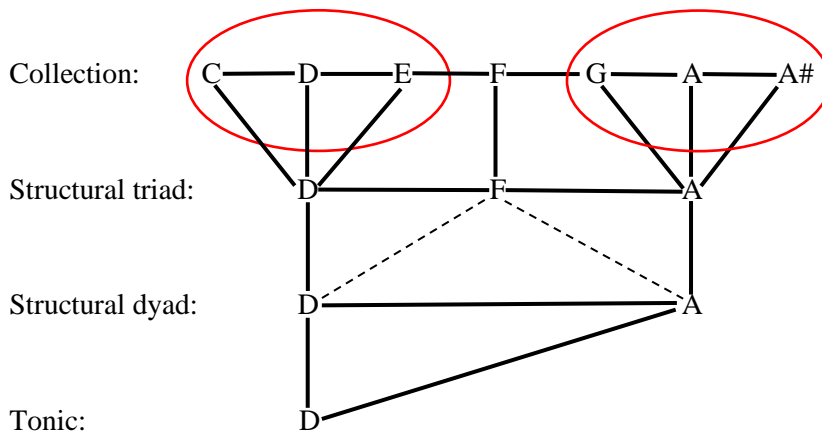
As the musical motions of a work become more complex, more branches will sprout, enlarging the resultant collection. This can be seen in the steering tree for the *Kyrie Orbis Factor* analysed previously. The tonality frame, in notation typical of Thomson’s analyses, shown in Figure 39 of the previous chapter, can be diagrammed as the steering tree illustrated below.



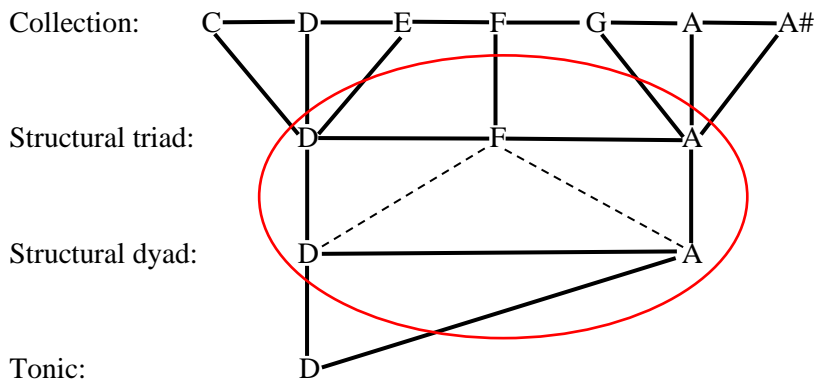
As described, each element remains in the collection from when it is first

¹¹ Larson, p. 126.

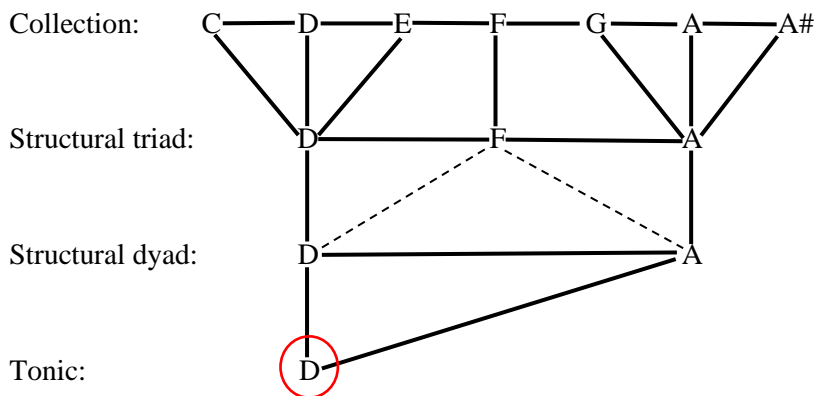
introduced, forming vertical columns. Supporting tones branch off at different structural levels, beginning with the pitch forming the dominant dyad. These lower horizontal levels make up the deeper subsets which can be leapt through. This makes the *tree* aspect of the name clear. The *steering* aspect of the diagram can be seen by considering the top line of the tree, which represents the resultant collection.



The interrelationships indicated by the branchings show how the hierarchy implies IPF groups, here circled in red, which sprout from their more structural members. One is composed of the pitches C-D-E, the other G-A-A#. These constitute an hour VI (IPF 2-2) group and an hour II group (IPF 2-1). The F is excluded from these subgroupings, as it tends to act as a stepping-stone on the path between the two subgroups rather than showing a distinct direction of support towards one or the other. This ambiguity is reflected in the dotted branching lines further down the tree where the structural triad and fifth can be identified. They are circled in red below. This structural D-F-A collection, primarily the D-A fifth, is what justifies the carving up of the collection into the subgroups indicated previously. Under an inclusive definition of steering, this D-F-A group constitutes the steering group from which all other pitches sprout, demonstrating how the tree shows that *every horizontal row steers the pitch content of the row(s) above it.*



Finally, at the very base of the tree – the tip of Krumhansl’s pitch cone – the tonic root can be found. It is circled in red below.



In the science of biology, the patterns formed by leaves sprouting from a branch are known as a *phyllotaxis*. The similar patterns of the steering tree show what might be called the *phyllotaxis grouping* of a set of musical motions, particularly with regard to the resultant collection.

A Problem

Some ambiguities are necessitated by this approach. A classic tone clock theorist would analyze the *Kyrie Orbis Factor* as being made up of two tetrachords – both IPF 221 – steered by a perfect fifth. This conclusion would be reached by considering only the intervals from which the collection is constituted. In this regard a classic tone clock analysis is rigorously definite.

On my account, though, different motions may imply different ways of carving up the musical surface. For example, the groupings outlined above in red would

closely match neighbour note motions, as a single pitch of the structural triad is emphasized by moving about it through the notes which sprout directly from it. But in a linear progression, a different grouping may emerge.



Figure 46: A bunched neighbour grouping

For instance, Figure 46 demonstrates the groupings which result from neighbour note motions. The B flat and G are bunched about the A as wings or arms around the central root. The same is true for the F and its neighbouring E: they are readily grouped together as a unit.

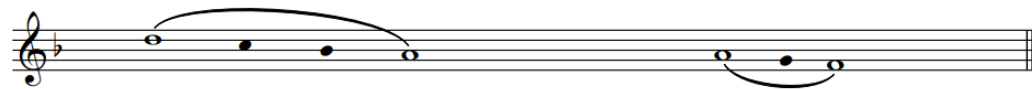


Figure 47: A linear progression grouping

Figure 47 shows the contrasting grouping which emerges from linear progressions bordered by structural tones. In this instance, what stands out is not the B flat-to-A motion, but the entire unit framed by D-A. Likewise for A-F, what stands out is the major third not the G as an outgrowth of the A. Unless either one of neighbour tones/appoggiaturas or linear progressions are excluded from a taxonomy of framing motions, these shadow steerings are an unavoidable aspect of steering trees.

Framing Analysis Revisited

The foregoing section has already outlined the steering tree which models the musical motions of the *Kyrie Orbis Factor* analysed previously. In this section, steering trees of the monophonic music analysed previously will be presented.

Absolution chant, *Liber Usualis* 119

This very simple chant resulted in the tonality frame shown in Figure 48.

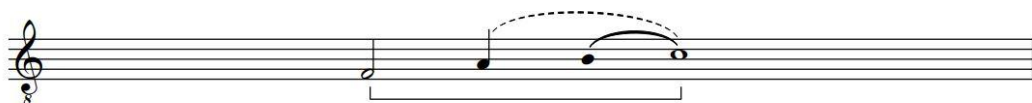
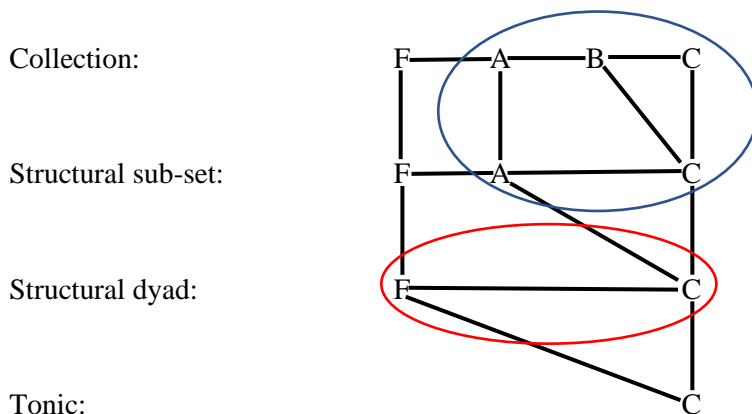


Figure 48: Tonality frame for the absolution chant, *Liber Usualis* 119

Translated into the terms of the steering tree, this frame produces the following:



The groupings result from a basic dyad 5/C-F fifth, circled in red, which sprouts an IPF1-2/hour IIM triad from the C root in several structural layers. This is circled in blue. The structural layering of this sprouted triad – seen in both the A’s position as a border pitch and that it is sometimes leapt to, rather than always being approached by step – creates an intermediate structural sub-set of F-A-C, equivalent to Ler Dahl’s leaping higher-order collection. In a steering tree of this simplicity, there is very little scope for linear progressions to create shadow groupings. However, for the chants that follow, I will attempt to outline possible alternative groupings.

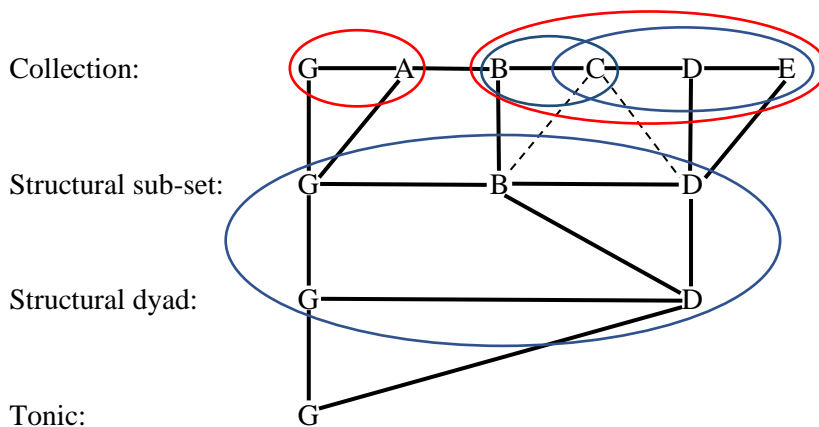
Agnus Dei, *Liber Usualis* 18

The frame given in Figure 49 describes the motions of this chant, analysed in Chapter 4.



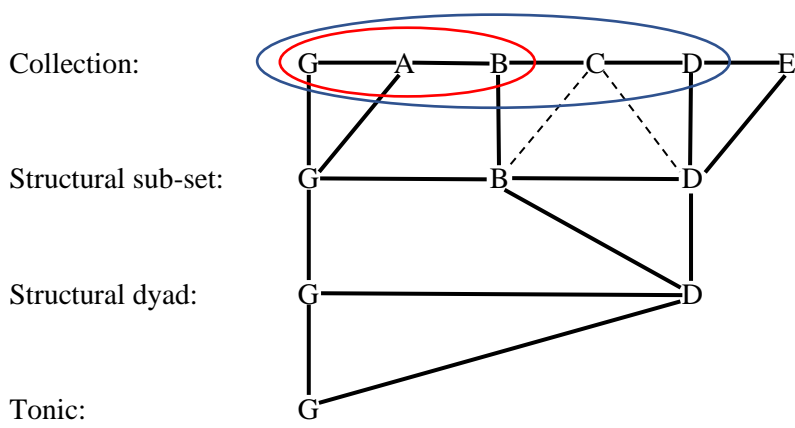
Figure 49: Tonality frame for the Agnus Dei, Liber Usualis 18

This can be represented by the following steering tree:



The groupings of this chant sprout from an hour XI structural sub-set group. This is shown in the larger of the blue circles. The tonic pitch, G, sprouts an A as an upper adjunct, shown in the left-most red circle, while a larger group is formed by the upper tetrachord which sprouts from B and D. This is shown in the right-most red circle. It is the dual nature of the C as an adjunct to both B and D which blurs this into a single grouping. Otherwise, this tetrachord (IPF 122) subdivides into the grouping shown in the small blue circles. In this sub-grouping, C sprouting from B as an adjunct forms the left-most group (dyad 1) while the grouping of this same C, showing its dual nature, and E about the D form the right-most group (IPF 2-2/hour VI).

Because the upper tetrachord is already complex, there is little further scope for alternate groupings. Exceptions are motions taking G and D as a framing pillars to progress between. This would create the alternate groupings shown below.



The linear progression grouping shown in red repeats the hour VI colour encountered previously in the branching about the upper D, while the grouping circled in blue merges the colours of hour II with hour VI. This merger is already present on the upper tetrachord circled in red on the previous tree. Thus, these shadow groupings act as a kind of blending which carves up the intervallic steps already present in the foreground in a slightly different way. It also serves to saturate the ever-present background intervallic groups with elements from the foreground branching groupings.

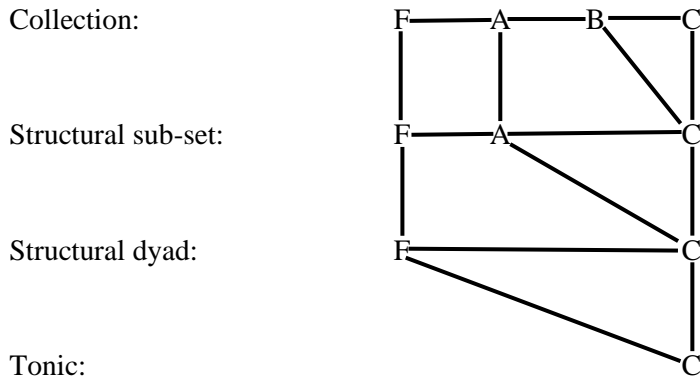
Relevance

It will now be clear how the groupings created by framing motions can be described by tone clock theory. However, two other points can also be emphasized. Firstly, the patterns which underly the plainchant examples analysed are highly repetitious, as the same triadic sub-set occurred in all analysed chants. Secondly, these chants are profligate with different interval combinations. Groupings and their alternatives seem to jostle for attention, making the structural use of interval colour difficult.

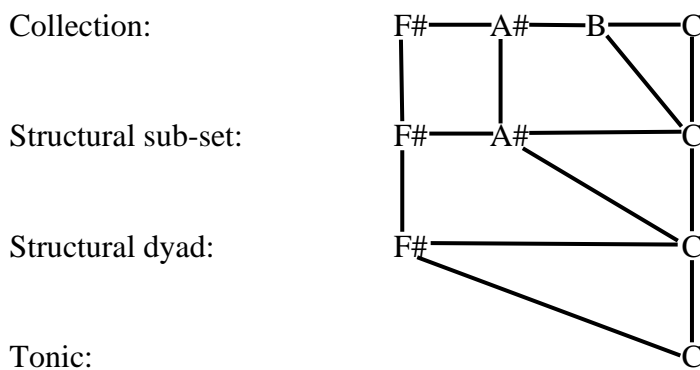
The significance of describing these chants using the tone clock is that a comprehensive theory incorporating all possible intervallic combinations has a foothold in tonality, so to speak. It will now be possible to manipulate the groupings shown in a steering tree, to 'stretch' them, into other IPF and hour figurations. This may have a twofold effect, in that it allows a composer to effectively transpose tonal framing motions into radically different and exotic intervallic combinations, and also to control the intervallic content of tonal music more tightly. These principles will be demonstrated in the next section, where the chants analysed above will be stretched in to new and exotic intervallic shapes, and the consequences for framing motions examined.

Some Stretched Chants

I shall begin with the simplest of the chants, the *Pater Noster* absolution chant. The steering frame given previously is shown on the next page.



This tree clearly shows the standalone F accompanied by the A-B-C grouping. Using this grouping as a ‘hook’, the tree can be pulled into contrasting, exotic intervallic shapes. By shifting the F-C dyad into an F sharp-C tritone, and compressing the upper triad into an hour II cluster-like form, the following stretched steering tree results:



From the grouping of the structural sub-set, it can be seen that this stretched version is built around a diminished/hour X triad. This tree can be represented in the tonality frame given in Figure 50.

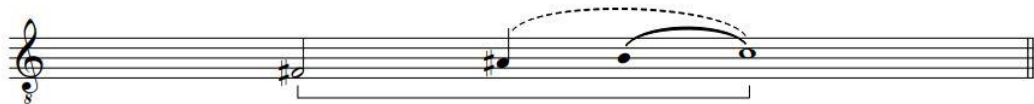


Figure 50: Stretched tonality frame for the absolute chant

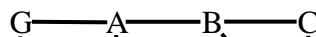
Translated back into the musical motions of the chant, this process of stretching results in the new version of the chant given on the next page.

Pa - ter no - ster et nos in - du - ces in ten - ta - ti - on - em
 ex - au - di Do - mi - ne Je - su Chri - ste pre - ces ser - vo - rum tu - o - rum et mi - se - re - re no - bis
 qui cum Pa - tre et Spi - ri - tu Sanc - to vi - vis et re - gnis in sae - cu - la sae - cu - lo - rum A - men
 Ju - be Do - mi - ne be - ne - di - ce - re be - ne - dic - ti - o - re per - pe - tu - a
 be - ne - di - cat nos Pa - ter ae - ter - nus A - men

Reflecting on the experience of listening to this new form of the chant, it is surprising how easily one becomes used to the exotic intervallic shapes. At its first occurrences, the C-A# leap sounds closer to a step than a leap. However, once the B is interpolated at “miserere nobis...” the motion is clarified. The tritone leaps between C and F# are more difficult to process, perhaps because the interval of a perfect fourth or fifth is such a strong archetype for motions of this kind. To a listener accustomed to common-practice harmony, the tritone in this context possesses a kind of dull, half-closure quality. After repeated listening, this curiously neutral quality matches well to its function in the chant.

There are many other possibilities for stretching this chant’s steering tree. The low F could be raised, ‘squashing’ the musical motions into a smaller range.

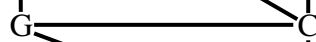
Collection:



Structural sub-set:



Structural dyad:

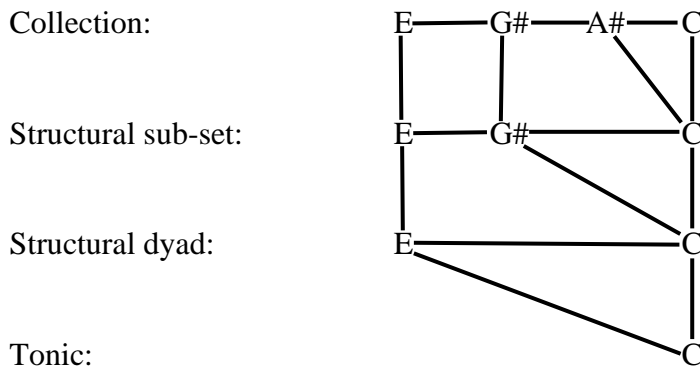


Tonic:



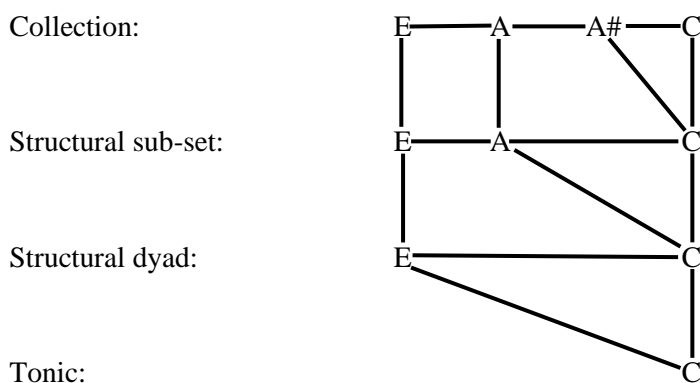
This stretching has the interesting property of using a sonority not found in diatonic tertial harmony as its structural sub-set – a triad of hour VII.

Alternatively, the tree can be stretched outwards, to lengthen the distance between the notes of the leaping dyad and open out the upper grouping.



This stretching gives the tree an hour VI colour in its upper grouping, which is partly reinforced by the low E emphasising dyad 4 through inversion. This also places an augmented/hour XII triad E-G#-C as the structural sub-set.

Alternatively, a combination of widening and narrowing could be used. The next example shuffles the upper grouping by inversion and widens the leaping dyad out to a minor sixth:



This tree possesses a conventional diatonic, tertial triad as its structural subset, but has the distinction of placing the structural root on the supposed mediant degree.

A similar oddity has been justified previously as the result of ‘contoural locus’ and sheer repetition. Translated back into a tonality frame, this tree results in Figure 51.

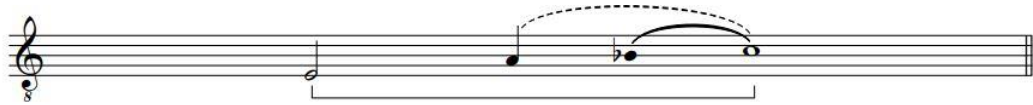
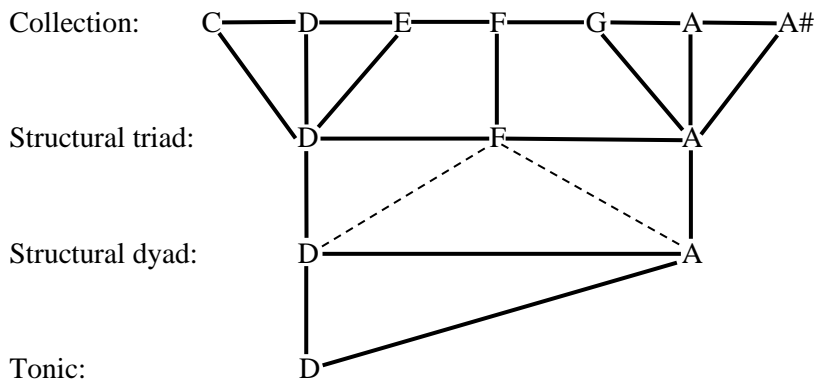


Figure 51: Another stretched tonality frame for the absolution chant

This frame creates the new version of the chant found below. While the upper grouping is entirely unproblematic, the leap between C and E is a little strange at first perhaps because of the unusual triadic arrangement of the structural background noted above. Like the previous stretched version of the chant on p. 126, this is perhaps because it breaks the expected archetypal leap of a perfect fourth or fifth. However, it does not replace this archetype with an interval as unexpected as the tritone, rather another interval which is a familiar participant in conventional triadic leaping movements. As such it is less jarring, but more subtly subversive as it takes a familiar intervallic paradigm and assigns it a new and exotic role.

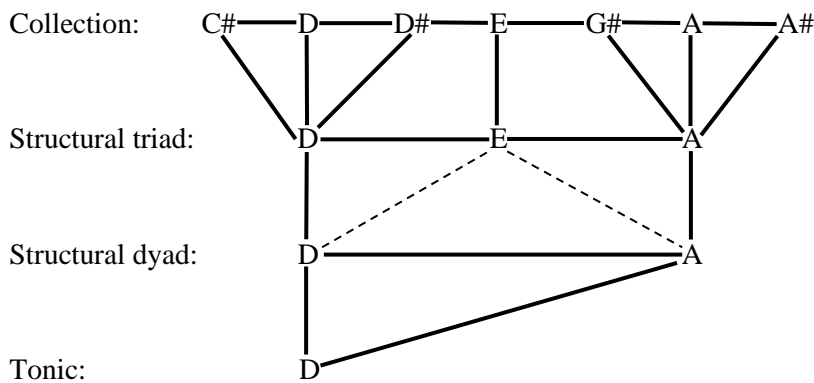
Pa - ter no - ster et nos in - du - ces in ten - ta - ti - on - em
ex - au - di Do - mi - ne Je - su Chri - ste pre - ces ser - vo - rum tu - o - rum et mi - se - re - re no - bis
qui cum Pa - tre et Spi - ri - tu Sanc - to vi - vis et re - gnis in sae - cu - la sae - cu - lo - rum A - men
Ju - be Do - mi - ne be - ne - di - ce - re be - ne - dic - ti - o - re per - pe - tu - a
be - ne - di - cat nos Pa - ter ae - ter - nus A - men

Next, a more complex chant – the *Kyrie Orbis Factor*. Its steering tree is shown on the following page.



Previously, its groupings were seen to be composed of a background hour XI triad steering group, with the D tonic sprouting a triad of hour VI (IPF 2-2) and the A dominant sprouting a triad of hour IIM (IPF 1-2). These hour colours are repeated by the tree's shadow groupings; hour IIM in the D-E-F linear grouping and hour VI in the F-G-A linear grouping.

Under stretching, the branching groupings could be collapsed into closer, more intervallically-consistent clusters. This possibility is shown in the following steering tree, along with a slight shifting of the background steering group from hour XI to hour IX:



Translated back into a tonality frame, it creates Figure 52:

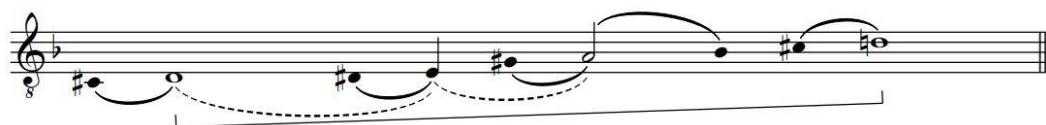


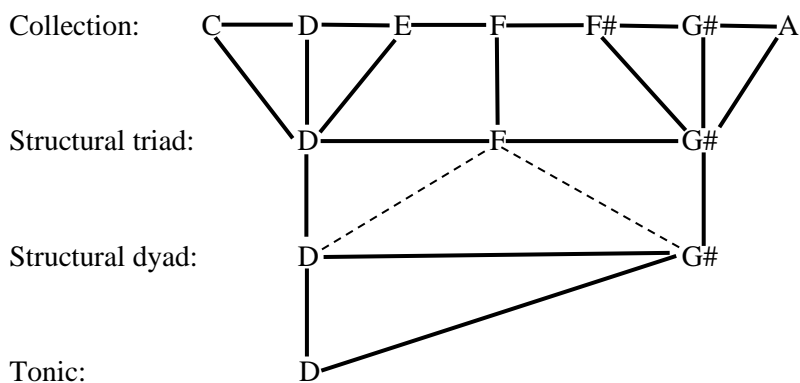
Figure 52: Stretched tonality frame for the Kyrie Orbis Factor

Translating again, this time into the actual motions of the chant, creates the

following version of the original chant:

Ky - ri - e e - le - i - son. Chri - ste e - le - i - son. Ky - ri - e e - le - i - son.

Alternatively, the surface groupings within the collection could be kept the same, with just their deeper-level steering relationship being altered. For instance, the D-A pillars which frame the chant could be warped by a semitone into a tritone:



Translating back into a tonality frame again gives Figure 53:

Figure 53: Another stretched tonality frame for the Kyrie Orbis Factor

Reconstructed into actual melodic motions, it gives the chant shown below.

Ky - ri - e e - - le - i - son. Chri - ste

e - - le - i - son. Ky - ri - e e - - le - i - son.

Ky - ri - e e - - le - i - son.

These same principles can be seen demonstrated in original composition in Intermezzo I. The small piece featured and analysed there uses a simple melody-plus-pedal point texture, with leaps between the two implied voices elaborating the basic framing motions of which the music is constituted.

→ *Intermezzo I – Etude, p. 33*

Conclusion

This chapter has served, firstly, to outline how the concept of a single steering note, embraced by McLeod and implicit as a difference only of degree, not of kind from the classic tone clock, can easily describe the groupings which emerge from the hierarchical pitch framings of tonality. Secondly, the practical stretching of melodies undertaken in the latter half of the chapter demonstrated some of the practical possibilities of this method, regarding its ability to transplant tonal motions into unusual intervallic contexts.

It should be emphasised that the selection of stretching processes made to these tonality frames is not intended to be systematic. Those made use of so far have merely been chosen subjectively, as they seemed obvious and interesting ways of manipulating the intervallic make-up of a melody. There are many, many more possibilities. For instance, take a simple melody of a mere four pitches such as the *Pater Noster* chant used above. Even with the requirement that the lower pitch of the structural dyad reserve space for the upper branchings without overlaps, there

are still nine possible positions for this note from A down to D flat. These are shown in Figure 54.



Figure 54: Positions of the structural dyad

While a structural dyad made up of the notes C and A crushes the upper branching into only a single possible position – A#-B – the number of possibilities increases with each semitone the structural dyad grows by. For a major third, this upper branching may now take three forms: hour I and hour II_m and hour II_M. These, along with the single minor third position are shown in Figure 55.



Figure 55: For a structural dyad of a minor, and a major, third

For a structural dyad of a perfect fourth, this number increases to six: hour I; hour II_m and II_M; hour III_m and III_M; and hour VI. These can be seen in Figure 56.

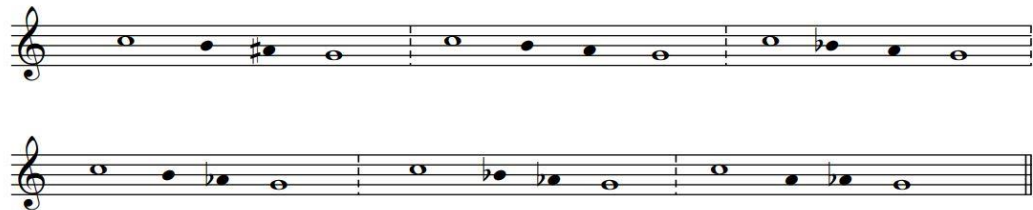


Figure 56: For a structural dyad of a perfect fourth

For a tritone, it increases again to 10: hour I; hour II_m and II_M; hour III_m and III_M; hour IV_m and IV_M; hour VI; and hour VII_m and VII_M. These are shown in Figure 57.

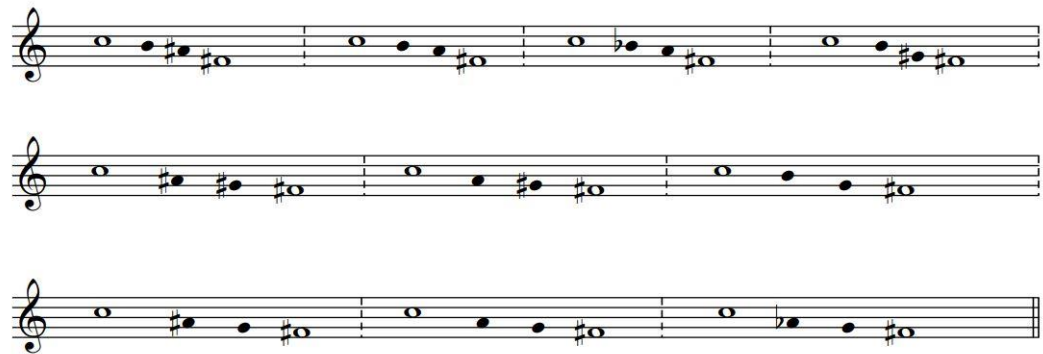


Figure 57: For a structural dyad of a tritone

So far I have listed 20 different forms the grouping pattern a single four-note

melody may take, and this is by no means comprehensive. Of course, trees of a larger cardinality have fewer possibilities regarding the position of their structural pitches, if the borders between branching groups are to be maintained with clarity. But the combinatorial possibilities between groupings goes some way to make up for this restriction.

Intermezzo V

Canon

a2

♩=c.80

Piano *mp*

6 *rall. . . a tempo*

Pno. *f* *p*

11 *pp* *f*

Pno.

16 *sempre f* *poco meno f* *rall. . .*

Pno. *bring out bass*

19 *molto* *sp* *pp* ♩=c.50

Pno.

→ *Relevant to Chapter 6, pp. 146-152*

Chapter 6: Steering Tree Tonality in Textures

In the previous chapter, an attempt was made to demonstrate how the principles of tone clock grouping and steering may be used to describe and manipulate the framing motions of a tonal melody. This allowed the controlled composition of melodies with an unusual intervallic makeup which still possessed the structures of tonality in their organization. The current chapter aims to expand this principle to more complex instances in music made up of multiple voices and chords.

An analysis

As has already been described, for Thomson tonality frames and framing motions function identically in multi-voice textures as in a single-voice monophony:

“Like a wave whose particles shift as they move toward shore, melodic patterns horizontalize pitches of the shifting chords – or we can turn it around to say that the chords merely verticalize the skips and steps of concurrent melody.”¹

As he notes, “I am surprised how frequently pristine framing actions, all laid out with a common tonic, shape the individual lines of a multi-voice texture.”² A useful exercise to begin will therefore be the analysis of a musical example which implies a more complex harmony while still remaining within the bounds of a single voice. The fifth of Georg Phillip Telemann’s *Fantasias* for unaccompanied flute provides a simple instance a single line implying more complex harmony. The first movement of this short work is given on the next page.

¹ Thomson, 2004, p. 449.

² Thomson, 2006, p. 94.

The musical score consists of six systems of notation. The first system (bars 1-4) is marked 'Presto' and shows a continuous eighth-note melody in C major. The second system (bars 4-8) is marked 'Largo' and features a slower melody with a C pedal point. The third system (bars 8-12) is marked 'Dolce' and continues the melody. The fourth system (bars 12-16) is marked 'Dolce' and includes a piano (*p*) dynamic marking. The fifth system (bars 16-18) continues the melody. The sixth system (bars 18-20) concludes the piece.

At first sight, bars 1-4 seem to disprove a point made during the selection of the four basic framing motions made earlier in this thesis: that leaps always affirm the notes leapt between as more structural, unless relevant resolution proves one an adjunct. Every note in these bars is both leapt to and leapt from. Yet, a listener does not perceive every note as structural. The Cs cluster together, forming a pedal tone over which the conventionally-framed melody follows its course. Thus, an addition: not a framing motion itself, as it does not necessarily affect the structural role of each pitch. Rather, it is a way of hearing the musical surface that seems to follow the rule of simplest is best. Therefore, a new descriptor may be needed by which an anomalous musical surface may be understood as two or more musical lines, themselves made up of conventional framing motions, which are leapt between in an **unfolding** motion. With this unfolding established, these four bars resolve with clarity into a C tonic pedal, beneath a melody which steadfastly elaborates the pitches C-E-G, affirming them as the tonic frame.

In bar 1, this melody is made up of a linear progression E-G, followed by a leap back to E, which initiates in bar 2 what is either:

1. A linear progression up to G, terminating in an adjunct A which returns to G; or
2. An E which smoothly joins to G by way of both the G's adjuncts.

This G then initiates another linear progression up to C in bar 3 after which the structural framing set is leapt through, affirming it further to conclude the phrase.

At bar 5, the largo section consists of the same frame expanded downwards. The appoggiatura leaps are made up of the framing pitches while the melody simply elaborates the same notes C-E-G as before, although this time descending. This descent is elaborated by leaping between both the upper and lower adjuncts of each note. Bars 7 and 8 interrupt this pattern with play about the notes E-D, which blurs their structural roles slightly as the insistent presence of the D on strong beats promotes it over the E (e.g. 7(3), 8(2)). A note of tension is also aroused by the lack of final resolution for this D. From its previous role as an adjunct, the listener's expectation is likely to be for a return to C creating an air of ambiguity

This ambiguity acts as a transition to a note-for-note transposition of those eight bars, now sounding a fourth lower with a G tonic. This occupies bars 9-16(2), while 16(3) initiates something quite different. In light of the addition of unfolding to our analytical toolkit for tonality frames, this passage 16(3)-24 can be understood as an elaboration of three voices. This is shown in Figure 58.



Figure 58: The underlying voices of bb. 17-20

The lowest of these voices consists simply of the rising pattern E-F#-G, followed by a leap down to the structural pitch D and back as a kind of cadence. The middle voice is composed of a play about the portion of the framing subset B-C-D. In bars 17-18, the C's role as an embellishing pitch is subverted by D and B acting as double-neighbour-type adjuncts. However, the C resolves clearly to B in the bar 19, making the ambiguity of the previous two bars seem a deliberate play with a suspended dissonance. Finally, the top voice plays about the upper and

lower adjuncts to the highest G, moving G-A-G-F#-G. This resolution is made explicit in bar 20. The leaps in this bar also serve to affirm the framing set. The following 4 bars are made up of a repetition of bars 17-20, with a simplified final bar that leaves the resolution of the topmost voice implied rather than explicitly sounded.

All of these motions can be placed into two frames, one based upon C and the other upon G. These are shown in Figure 59 and Figure 60.

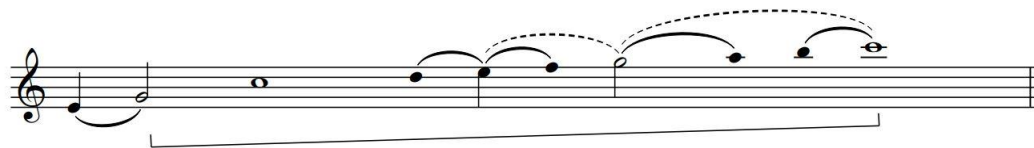


Figure 59: Tonality frame, bb. 1-7

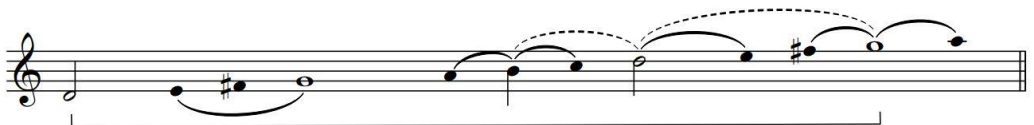


Figure 60: Tonality frame, bb. 8-20

Alternatively, the apparent ambiguities in bb. 17-20 can be analysed in a contrasting carving-up of the musical surface of several different frames. This analysis shown in Figure 61.

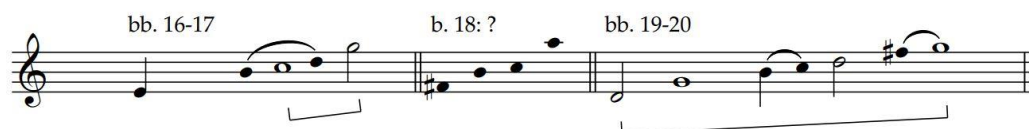


Figure 61: Bb. 17-20, alternate analysis

This alternate analysis makes less sense, though, than the first attempt which confined the pitches to a single frame. Bar 18 in particular is difficult to explain as a stand-alone frame unless multiple qualities of frame are in play – i.e. a new frame with an intervallically-different steering group – which is unlikely. It therefore is more reasonable to explain the leaps in terms of unfolding embellishments upon a simpler background.

Within this small piece, we have found an example of tonal motions in texture.

These motions are, as Thomson stated, simply a matter of piling different motions from the same frame upon one another. Where frames are transitioned between, this is done by initiating a structural ambiguity around a shared element, as with the D shared between the C and G frames in Telemann's Fantasia.

One problem does emerge from this approach, as it relates to the status of the framing of each voice. This can be demonstrated by an example from Bach's prelude upon the chorale *Kommt her zu mir, spricht Gottes Sohn*. The first two bars are given in Figure 62.

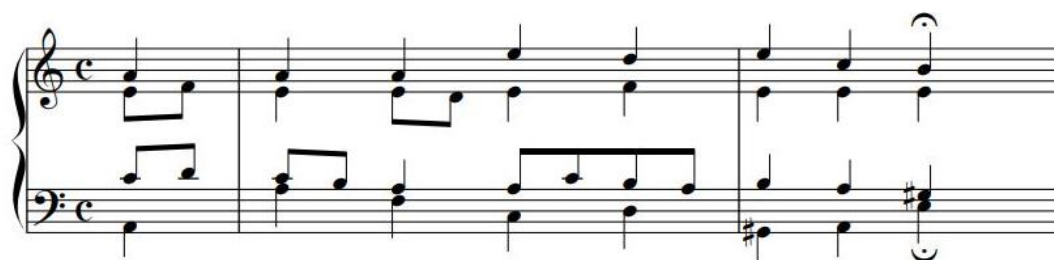


Figure 62: A Bach chorale prelude

The piece is in A minor, meaning an analysis frames centred upon an A tonic would be anticipated. Consider the alto voice in the same passage, shown in Figure 63.



Figure 63: The alto of the chorale prelude

The adjunct framing motions of this voice centre it firmly about the pitch E, as if it is the tonic. While it can be objected that this is a very small excerpt, and on its own may lack tonal context which the conclusion of the prelude provides, it does indicate the possibility that some voices' framing may contradict other voices in the same texture.

To solve this sense of ambiguity, some form of hierarchy between the voices is necessary. Any voice that takes a less-structural pitch as its apparent tonic (in the example given above, the mediant functions as a pseudo-tonic) can simply be classed as a less-structural voice. This allows the pitch it tonicizes to be over-ruled by other, more structural voices and their tonics.

Criticisms

To reiterate, the foregoing analyses have found that tonal motions in texture, as Thomson stated, are simply a matter of piling differing motions from the same frame upon one another. The small compositional experiments featured in *Intermezzi II* and *III* put into practice this technique of stacking framing motions upon on another in vertical combinations to form multi-voice textures. There, each is followed by an analysis describing in detail their framing motions.

—→ *Intermezzo II – Prelude, p. 50*

—→ *Intermezzo III – Largo, p. 76*

Reflecting upon these compositions, it seems as though something is missing from this music. Granted, every line contains clearly defined framing motions which define a tonal hierarchy in every voice, but the result is unsatisfactory. At the root of this dissatisfaction is the nature of the vertical dimension – from now referred to as the harmonic dimension – of this music. In this piece, I intuitively aimed towards consistent intervallic stackings related to the form of the structural steering-group, meaning almost every vertical chord-form can be related to the hour IX steering-group. However, without this similarity being elevated to a standard compositional principle for music of this kind, the musical surface is liable to sound scrambled. For instance, it may be possible in some cases for embellishing pitches in one voice to always coincide with structural pitches in another and vice versa, such that the structural pitches of the steering-group never sound together except at initial and terminal locations. Motions such as these are shown in Figure 64.



Figure 64: Intervallic scrambling of the steering group

In this instance, the hour XI quality of the framing-group is overwritten by the dyad 2 sonority which emerges from saturating repetitions of stacked and rhythmically displaced framing motions. It may be the case that the rhythmic demands of framing motions would imply that structural pitches tend to occupy stronger positions rhythmically. This means in practice, steering-group pitches

will tend to coalesce into an audible chordal unit as they occupy the same rhythmic positions. However, it is possible that without a principle to govern the harmonic dimension, in some cases the heard surface of the music will be overwhelmingly populated by intervals foreign to the structural steering-group.

Further difficulties which may contribute to this sense of incompleteness could include firstly, as listeners, it seems that in an example like the small composition given above, the embellishing pitches contain within them a reminiscence or expectation of the structural pitches they are framed by. Because of this, the musical surface presents an unrelieved affirmation of the structural subset. A demand for variety means this is not always a pleasant listening experience.

A second potential difficulty is that while the structural differentiations between the framing/steering group can create a sense of movement in purely melodic music, superimposing those melodic motions above one another tends to undermine this sense. As the undifferentiated cloud of sound which results relies upon 'clock time', it cannot easily articulate musical movement unless the voices are somehow harnessed to each other to create harmonic movement.

A third reason for a sense of incompleteness is the compositional process by which these pieces were created was reductive compared to that for diatonic common-practice tonality, as there was no means of sifting the stackings of tonal motions to create a consistent harmonic identity within the music. This is not to say that the goal of this research is to re-create every aspect of diatonic common-practice tonality using the tone clock as a tool. As has been established, not everything that forms a part of one historically and culturally-specific incarnation of tonality is necessary to the concept of tonality in the broad sense it has been approached here. However, the goal of this research is also not to develop tools for composing unsatisfying music.

A fourth and final reason is controlling interval colour forms the *ne plus ultra* of the tone clock, which is here being synthesized with tonality proper. While the structural steering group *is* affirmed such that we can come to understand the branching steerings and shadow groupings which subsist within the collection,

allowing the harmonic combinations of the musical surface to go unchecked runs firmly against the grain of tone clock principles.

Through this analysis and questioning of the notion of tonality based on my own composition means the topic in question has morphed into the inter-relationships between the harmonic and melodic dimensions of music. The compositional examples given above are practical evidence that the claim that the same rules and structures can guide both dimensions is only true up to a point. It is thus necessary to conceptualize how tonality frames – and, hence, steering trees – relate to the phenomenon of *chords*.

Chords

Any project which attempts an explanation of the phenomenon of chords and their relationship to the melodic dimension of music must grapple with the extensive scope of the subject. The approach taken here is to rely upon assumptions honestly stated, rather than overloading the scope and purpose of the project. These assumptions are as follows:

Firstly, that in nearly all cases the basic framing subset within a collection provides a prototype for all the harmonic combinations which are contextually ‘right’. For example, in common-practice diatonic tonality, the stacked thirds of the XI hour form this paradigm. All other vertical combinations which are treated as stable must relate recognizably to this prototypical stacking of intervals.

Secondly, that in some cases historically, near-neighbours to this chord prototype have been included in order to preserve satisfying movement between chords. In the common practice, this included the diminished triad (hour X) and the augmented triad (hour XII).

Thirdly, that this prototype may also be broken by stacking framing motions upon a chord which is recognizably related to the tonic frame prototype. This is how chords of addition and supposition may be created, such as the dominant seventh or Rameau’s chords of the thirteenth.

Fourthly, that these chords may temporarily function as a new structural steering set within the collection.

Fifthly, that the melodic dimension, unless a chord is temporarily functioning as a structural steering set, is determined by the motions of the tonic tonality frame.

Sixthly, that the harmonic role each chord progression may play can be determined according to the tonal motions which have been established for each of its members. In the same way that a mob of angry men can be described as an angry mob, a progression of motions possessing the quality of closure may be described as a progression of closure. Thus, the harmonic quality of any chord depends upon the melodic framing motions established within the music, in other words the quality of its voice-leading.

Lastly, that hierarchies will emerge in practice through the patterns of felicitous voice-leading inherent in a tonality, such that some chords will recur or be promoted perceptually over others. This may constitute the beginnings of a set of stereotyped tonal functions.

Voice-Leading Tables

As a means of easily reviewing the voice-leading properties of all possible progressions in a tonality, I made use of *voice-leading tables*. A voice-leading table for a stereotypical C major tonality is outlined below to demonstrate how a table such as this shows the interrelationship between the vertical and horizontal dimensions of music. Further examination of the emergent functions of such a strict tonality would require larger sentences to be created in order to observe the perceptual patterns of chord promotion which voice-leading creates.

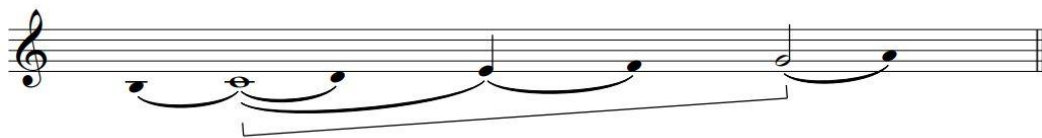
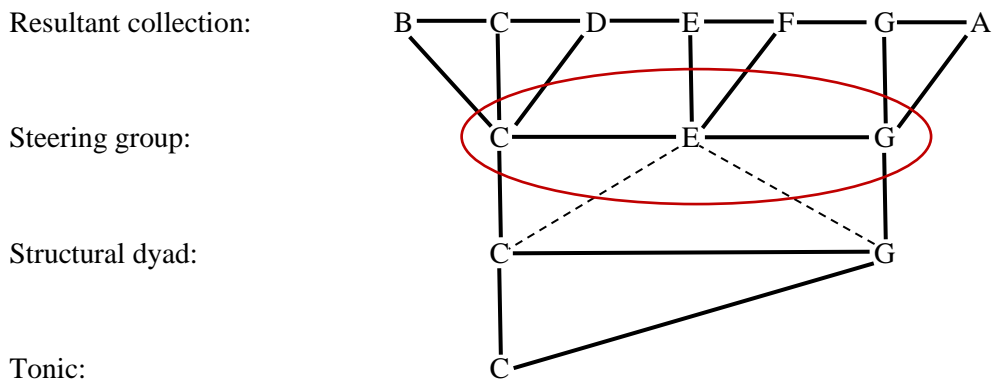


Figure 65: Stereotypical C major frame



The hour XI steering group which will define the chordal paradigm is found on the third level of the tree, and is circled in red.

All possible hour XI triads within the collection are shown in Figure 66, including those in inversion. For ease of classification, these chord units will be labelled with roman numerals according to their order within the collection:

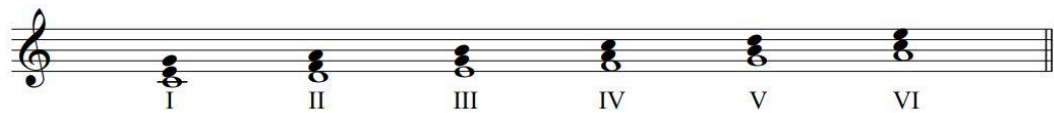


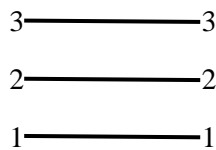
Figure 66: Hour XI triads

This diagram gives the units of this tonality's chordal grammar, excluding the nearly-similar chord forms suggested above. The chords shown can now be ordered in a systematic examination of the framing qualities of their progressions.

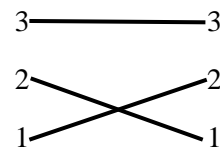
For progressions in three voices, the voice-leading possibilities will be exhausted by the following table of six arrangements. Here, 1, 2 and 3 refer to the pitches of each triad in ascending order. The full table, annotated regarding the framing potential of each progression, can be found on p. 169 of Appendix A. If a progression is labelled 'unsatisfying', this should not be taken as a recommendation that it be excluded from use. Rather, it is an indication that the progression creates difficulties for framing, such as leaping to pitches which will require resolution to their grouping's steering pitches in the surrounding chordal context to preserve recognizable framing. Satisfying stand-alone progressions are those which can proceed from the first chord to the second and back while preserving recognizable framing. Floating unbound adjuncts are those which must

be framed as the intermediate notes in a linear progression to preserve framing.

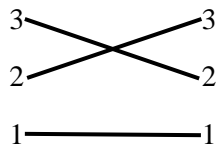
a)



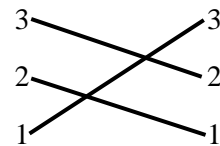
b)



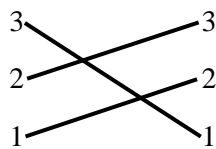
c)



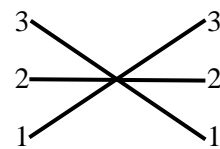
d)



e)



f)



The resulting progressions – those which satisfy, and those which must be treated with care to preserve framing – can be strung together like beads on a chain to form larger compound progressions. These compound progressions will be channeled by the framing motions while allowing greater control of the vertical dimension of music.

It may be objected that this approach places impractically strict limits upon possible chordal progressions. That may be so – for example, it would rule out a stand-alone I-IV progression in common-practice tonality unless 4 resolves to 3 or perhaps 5 depending upon the framing. Whilst I consider it likely that most instances of I-IV, unless modulating, will in fact show 4 resolving to a more structural pitch, it may also be the case that chords as units help the music hang together through more ambiguous framing. However, this strictness suits my goal of showing how strict, conventional tonal framing can be enriched with chords, and should not be taken as a recommendation to restrict composition to a few strictly satisfying progressions.

It is also possible a greater variety of progressions can be created by stacking framings, then sifting out those which do not possess a recognizable link to the chord-form of the steering group. As an example, consider the creation of cadences from those motions which move from a weaker pitch to a stronger one. These are shown, for the same frame as the previous table, in Figure 67.



Figure 67: Cadential motions

When stacked, progressions such as those shown in Figure 68 would be acceptable ‘beads’ to string together, while those in Figure 69 would be rejected on account of them ‘scrambling’ the vertical dimension of the music.

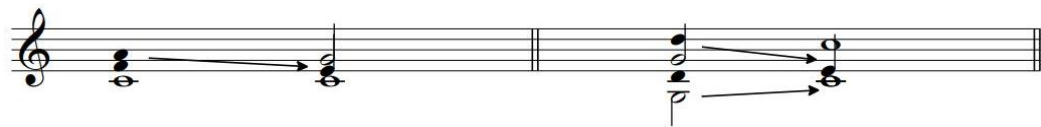


Figure 68: Acceptable cadential stackings

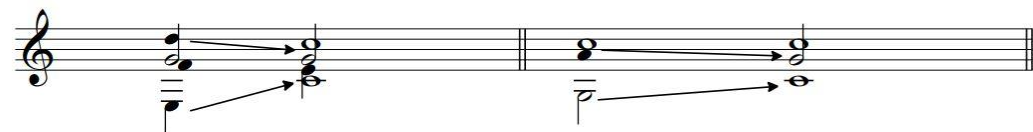


Figure 69: Unacceptable cadential stackings

In this way, sonorities such as the dominant seventh can be explained as stackings of a larger variety of motions which still relate recognizably to the steering-group prototype. This more extensive approach may constitute a more comprehensive way of dealing with the phenomenon of chords in extended tonality, although investigating the more extensive possibilities of this alternative method in detail is outside the scope of this thesis.

The stringing together of chordal units to form larger sentences with consistent framing is demonstrated in the composition found on p. 102 in *Intermezzo IV*, a small piece based upon the *gymnopédies* of Erik Satie. The collection chosen to compose with was IPF 22-111-22/PC set 8.23.



Figure 70: The gymnopédie collection and its IPF

The following melody was created from framing motions which matched the groupings of the collection.



Bars 1-4 outline two adjuncts of the D tonic – C and E flat, the last of which initiates a linear progression down to A. In bar 6 a structural leap up to D from A, then down to G is continued by an upper neighbour to the G. In turn this initiates a linear progression down to D. In bar 9 this concludes in a structural leap back up to G. bar 10 contains an adjunct motion to G's lower neighbour F. Bar 11 shifts the framing motions – C is leapt to and from, implying a greater structural role. At bar 13 D is also leapt to from F, but the eventual goal of the passage is audibly C. This, together with the emphasis given to G and F makes it likely that a new frame with a C-F-G steering group is now in play. Bars 13-17 are made up of a play about C's extensive nested adjuncts, resolving D as embellishing C and E as embellishing D in turn. At bar 18, G is leapt to again, moving to F at bar 20. The remaining bars return to the same framing as bars 1-9. Bars 22 and 23 are composed of D and its upper adjunct, leaping to G and its lower adjunct. D is reached at bar 24 via its lower adjunct C. The melody concludes by leaping up to G.

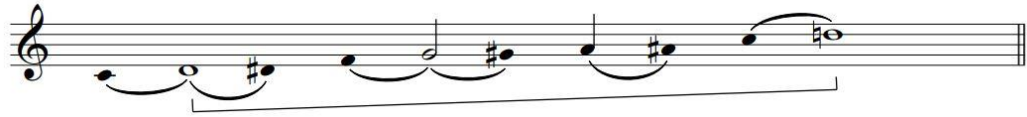


Figure 75: Gymnopédie frame 1 (bb. 1-9; 18-25)

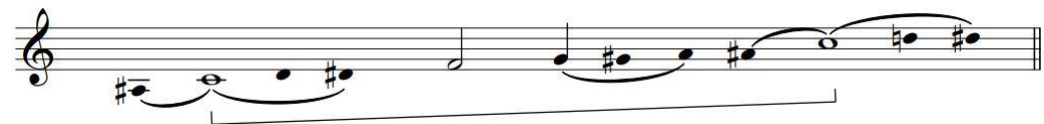
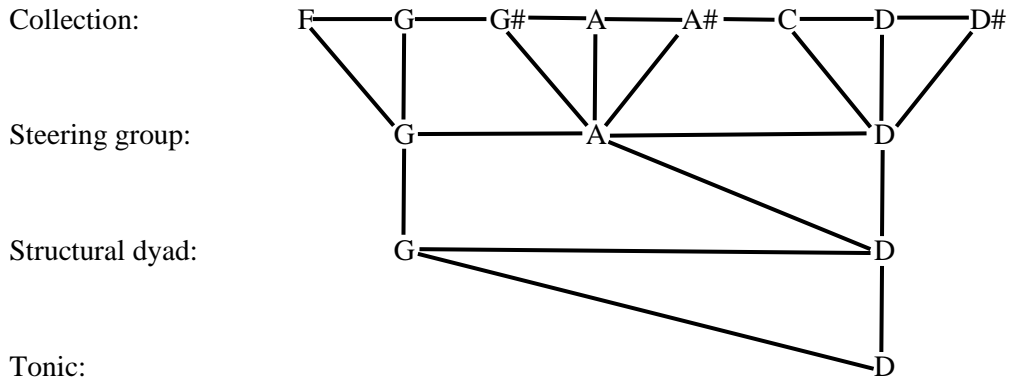
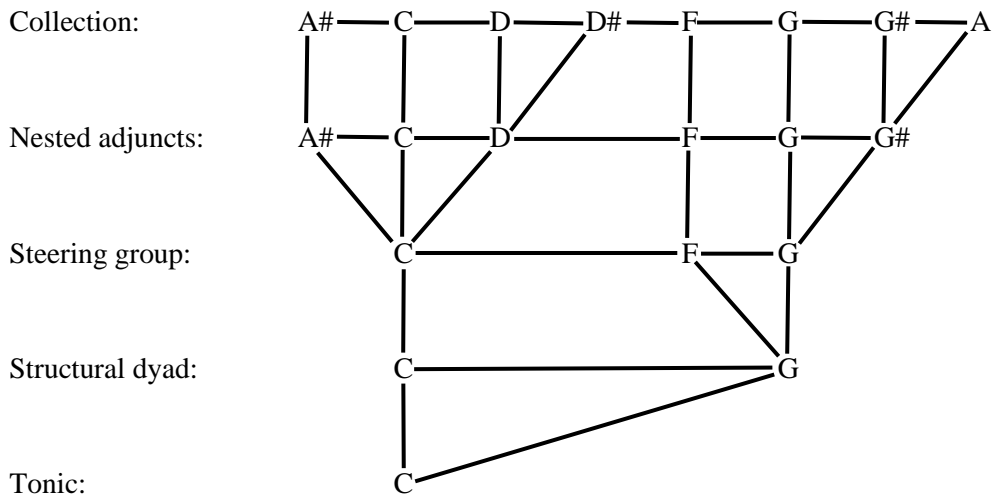


Figure 76: Gymnopédie frame 2 (bb. 10-17)



McLeod notes that this IPF is rich in chords of the IX hour,³ containing six steered by IPF 22122:

³ McLeod, 1994, p. 95.



Figure 77: Gymnopédie IPF chords

These six chords are extensive enough to provide a satisfying set of units for a chord grammar; fewer would require monotonous repetition. The full annotated voice-leading tables for both frames can be found on p. 184 and p. 199 respectively in Appendix A. The full score of the *Gymnopédie*, harmonized according to the grammar which emerges from these tables, is found in *Intermezzo IV*. There, it is followed by an analysis of its harmonic outline, with regard to how each progression preserves satisfying framing.

→ *Intermezzo IV – Gymnopédie, p. 102*

It will be seen that certain patterns emerge from the intersection of restricted chord forms and felicitous voice leading, such as the hovering between chords I and II in frame 1. This is what was meant by hierarchies which emerge in practice through the patterns of some chords recurring and/or being promoted perceptually over others. With greater familiarity, these emerging patterns could form the basis of contextual harmonic functions in the familiar sense of functional tonality.

Counterpoint

A slightly different approach was taken in the composition of the Canon featured in *Intermezzo V*. Here, the collection chosen to compose with was IPF 22-1-22/PC set 6.32



Figure 71: The canon collection and IPF

McLeod notes that this IPF is rich in triads of the VII hour.⁴ With D chosen as the tonic, this gives the following set of six hour VII chords as units of a chordal

⁴ McLeod, 1994, p. 87.

grammar:

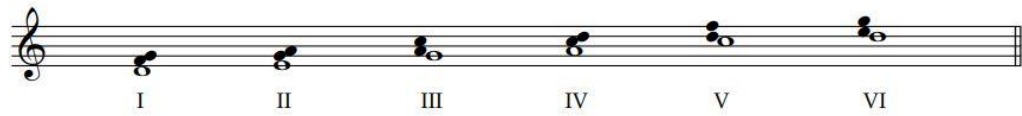
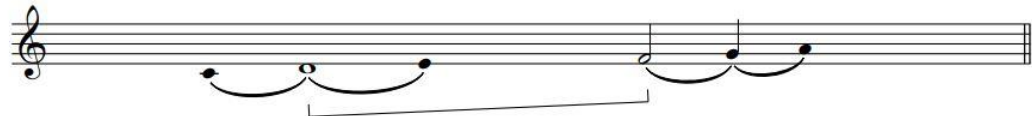
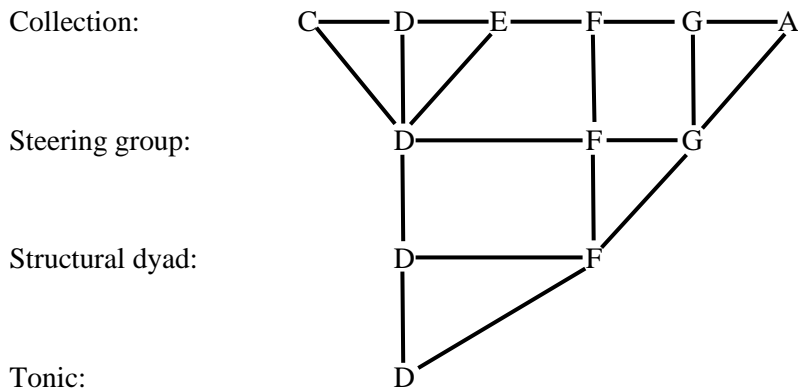


Figure 72: Canon IPF chords

The basic tonal frame of this collection was created around chord I as the steering group:



It can be restated as the following steering tree:



The melody I created from this frame is shown below.



Bar 1 is made up of a series of structural leaps through the steering group – F to D, D to G. This G at 2(1) initiates a linear progression up to D at bar 4, via an embellishing unfolding at 3(2) consisting of a leap down to D.

Bars 5 and 6 consist of an extended peroration upon the D's upper adjunct E, resolving back at 6(3) to D. This resolution initiates a further series of leaps through the steering group – to F at bar 7, back to D at 7(3), to G at bar 8, then back to D at 9(3). This return to the tonic pitch is affirmed by being sustained through bar 10 as a kind of mid-point cadence.

Following a short rest, melodic motions begin again at 11(3) with a leap from C to F at 12(1). This leap appears to change the structural role of the C adjunct when considered in isolation; but when considered in context preceded by a sustained D tonic, this C is still audibly bound as an adjunct to the D. The F at bar 12 initiates another passage of leaps through the steering group to D at 12(3) and up to G at 13(1). This G then frames a linear motion from G and F down via E to D at 14(3)-15(2).

The rest of the melody consists of perorations about the D tonic. From 15(3) a double-neighbour-type motion of D-E-C-D is embellished by a change of register between the E and C at 16(1), and by an unfolding leap down to a linear progression from F to D in bar 17.

At 18, the terminal D is reached. Another double-neighbour-type adjunct motion of D-C-E-D from 18(2)-21 affirms this tonic D by dwelling upon the E adjunct in bar 20. This functions as a kind of cadence, resolved by the final step down to D at 21(1).

When transposed up by a seventh and displaced by a single bar this melody requires very few changes – listed below – to harmonize with itself:

- What was a step down from D to C in bar 4 of the dux must be changed into an unfolding leap from C to G in the comes at bar 5, with the C bound to D in the following bar to preserve framing.

- The structural leap from F to C in bar 7 of the dux requires changing to an E-D adjunct in bar 8 of the comes, also for framing reasons.
- For framing reasons as well as to harmonize well with the dux's midpoint cadence-like motions, the comes swaps the dux's bar 9 structural leap from G to D for a smaller leap of F to D in bar 10.
- To avoid leaping from an unbound A adjunct in bar 12, in the comes the dux's structural leap of bar 11 changes the initial pitch of this leap to a C still audibly bound to the preceding D.
- The dux's adjunct F-D leap at 12(3) is changed to a step from E to D and back at 13 in the comes, to maintain consistent framing as well as a more pleasing melodic shape.
- The dux's E-D adjunct in bar 15 is rhythmically altered in the comes at bar 16 to avoid over-emphasizing the unison C in both voices.
- The dux's unisons at 16 are changed to include a step down from A to G in the comes at 17 in order to bind the A to its neighbouring steering pitch.

The voices follow each other closely from bar 14, until the dux's unison Cs in bar 16 are swapped for a step down from A to G at 17(3). This initiates a free coda, where the comes' motions consist of structural leaps from D to G in bar 18, and down to F in bar 19. This F is sustained until the end of the piece.

The resulting two-voice canon is shown below.

The musical score consists of two systems of two staves each. The first system contains five measures. The second system, starting at measure 6, contains five measures. The notation includes treble and bass clefs, a 3/4 time signature, and various note values and rests. The score illustrates the structural changes and framing adjustments discussed in the text, such as the leap from F to C in bar 7 and the unison C in bar 16.

To complete the canon I simply added a bass voice filling in the implied chordal sonorities of the imitative voices. This third voice begins with a D-G descending linear progression from 1(1)-2(2). The low G initiates a series of structural leaps through the steering group – to D at 2(3); to G at 3(1); back to D at 3(3) elaborated by another C adjunct; up to F at 4(2); to G at 4(3); to D at 5(3); back to G at 6. This G is elaborated by an A adjunct, initiating a double-neighbour type motion incorporating its neighbour in the steering group F and it's a adjunct at 7(3)-8(2). Via a move to F, further leaps pass to D at 9; via a C adjunct, up to G at 10(1); down to D at 10(3). The return to G at 11(1), via a C adjunct, initiates a further series of structural leaps – to F at 11(2); to G at 12(1) via an A adjunct; to D at 13(1) via a C adjunct; to F at 13(3). This F frames a descending linear progression back down to D at 14(1) via E. Via a C adjunct, this is followed by further leaps down to G and F, and back up to G from 15(3) to 16(2). The terminal G is elaborated by an A adjunct.

This is followed by another extended series of leaps through the steering group – up to D at 17(3); to F at 18(1); back down to D at 18(2); up to G at 19(1), decorated by shifts of register. The ensuing F at 21(1) frames a concluding linear progression down to D at 22(1), an extension of the piece which requires the other voices to be altered – the dux to a structural leap down to F; the comes to sustain its terminal F further.

The chordal harmonies filled in by this third voice are shown in the score below. In some cases, the choice of possible chord was limited by particular motions in the other voices. For instance, I considered harmonizing 10(3) as if the comes' sustained F was a suspension. However, as this F resolves by leap rather than by step, it required harmonization by a single chord – chord V – to satisfyingly resolve the leaping motion, similarly to conventional common-practice contrapuntal writing.

1/4 3/4

I/V V II II/VI VI I VI V I III II VI

6

VI IV I V II II/IV I I I V I I IV/VI

11

I/VI I/V IV I IV/V VI I II/VI I V VI I VI

16

I IV II I V VI

19

II/VI ----- I/V ----- I

→ *Intermezzo V – Canon, p. 131*

This music creates some difficulties for the listener, however. This can be seen in two locations of interest in the music: 3(3) and 17(3). At 3(3), the A in the dux voice forms an accented dissonant note, a kind of loose appoggiatura which resolves upwards to a consonant C. It is difficult to hear the contextual difference between the A and C, meaning the A misses some of the tonal force a listener may expect from an appoggiatura. The same is true of the dux's dissonant G at 14(3), also partly obscured by an F present in the comes – a part-writing fault present at other locations in the canon partly necessitated by the demands of framing in a tonality of relatively low harmonic differentiation between chords, and the dux's dissonant F at 17(1). The resolution of the comes' dissonant A to G at 17(3) lacks force due to the unfamiliarity of the contextual hour VII consonance-dissonance paradigm. This will be discussed further in the next chapter.

Conclusion

This chapter explored steering tree tonality through the composition of music in multi-voice textures, identifying two significant problems. Firstly, while the structural steering-group can emerge from a free combination of voices, without a principle of regulating vertical combinations of tones the musical surface becomes scrambled. Secondly, chord progressions can be easily created out of the steering-group prototype to regulate contextually-consonant pitch combinations; however they require careful treatment to maintain consistent framing motions in every voice, and progressions which do this may be very few for a given tonality. Simply stacking motions atop one another as demonstrated in compositional practice lead to an unsatisfactory result and justified the addition of chords to this

system. By trimming down the vertical stackings of pitches to triads identical to the structural steering subset of the steering tree and channelling these triads into frame-preserving progressions summarized in voice-leading tables, a more satisfactory result was produced.

In the next chapter, the argument of the thesis and the resulting theory of expanded tonality will be summarized. This will be followed by a discussion of potential problems with the theory, along with suggestions for future research

Conclusion

The goal of this thesis was to combine a general theory of tonality with the principles of the tone clock in order to demonstrate the possibility of a coherent tonality of non-traditional intervallic make-up. This process began in chapter Chapter 1 in which I justified such an approach through outlining significant criticisms of the New Music which dominated the mid- and late-twentieth century. Drawing upon the critical writings of Peter Schat and George Rochberg, I described how the New Music, while constituting a genuine re-stocking of the materials and resources of music-making, courted irrelevance by being perceptually impenetrable.

Building on this notion further, Chapter 2 described Peter Schat's challenge to the New Music: tone clock theory, an attempt to create a musical grammar that embraced both expression and inclusion while remaining technically rigorous. I also described how New Zealand composer Jenny McLeod expanded the system to all possible pitch class sets to create a more general 'musical theory of everything'. The essence of the tone clock technique for both Schat and McLeod is found in the grouping principle of the hours – triads based upon characteristic and limited interval content – and steering, a system of transposing those hours to form aggregates, along with an insistence that intervallic colour and symmetry constitute a viable and perceivable alternative form of tonality.

Marrying the tone clock and tonality, Chapter 3 evaluated this claim to tonality, drawing on William Thomson's analysis of historical approaches to tonality. Each of his five genera of tonality – harmonic, functional, scalar, colour and centric – were shown to be inadequate accounts of the essential features of tonality in music. This justified adopting Thomson's tonality frame as a general theory of tonality, as it does not seriously suffer from the same issues of arbitrariness, a supposed 'natural' foundation in acoustics, or circularity. In brief, the tonality frame explains tonality as a system of consistent hierarchical structural relations between the pitches of a collection, created by the motions which occur within the music and based upon the perception of some pitches as embellishing or unfurling

from other, more structural pitches. Under this definition, the tone clock cannot constitute a tonality. However, it can be used as a descriptor of the musical surface of tonality and hence can be blended with the tonality frame to create a viable tonality.

Left mysterious in the work of Thomson, framing motions were examined in Chapter 4, in further detail. By comparison with principles of prolongation, a taxonomy of three motions was defined: adjunct, linear progression and structural leaps. The effectiveness of this taxonomy was then tested, successfully, in analysing a series of plainchant melodies. This proved that framing, far from being inexplicable, could be successfully reduced to the three motions listed above

Bridging the notion of tonality and the tone clock, in Chapter 5 I attempted the synthesis between this more precise framing and the tone clock. Arguing that the steering principle creates unavoidable hierarchies even in a classic twelve-note tone clock field, I proceeded to demonstrate that all instances of musical hierarchies create groupings of notes which sprout from each other, identically to McLeod's description of steering as a single note sprouting a group of other notes. This was practically demonstrated by expressing the plainchant analyses from Chapter 4 in terms of the tone clock, achieved by means of steering trees – branching diagrams which summarize the groupings at each structural level and shows how those which are more structural steer those which sprout from them at less-structural levels. These trees were then stretched into groupings of different intervallic qualities to demonstrate instances of definitively tonal motions subsisting in unfamiliar intrvallic shapes, a principle tested further in the composition of a simple monophonic study.

In the final chapter of this thesis, in Chapter 6 I tested this expanded tonality in thicker, multi-voice textures. Dissatisfaction with merely stacking motions atop one another as demonstrated in compositional practice justified the addition of chords to this system. This was achieved by limiting the vertical stackings of pitches to triads identical to the structural steering subset of the steering tree and channelling these triads into frame-preserving progression summarized in voice-

leading tables.

I have drawn three significant learnings from the course of research outlined above. Firstly, at least in those instances examined in this thesis, a perceivable sense of tonality can and does inhere wherever consistent framing is maintained. This was particularly noticeable during my reflections upon the stretched framings of Chapter 5.

Secondly, that this sense of tonality can be expanded into a complete system equivalent in most ways to common-practice diatonic harmony. As Chapter 6 showed, however, this does require much care to preserve framing, and the possible tonalities that can be placed in a given pitch collection may be very limited.

Lastly, the practical experience or ‘ideas-in-action’ gained during this research process has emphasized how versatile a musical tool the tone clock is. Under an inclusive interpretation, it can easily function as a descriptor of framing and generate new tonalities. This gives some credence to McLeod’s claim that the tone clock has the potential to unite all existing theories of music into a single ‘theory of everything’

A Hint of Politics

As a tribute to Schat the activist, who often related music to society in his writings, it seems appropriate at this point to offer a political analogy for the new harmonic role I have demonstrated for the tone clock. As has been stated previously, Schat conceived of the the classic tone clock is a kind of utopian anarchism, where the tones are freed from both the centralized control of serialism or the common-practice domination by a single one of their number, to explore their innate relationships without arbitrary limits.

In the new harmonic role defined by the steering tree, there are still hierarchies, but they are shifting hierarchies. The steering tree not only allows any pitch to function as tonic (as in conventional common-practice diatonic harmony), but any combination of intervals – so long as they are treated correctly, within the limits

of a given collection – may function as the structural bones of the music’s framing and tonal makeup. The closest parallel with these egalitarian principles comes not from the world of politics but from the world of sport. In a comparison Schat would no doubt appreciate, the music of the steering tree closely matches the Dutch Total Football (*totaalvoetbal*) movement of the 1970s. According to this footballing philosophy, every outfield player must be equipped with the full range of necessary skills to play every position on the field – forward, midfield, or defense – thus constituting a ‘total footballer’. Like the tone clock proper, the steering tree refuses to marginalize any potential combination of tones as structurally unsatisfying. It also recognizes that a lack of centre, while forming an attractive utopia, is unhelpful perceptually. Thus, pitches and their relationships – intervals – are conceived as ‘total musical entities’. So long as they are treated correctly, such that a satisfying framing subsists between them, any of these ‘total musical individuals’ may take on any possible role in the musical game, in a shifting, relative hierarchy similar to the shifting formations of Total Football.

Potential Problems

The limited scope of the current study means that many questions and potential problems remain to be investigated. These are listed here, and may be treated as suggestions for further research.

Firstly, I have sidestepped the problem of chordal roots and inversions. This is partly out of an assumption that identifying the chordal root and the equivalence of chordal inversions is simply a matter of habit and will emerge from the music in a related way to the position of the tonic within the structural subset. However, other factors could be at play, for instance acoustical factors, which could limit the perception of potential roots and complicate the issue of inversional equivalence.

Second is the question of the octave. I have consistently attempted to reduce tonality frames and steering trees to a single octave, but it remains open to question whether this is an oversimplification, if octave transpositions deserve to be classified as a kind of steering. McLeod suggests so, proposing 6-6 as the

‘thirteenth hour’. If her suggestion is justified, it will require a revision of the type of steering trees and tonality frames demonstrated in the current study.

Thirdly, Lerdahl discusses steps and leaps in detail, and proposes that a structural difference between them requires a listener to clearly identify leaping motions versus stepping motions.¹ For Lerdahl, this means that all motions between adjacent pitches in the collection will be heard as steps, as a leap requires a pitch to be leapt over. This has been disregarded in the current study, and whether this will adversely affect perception of tonality deserves inspection. If so, it may severely limit the motions which may subsist within many IPFs

Lastly, the listening ear may be so conditioned by common-practice expectations of consonance and dissonance that perceiving a new contextual incarnation of the same rules is nearly impossible. In this thesis, hours IX and VII dominate the practical examples as both are different to a conventional hour XI tertial triad, but not too challenging to the ear. Even so, consider bar 19 of the *Gymnopédie* in Intermezzo IV. In the upper melody, a contextually-dissonant D foreign to the arbitrarily-stable hour IX chord resolves upwards to a more-stable E flat. The listening ear cannot help but hear the D as more stable, however, as it forms a tertial B flat major triad of hour XI with the pitches of the bass clef. Similar criticisms were raised in Chapter 6 regarding the treatment of dissonance in the *Canon* of Intermezzo V. Harmonic support becomes troublesome when the listener’s sensibility refuses to hear the intended order. Unless the ear can be retrained, steering tree tonality may court a similar perceptual irrelevance to the New Music.

A positive indication in this regard is given by Psyche Loui, David L. Wessel and Carly L. Hudson Lam.² In their study of musical learning, they created melodies from contrasting grammars or sets of motions out of the Bohlen Pierce scale. Results indicate that passive exposure to the melodies did lead participants to learn melodies in these unfamiliar grammars, even distinguishing melodies

¹ Lerdahl, 2001, p. 53.

² Psyche Loui, David L. Wessel and Carly L. Hudson Lam, ‘Humans rapidly learn grammatical structure in a new musical style’, *Music Perception* 27/5 (377-388).

composed in their exposure grammar from those composed in alternate but very similar grammars. Thus, it may be possible for listeners to easily learn and appreciate the order within new incarnations of tonality. However, further investigation may be necessary, particularly of the harmonic dimension of music, before a judgement can be passed on the cogency of steering tree tonality.

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Appendices

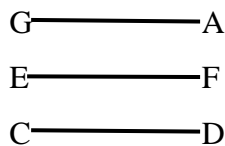
Appendix A: Voice-leading tables

Voice-Leading Table 1

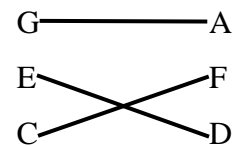
The following table systematically lists all possible voice-leadings for all possible two-chord progressions in the stereotypical C major tonal framing referenced in Chapter 6.

I-II/II-I

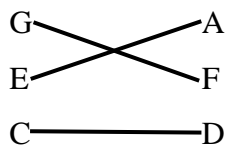
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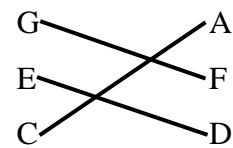
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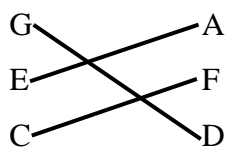
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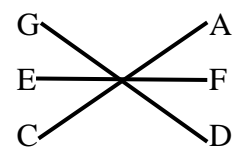
d)



e)



f)



All are unsatisfying progressions:

a): parallelism (under some circumstances, this may count as satisfying)

b): swapping direction of support of D adjunct; leaping to unbound F

c): swapping direction of support of F adjunct; leaping to unbound A

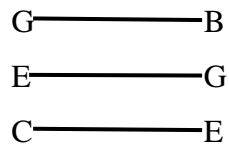
d): swapping direction of support of F adjunct; swapping direction of support of D adjunct; leaping to unbound A

e): leaping to unbound D; leaping to unbound A; leaping to unbound F

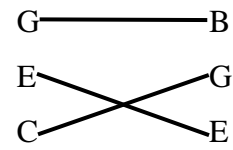
f): leaping to unbound D; leaping to unbound A

I-III/III-I

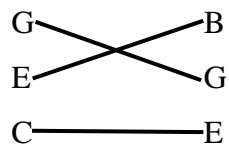
a)



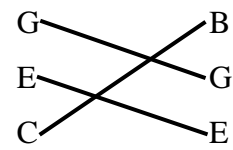
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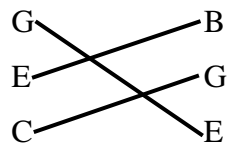
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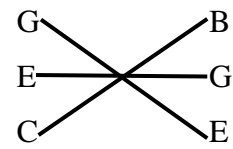
d)



e)



f)



Two satisfying progressions and four unsatisfying:

a): leaping to unbound B; parallelism

b): leaping to unbound B

c): leaping to unbound B

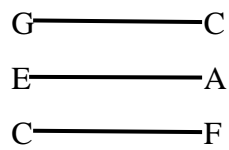
d): satisfying stand-alone progression

e): leaping to unbound B

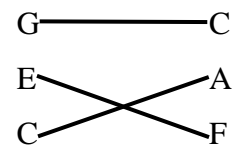
f): satisfying stand-alone progression

I-IV/IV-I

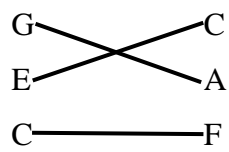
a)



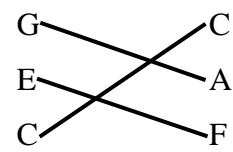
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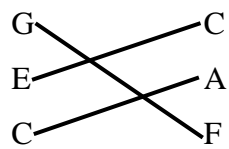
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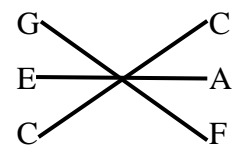
d)



e)



f)



One satisfying progression and five unsatisfying:

a): leaping to unbound A; leaping to unbound F; parallelism

b): leaping to unbound A

c): leaping to unbound F

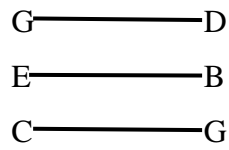
d): satisfying stand-alone progression

e): leaping to unbound A; swapping direction of support of G adjunct

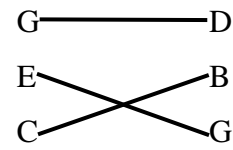
f): swapping direction of support of G adjunct; leaping to unbound A

I-V/V-I

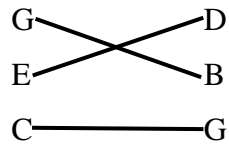
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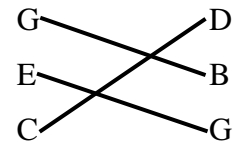
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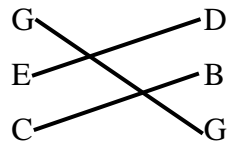
c)



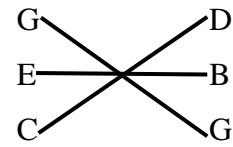
d)



e)



f)



All are unsatisfying progressions:

a): leaping to unbound D; leaping to unbound B; parallelism

b): leaping to unbound D

c): leaping to unbound B; swapping direction of support for D adjunct

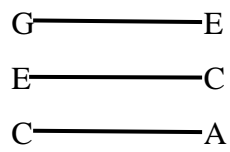
d): leaping to unbound B

e): swapping direction of support for adjunct D

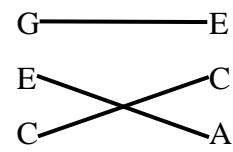
f): leaping to unbound B

I-VI/VI-I

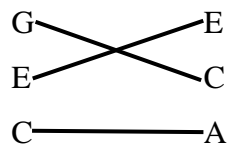
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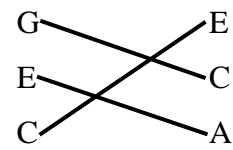
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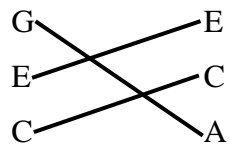
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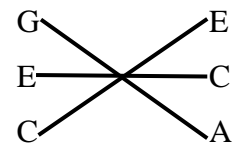
d)



e)



f)



Three satisfying progressions and three unsatisfying:

a): leaping to an unbound A; parallelism

b): leaping to unbound A

c): satisfying stand-alone progression.

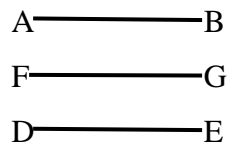
d): leaping to unbound A

e): satisfying stand-alone progression

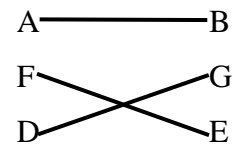
f): satisfying stand-alone progression

II-III/III-II

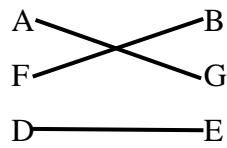
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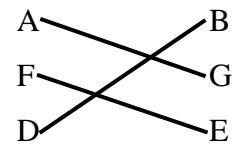
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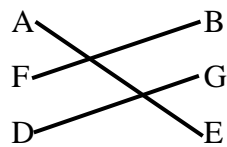
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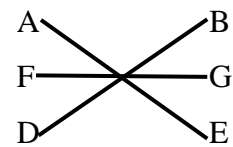
d)



e)



f)



All are unsatisfying progressions:

a): floating unbound A and B adjuncts; swapping direction of support for F and D adjuncts; parallelism

b): floating unbound A and B adjuncts; leaping from unbound D

c): leaps between unbound F and B; swapping direction of support of D adjunct

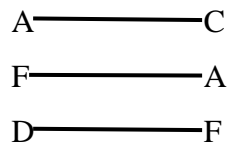
d): leaping between unbound F and B

e): leaping from unbound A; leaping between unbound F and B; leaping from unbound D

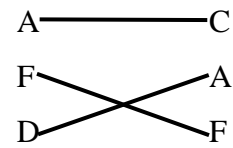
f): leaping from unbound A; swapping direction of support for F adjunct; leaping between unbound D and B

II-IV/IV-II

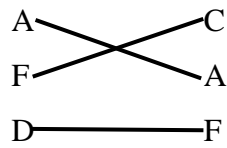
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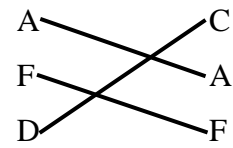
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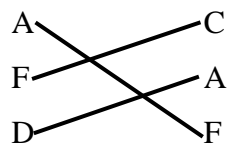
c)



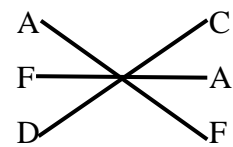
d)



e)



f)



One satisfying progression and five unsatisfying:

a): leaping from unbound A; leaping between unbound F and A; leaping between unbound D and F; parallelism

b): leaping from unbound A; leaping between unbound D and A

c): leaping from unbound F; leaping between unbound D and F

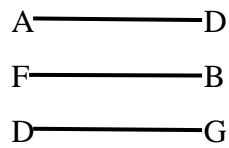
d): satisfying stand-alone progression

e): leaping between unbound A and F; leaping from unbound F; leaping between unbound D and A

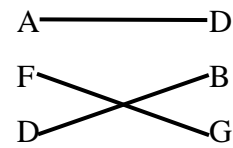
f): leaping between unbound A and F

II-V/V-II

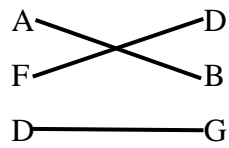
a)



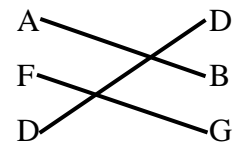
b)



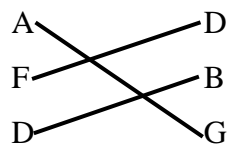
c)



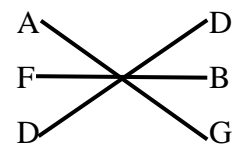
d)



e)



f)



All are unsatisfying progressions:

a): leaping between unbound A and D; leaping between unbound F and B; leaping from unbound D; parallelism

b): leaping between unbound A and D; leaping between unbound D and B; swapping direction of support of F adjunct

c): floating unbound A and B adjuncts; leaping between unbound F and D; leaping from unbound D

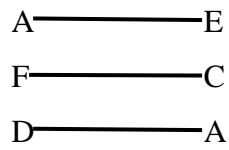
d): floating unbound A and B adjuncts; swapping direction of support of F adjunct

e): leaping between unbound F and D; leaping between unbound D and B

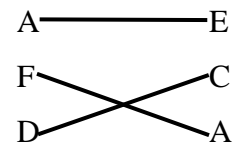
f): leaping between unbound F and B

II-VI/VI-II

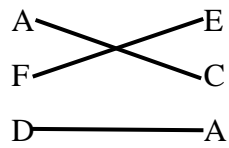
a)



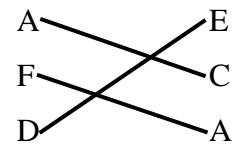
b)



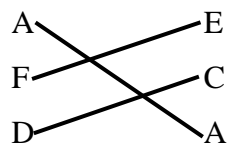
c)



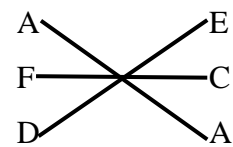
d)



e)



f)



One satisfying progression and five unsatisfying:

a): leaping from unbound A; leaping from unbound F, leaping between unbound D and A; parallelism

b): leaping from unbound A; leaping between unbound F and A

c): leaping from unbound A; leaping between unbound D and A

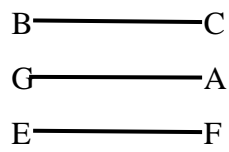
d): leaping from unbound A; leaping between unbound F and A; swapping direction of support of D adjunct

e): satisfying stand-alone progression

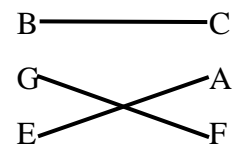
f): leaping from unbound F; swapping direction of support of D adjunct

III-IV/IV-III

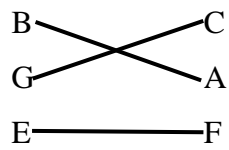
a)



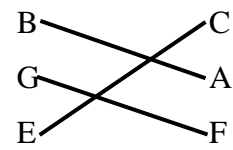
b)



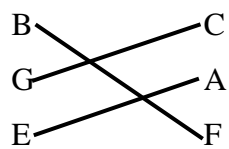
c)



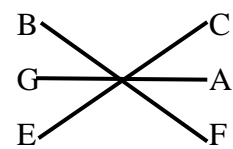
d)



e)



f)



All are unsatisfying progressions:

a): parallelism

b): swapping the direction of support of F adjunct; leaping to an unbound A

c): floating unbound A and B adjuncts

d): floating unbound A and B adjuncts; swapping the direction of support of F adjunct

e): leaping between unbound B and F; leaping to unbound A

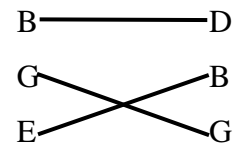
f): leaping between unbound B and F

III-V/V-III

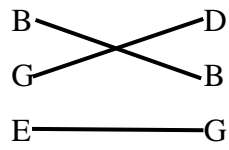
a)



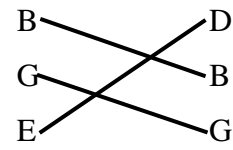
b)



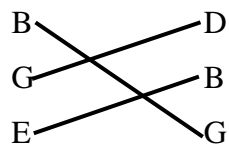
c)



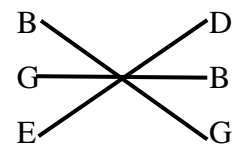
d)



e)



f)



All are unsatisfying progressions:

a): leaping between unbound B and D; leaping to unbound B

b): leaping between unbound B and D; leaping to unbound B

c): leaping to unbound D

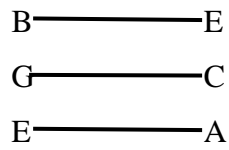
d): swapping direction of support for D adjunct

e): leaping from unbound B; leaping to unbound D; leaping to unbound B

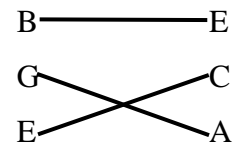
f): leaping from unbound B; leaping to unbound B; swapping direction of support of D adjunct

III-IV/IV-III

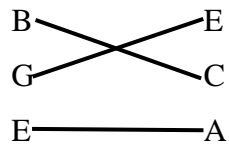
a)



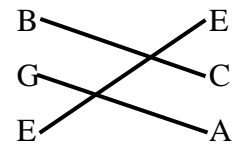
b)



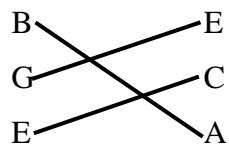
c)



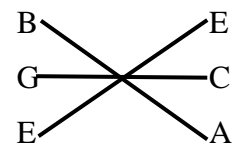
d)



e)



f)



One satisfying progression and five unsatisfying:

a): leaping from unbound B; leaping to unbound A; parallelism

b): leaping from unbound B

c): leaping to unbound A

d): satisfying stand-alone progression

e): floating unbound A and B adjuncts

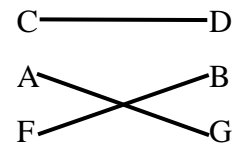
f): floating unbound A and B adjuncts

IV-V/V-IV

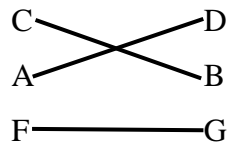
a)



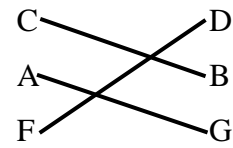
b)



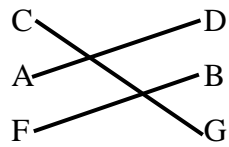
c)



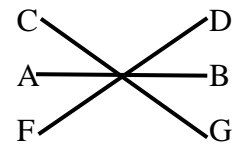
d)



e)



f)



All are unsatisfying progressions:

a): floating unbound A and B adjuncts; swapping direction of support of F adjunct

b): leaping between unbound F and B

c): leaping between unbound A and D; swapping direction of support of F adjunct

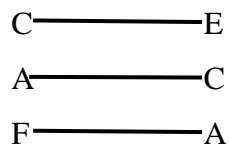
d): leaping between unbound F and D

e): leaping between unbound A and D; leaping between unbound F and B

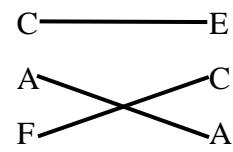
f): floating unbound A and B adjuncts; leaping between unbound F and D

IV-VI/VI-IV

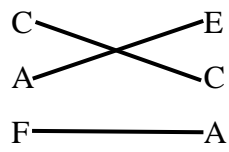
a)



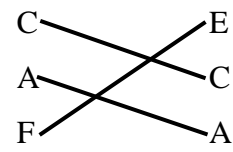
b)



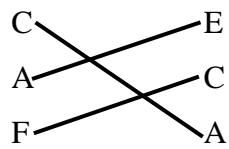
c)



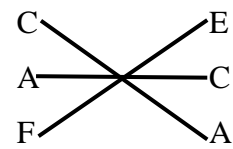
d)



e)



f)



One satisfying progression and five unsatisfying:

a): leaping from unbound A; leaping between unbound F and A; parallelism

b): leaping from unbound F

c): leaping from unbound A; leaping between unbound F and A

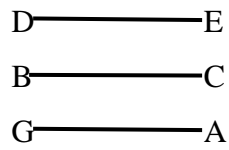
d): satisfying stand-alone progression

e): leaping to unbound A; leaping from unbound A; leaping from unbound F

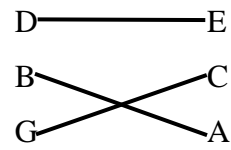
f): leaping to unbound A; leaping from unbound A

V-VI/VI-V

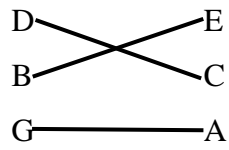
a)



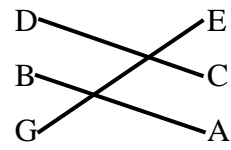
b)



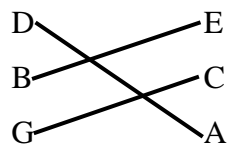
c)



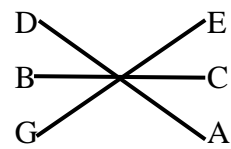
d)



e)



f)



All are unsatisfactory progressions:

a): swapping direction of support of D adjunct

b): swapping direction of support of D adjunct; floating A-B unbound adjuncts

c): leaping from unbound B

d): floating A-B unbound adjuncts

e): leaping between unbound D and A; leaping from unbound B

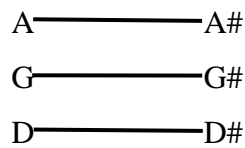
f): leaping between unbound D and A

Voice-Leading Table 2

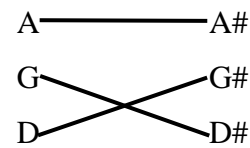
The following table repeats the same systematic process used previously, but in the framing of the IPF 22-111-22 collection established as Frame 1 of the *Gymnopedie* of chapter 6, using triads of hour IX.

I-II/II-I

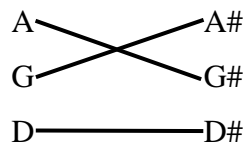
a)



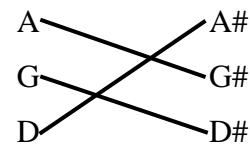
b)



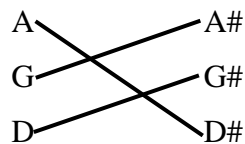
c)



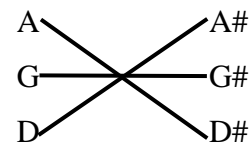
d)



e)



f)



All are unsatisfying progressions:

a): parallelism

b): leaping to unbound D#; leaping to unbound G#

c): swapping direction of support of G# adjunct; leaping to unbound A#

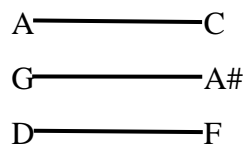
d): swapping direction of support of G# adjunct; leaping to unbound D#; leaping to unbound A#

e): leaping to unbound D#; leaping to unbound A#; leaping to unbound G#

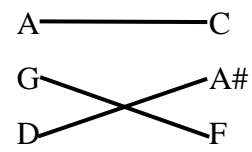
f): leaping to unbound D#; leaping to unbound A#

I-III/III-I

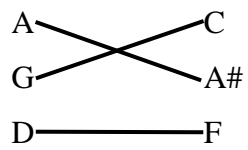
a)



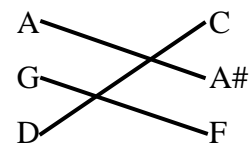
b)



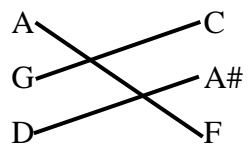
c)



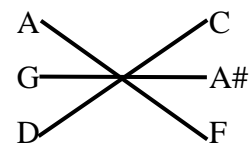
d)



e)



f)



One satisfying progression and five unsatisfying:

a): leaping to unbound C; leaping to unbound A#; leaping to unbound F;
parallelism

b): leaping to unbound C

c): leaping to unbound F; leaping to unbound C

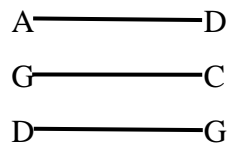
d): satisfying stand-alone progression

e): leaping to unbound F; leaping to unbound C; leaping to unbound A#

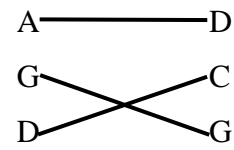
f): leaping to unbound F; leaping to unbound G#

I-IV/IV-I

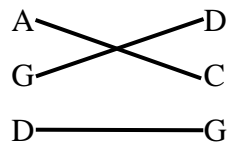
a)



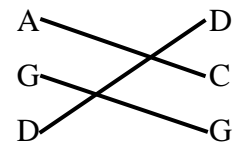
b)



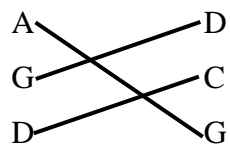
c)



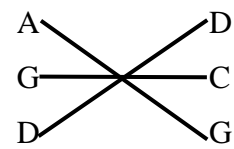
d)



e)



f)



Three satisfying progressions and four unsatisfying:

a): satisfying stand-alone progression

b): satisfying stand-alone progression

c): leaping to unbound C

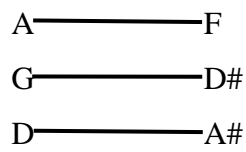
d): leaping to unbound C

e): satisfying stand-along progression

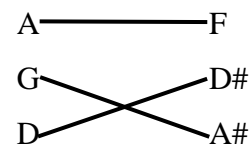
f): leaping to unbound C

I-V/V-I

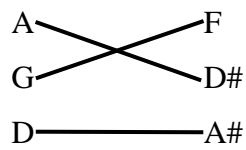
a)



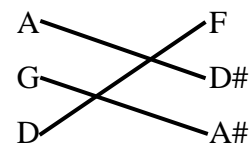
b)



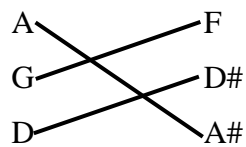
c)



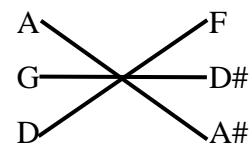
d)



e)



f)



One satisfying progression and five unsatisfying:

a): leaping to unbound F; leaping to unbound D#; leaping to unbound A#;
parallelism

b): leaping to unbound F; leaping to unbound A#

c): leaping to unbound D#; leaping to unbound A#

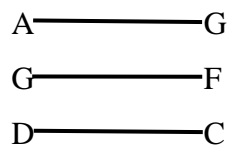
d): leaping to unbound D#; leaping to unbound A#; leaping to unbound F

e): satisfying stand-alone progression

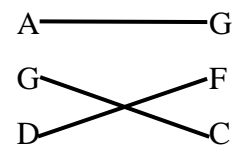
f): leaping to unbound D#; leaping to unbound F

I-VI/VI-I

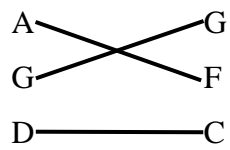
a)



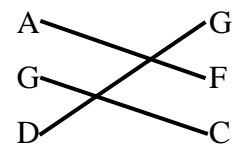
b)



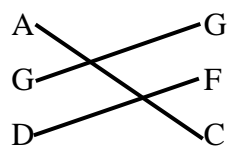
c)



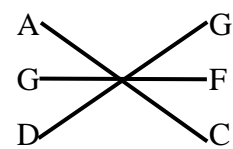
d)



e)



f)



One satisfying progression and five unsatisfying:

a): parallelism

b): leaping to unbound C; leaping to unbound F

c): leaping to unbound F

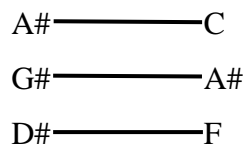
d): leaping to unbound F, leaping to unbound C

e): leaping to unbound C; leaping to unbound F

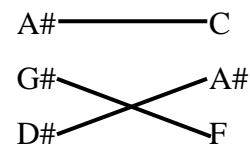
f): leaping to unbound C

II-III/III-II

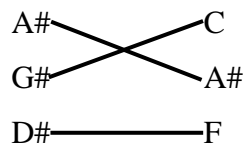
a)



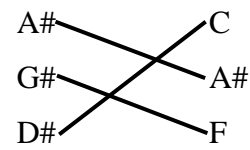
b)



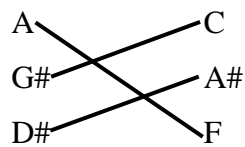
c)



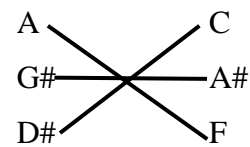
d)



e)



f)



All are unsatisfying progressions:

a): leaping from unbound A#; leaping between unbound G# and A#; floating unbound D# and F adjuncts; parallelism

b): leaping from unbound A#; leaping between unbound G# and F; leaping between unbound D# and A#

c): leaping between unbound G# and C; floating unbound D# and F adjuncts

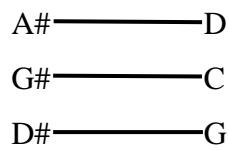
d): leaping between unbound G# and F; leaping between unbound D# and C

e): leaping to unbound F; leaping between unbound G# and C; leaping between unbound D# and A#

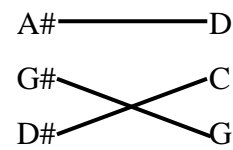
f): leaping to unbound F; leaping between unbound G# and A#; leaping between unbound D# and C

II-IV/IV-II

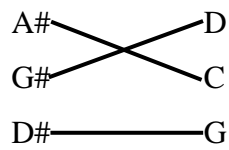
a)



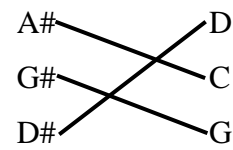
b)



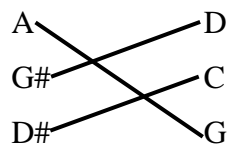
c)



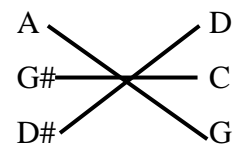
d)



e)



f)



All are unsatisfying progressions:

a): leaping from unbound A#; leaping between unbound G# and C; leaping from unbound D#; parallelism

b): leaping from unbound A#; leaping between unbound D# and C

c): leaping between unbound A# and C; leaping from unbound G#; leaping from unbound D#

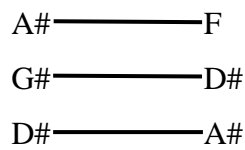
d): leaping between unbound A# and C

e): leaping from unbound G#; leaping between unbound D# and C

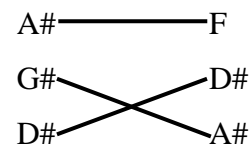
f): leaping between unbound G# and C

II-V/V-II

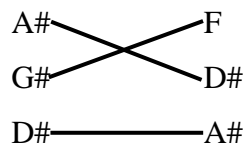
a)



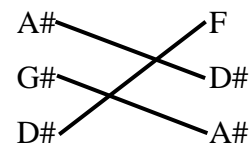
b)



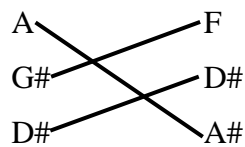
c)



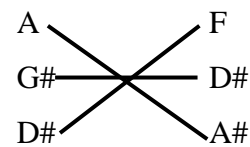
d)



e)



f)



All are unsatisfying progressions:

a): leaping between unbound A# and F; leaping between unbound G# and D#;
leaping between unbound D# and A#; parallelism

b): leaping between unbound A# and F; leaping between unbound G# and A#

c): leaping between unbound A# and D#; leaping between unbound G# and F;
leaping between unbound D# and A#

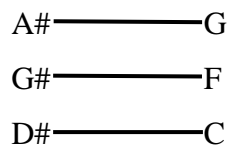
d): leaping between unbound A# and D#; leaping between unbound G# and A#;
floating unbound D# and F adjuncts

e): leaping between unbound G# and F

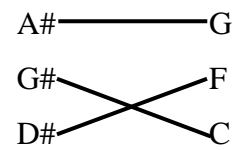
f): leaping between unbound G# and D#; floating unbound D# and F adjuncts

II-VI/VI-II

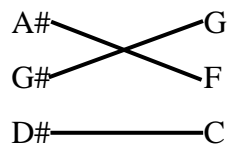
a)



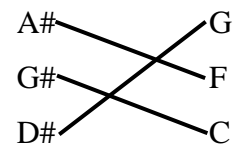
b)



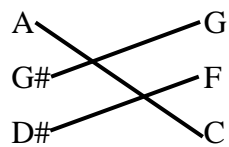
c)



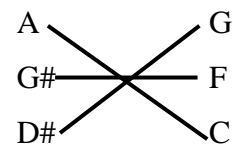
d)



e)



f)



All are unsatisfying progressions:

a): leaping from unbound A#; leaping between unbound G# and F; leaping between unbound D# and C; parallelism

b): leaping from unbound A#; leaping between unbound G# and C; floating unbound D# and F adjuncts

c): leaping between unbound A# and F; leaping between unbound D# and C

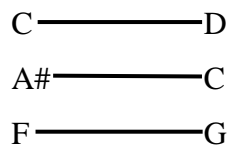
d): leaping between unbound A# and F; leaping between unbound G# and C; leaping from unbound D#

e): leaping to unbound C; floating unbound D# and F

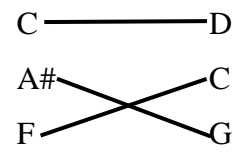
f): leaping to unbound C; leaping between unbound G# and F; leaping from unbound D#

III-IV/IV-III

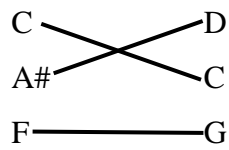
a)



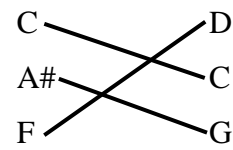
b)



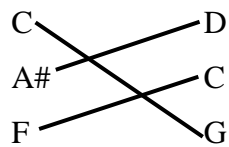
c)



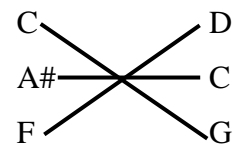
d)



e)



f)



All are unsatisfying progressions:

a): floating unbound A# and C adjuncts; parallelism

b): leaping from unbound A#; leaping between unbound F and C

c): leaping from unbound A#

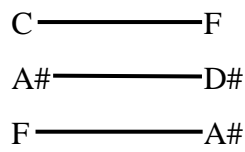
d): leaping from unbound A#; leaping from unbound F

e): leaping from unbound C; leaping from unbound A#; leaping between unbound F and C

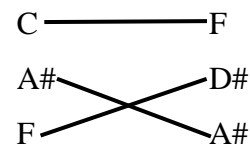
f): leaping from unbound C; leaping between unbound A# and C; leaping from unbound F

III-V/V-III

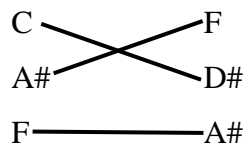
a)



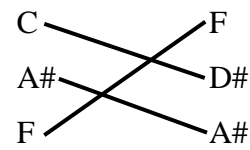
b)



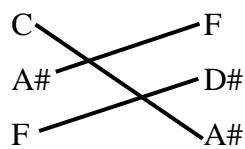
c)



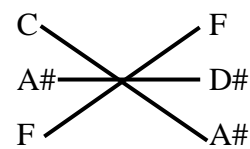
d)



e)



f)



All are unsatisfying progressions:

a): leaping between unbound C and F; leaping between unbound A# and D#;

leaping between unbound F and A#

b): leaping between unbound C and F; floating unbound F and D# adjuncts

c): leaping between unbound C and D#; leaping between unbound F and A# (in two voices)

d): leaping between unbound C and D#

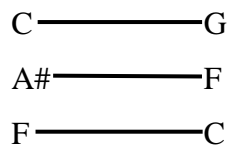
e): floating unbound C and A# adjuncts; leaping between unbound A# and F;

floating unbound F and D# adjuncts

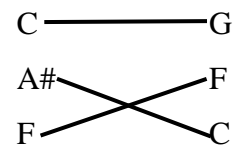
f): floating unbound C and A# adjuncts; leaping between unbound A# and D#

III-VI/VI-III

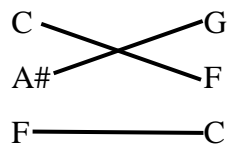
a)



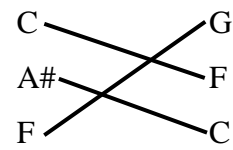
b)



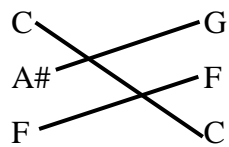
c)



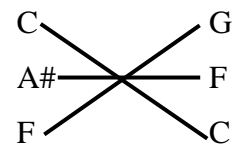
d)



e)



f)



All are unsatisfying progressions:

a): leaping from unbound C; leaping between unbound A# and F; leaping between unbound F and C; parallelism

b): leaping from unbound C; leaping between unbound A# and C

c): leaping between unbound C and F (in two voices); leaping from unbound A#

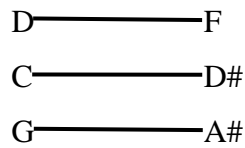
d): leaping between unbound C and F; leaping between unbound A# and C

e): leaping from unbound A#

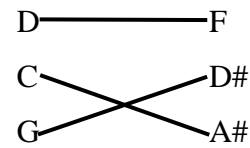
f): leaping between unbound A# and F

IV-V/V-IV

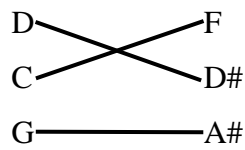
a)



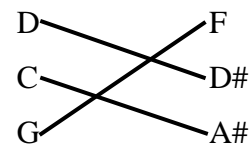
b)



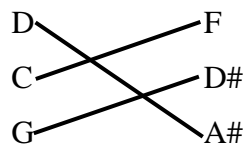
c)



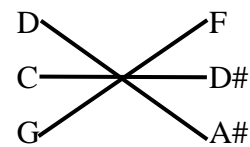
d)



e)



f)



All are unsatisfying progressions:

a): leaping to unbound F; leaping between unbound C and D#; leaping to unbound A#; parallelism

b): leaping to unbound F; floating unbound C and A# adjuncts; leaping to unbound D#

c): leaping between unbound C and F; leaping to unbound A#

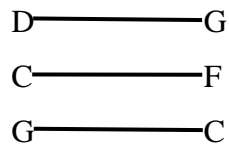
d): floating unbound A# and C adjuncts

e): leaping to unbound A#; leaping between unbound C and F; leaping to unbound D#

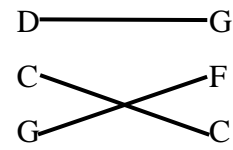
f): leaping to unbound A#; leaping between unbound C and D#

IV-VI/VI-IV

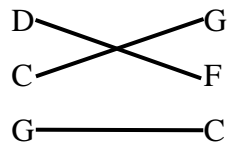
a)



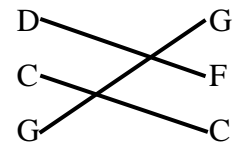
b)



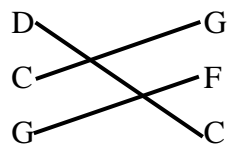
c)



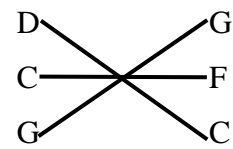
d)



e)



f)



One satisfying progression and five unsatisfying:

a): leaping between unbound C and F; leaping to unbound C

b): satisfying stand-alone progression

c): leaping to unbound F; leaping from unbound C; leaping to unbound C

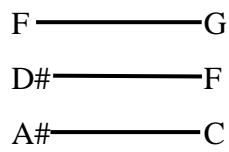
d): leaping to unbound F

e): leaping from unbound C

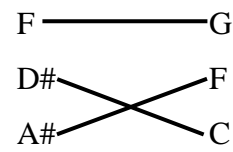
f): leaping between unbound C and F

V-VI/VI-V

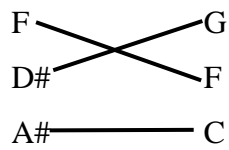
a)



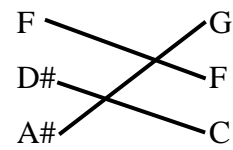
b)



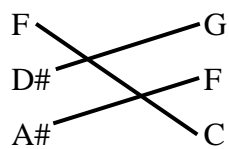
c)



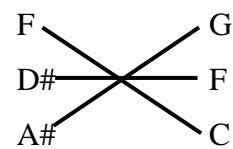
d)



e)



f)



All are unsatisfying progressions:

a): floating unbound D# and F adjuncts; floating unbound A# and C adjuncts

b): leaping between unbound D# and C; leaping between unbound A# and F

c): leaping from unbound D#; floating unbound A# and C

d): leaping between unbound D# and C; leaping from unbound A#

e): leaping between unbound F and C; leaping from unbound D#; leaping between unbound A# and F

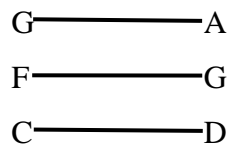
f): leaping between unbound F and C; floating unbound D# and F adjuncts; leaping from unbound A#

Voice-Leading Table 3

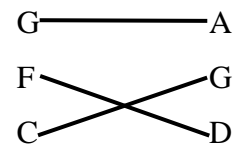
The following table also repeats the same systematic process used previously, but in the framing of the IPF 22-111-22 collection established as Frame 2 of the *Gymnopedie* of chapter 6, using triads of hour IX.

I-II/II-I

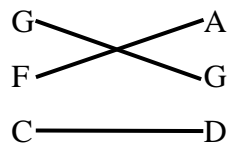
a)



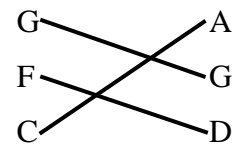
b)



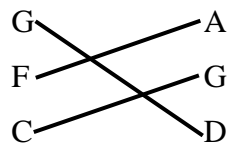
c)



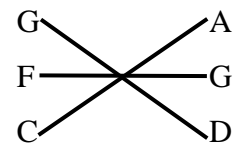
d)



e)



f)

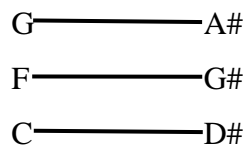


All are unsatisfying progressions:

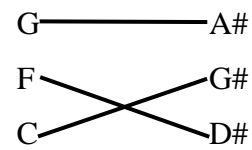
- a): leaping to unbound A; parallelism
- b): leaping to unbound A; leaping to unbound D
- c): leaping to unbound A
- d): leaping to unbound D; leaping to unbound A
- e): leaping to unbound D; leaping to unbound A
- f): leaping to unbound D; leaping to unbound A

I-III/III-I

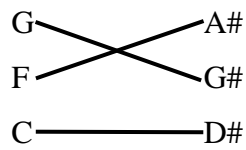
a)



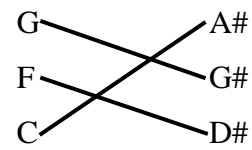
b)



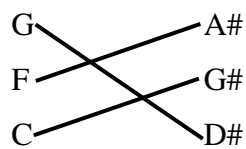
c)



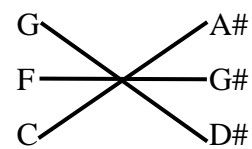
d)



e)



f)



All are unsatisfying progressions:

a): leaping to unbound A#; leaping to unbound G#; leaping to unbound D#;
parallelism

b): leaping to unbound A#; swapping direction of support of D# adjunct; leaping
to unbound G#

c): leaping to unbound A#; leaping to unbound D#

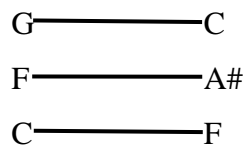
d): swapping direction of support for the D# adjunct; leaping to unbound A#

e): leaping to unbound D#; leaping to unbound A#; leaping to unbound G#

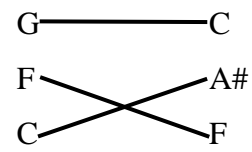
f): leaping to unbound D#; leaping to unbound G#

I-IV/IV-I

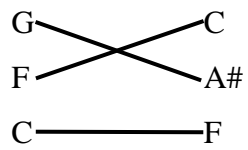
a)



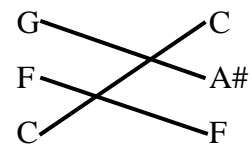
b)



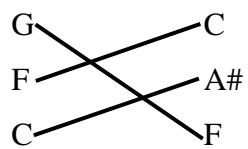
c)



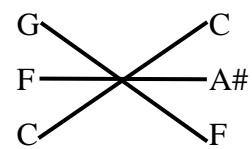
d)



e)



f)



One satisfying progression and five unsatisfying:

a): leaping to unbound A#; parallelism

b): satisfying stand-alone progression

c): leaping to unbound A#

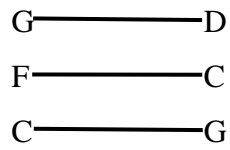
d): leaping to unbound A#

e): leaping to unbound A#

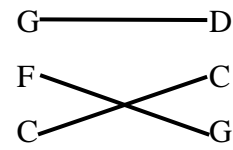
f): leaping to unbound A#

I-V/V-I

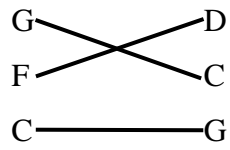
a)



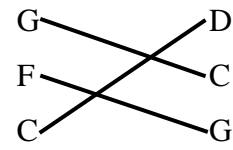
b)



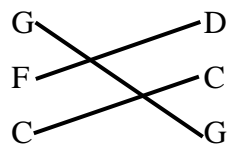
c)



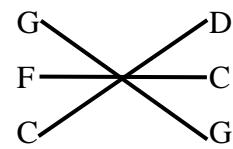
d)



e)



f)



Two satisfying progressions and four unsatisfying:

a): leaping to unbound D

b): leaping to unbound D

c): leaping to unbound D

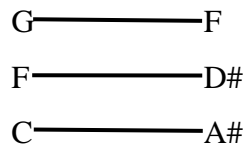
d): satisfying stand-alone progression

e): leaping to unbound D

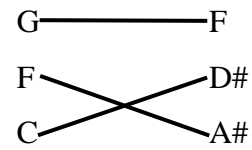
f): satisfying stand-alone progression

I-VI/VI-I

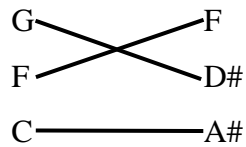
a)



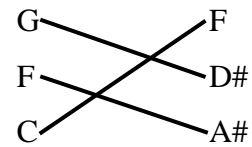
b)



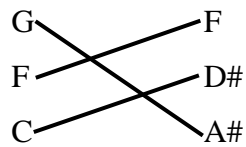
c)



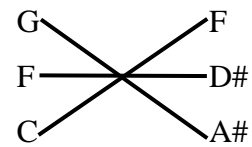
d)



e)



f)



All are unsatisfying progressions:

a): swapping direction of support for D# adjunct; parallelism

b): leaping to unbound A#; leaping to unbound D#

c): leaping to unbound D#

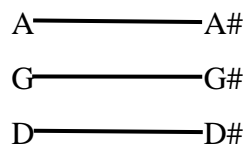
d): leaping to unbound D#; leaping to unbound A#

e): leaping to unbound A#; leaping to unbound D#

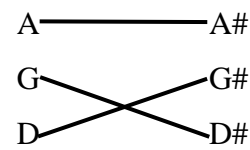
f): leaping to unbound A#; swapping direction of support of D# adjunct

II-III/III-II

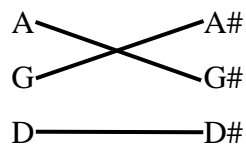
a)



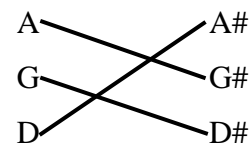
b)



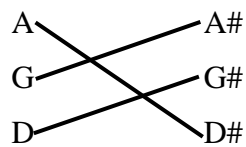
c)



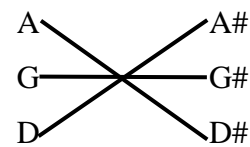
d)



e)



f)



All are unsatisfying progressions:

a): floating unbound A and A# adjuncts; floating unbound D and D# adjuncts; parallelism

b): floating unbound A and A# adjuncts; leaping to unbound D#; leaping to unbound G#

c): floating unbound A and G# adjuncts; leaping to unbound A#; floating unbound D and D# adjuncts

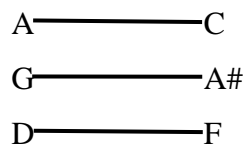
d): floating unbound A and G# adjuncts; leaping to unbound D#; leaping between unbound D and A#

e): leaping between unbound A and D#; leaping to unbound A#; leaping between unbound D and G#

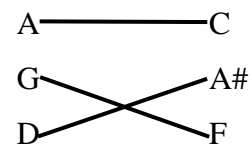
f): leaping between unbound A and D#; leaping between unbound D and A#

II-IV/IV-II

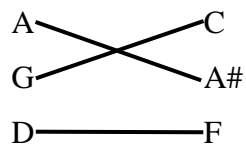
a)



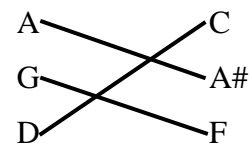
b)



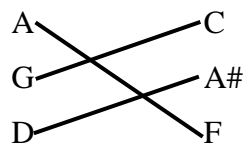
c)



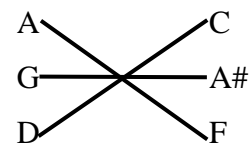
d)



e)



f)



All are unsatisfying progressions:

a): leaping from unbound A; leaping to unbound A#; leaping from unbound D

b): leaping from unbound A; leaping between unbound D and A#

c): floating unbound A and A# adjuncts

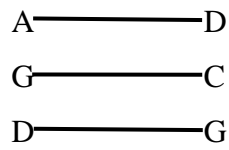
d): floating unbound A and A# adjuncts

e): leaping from unbound A; leaping between unbound D and A#

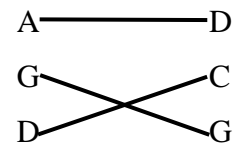
f): leaping from unbound A; leaping to unbound A#

II-V/V-II

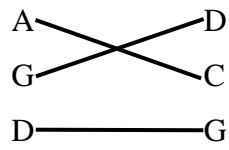
a)



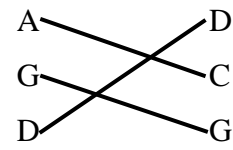
b)



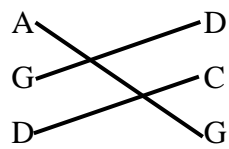
c)



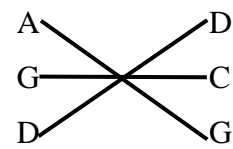
d)



e)



f)



All are unsatisfying progressions:

a): leaping between unbound A and D; leaping from unbound D; parallelism

b): leaping between unbound A and D

c): leaping from unbound A; leaping to unbound D; leaping from unbound D

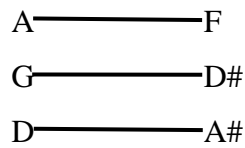
d): leaping from unbound A

e): leaping from unbound A; leaping to unbound D

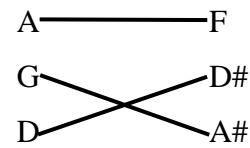
f): leaping from unbound A

II-VI/VI-II

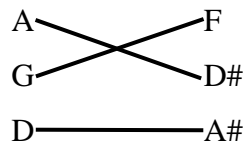
a)



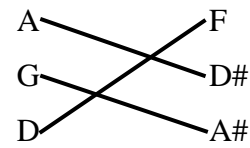
b)



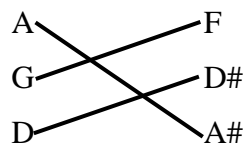
c)



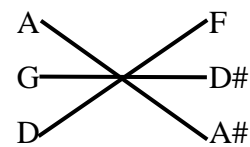
d)



e)



f)



All are unsatisfying progressions:

a): leaping from unbound A; leaping to unbound D#; leaping between unbound D and A#; parallelism

b): leaping from unbound A; leaping to unbound A#; floating unbound D and D# adjuncts

c): leaping between unbound A and D#; leaping between unbound D and A#

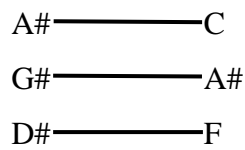
d): leaping between unbound A and D#; leaping to unbound A#; leaping from unbound D

e): floating unbound A and A# adjuncts; floating unbound D and D# adjuncts

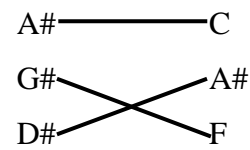
f): floating unbound A and A# adjuncts; leaping to unbound D#; leaping between unbound D and F

III-IV/IV-III

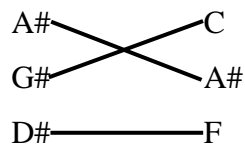
a)



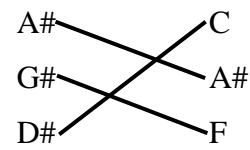
b)



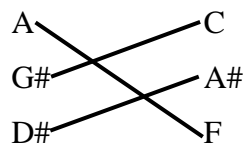
c)



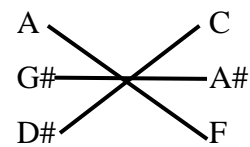
d)



e)



f)



All are unsatisfying progressions:

a): leaping between unbound G# and A#; swapping direction of support of D# adjunct; parallelism

b): leaping from unbound G#; leaping between unbound D# and A#

c): leaping from unbound G#; swapping direction of support of D# adjunct

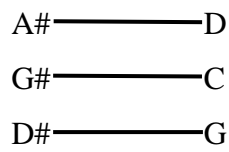
d): leaping from unbound G#; leaping from unbound D#

e): leaping from unbound A; leaping from unbound G#; leaping between unbound D# and A#

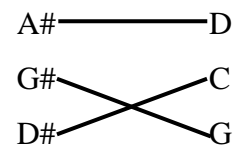
f): leaping from unbound A; leaping between unbound G# and A#; leaping from unbound D#

III-V/V-III

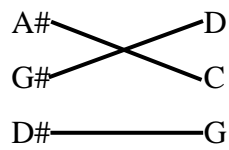
a)



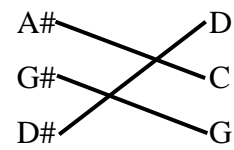
b)



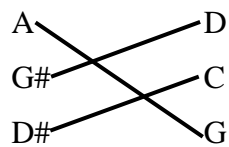
c)



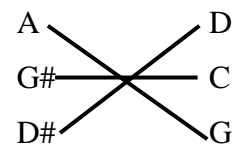
d)



e)



f)



All are unsatisfying progressions:

a): leaping between unbound A# and D; leaping from unbound G#; leaping from unbound D#; parallelism

b): leaping between unbound A# and D; leaping from unbound D#

c): leaping between unbound G# and D; leaping from unbound D#

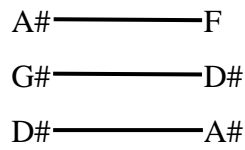
d): floating unbound D# and D adjuncts

e): leaping between unbound G# and D; leaping from unbound D#

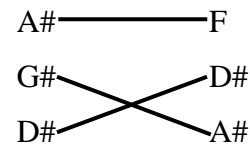
f): leaping from unbound A; leaping from unbound G#; floating unbound D# and D adjuncts

III-VI/VI-III

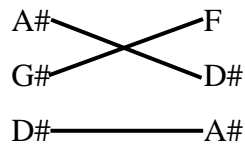
a)



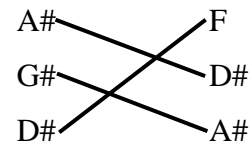
b)



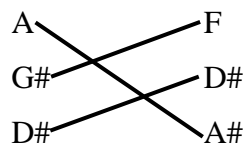
c)



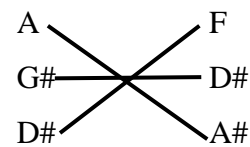
d)



e)



f)



All are unsatisfying progressions:

a): leaping from unbound A#; leaping between unbound G# and D#; leaping between unbound D# and A#; parallelism

b): leaping from unbound A#; leaping between unbound G# and A#

c): leaping between unbound A# and D#; leaping from unbound G#; leaping between unbound D# and A#

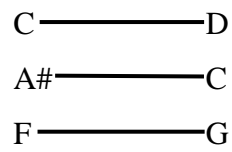
d): leaping between unbound A# and D; leaping between unbound G# and A#; swapping direction of support of D# adjunct

e): floating unbound A and A# adjuncts; leaping from unbound G#

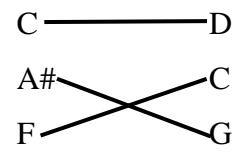
f): floating unbound A and A# adjuncts; leaping between unbound G# and D#; swapping direction of support of D# adjunct

IV-V/V-IV

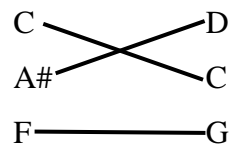
a)



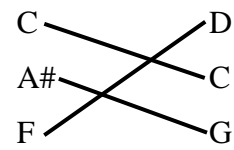
b)



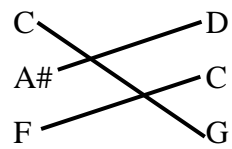
c)



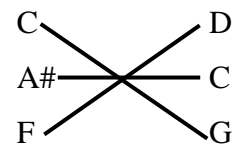
d)



e)



f)



All are unsatisfying progressions:

a): parallelism

b): leaping from unbound A#

c): leaping between unbound A# and D

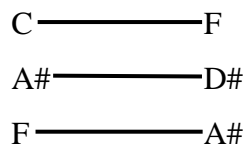
d): leaping from unbound A#; leaping to unbound D

e): leaping between unbound A# and D

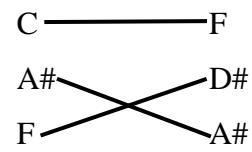
f): leaping to unbound D

IV-VI/VI-IV

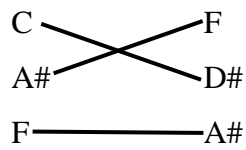
a)



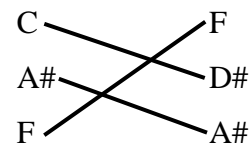
b)



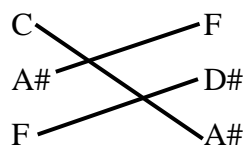
c)



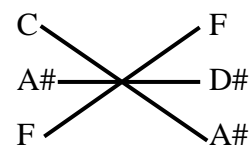
d)



e)



f)



All are unsatisfying progressions:

a): leaping between unbound A# and D#; leaping to unbound A#; parallelism

b): swapping direction of support of D# adjunct

c): leaping to unbound D#; leaping between unbound A# and F (in two voices)

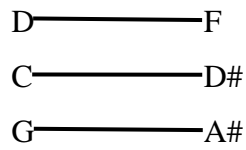
d): leaping to unbound D#

e): leaping from unbound A#; swapping direction of support of D# adjunct

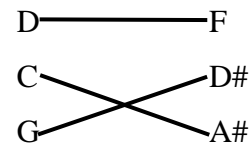
f): leaping between unbound A# and D#

V-VI/VI-V

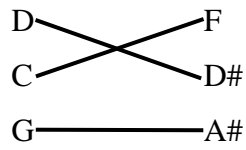
a)



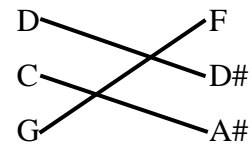
b)



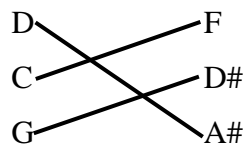
c)



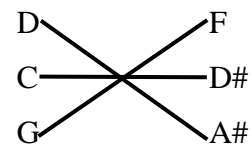
d)



e)



f)



All are unsatisfying progressions:

a): leaping from unbound D; leaping to unbound D#; leaping to unbound A#;
parallelism

b): leaping from unbound D; leaping to unbound D#

c): floating unbound D and D# adjuncts; leaping to unbound A#

d): floating unbound D and D# adjuncts

e): leaping between unbound D and A#; leaping to unbound D#

f): leaping between unbound D and A#; leaping to unbound D#