



MONASH University

A HEXACHORDAL COMBINATORIALITY
COMPOSITIONAL APPROACH
FOR
JAZZ BIG BAND

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ABSTRACT

This practice-based research project investigates a dodecaphonic compositional system known as hexachordal combinatoriality (HC). Through a creative output and exegesis, its aim is to explore how HC melodic and harmonic material is used to compose music for a jazz big band. The rationale for this research is to contribute knowledge to the existing body of work concerning dodecaphonic systems suitable for jazz big band composition.

The creative output includes a four-movement 49-minute jazz big band work (*Cosmica Sidera*) composed by this author. The exegesis is inclusive of a qualitative framework employing a practice-based methodology framed by musicologist Jan La Rue's Style Analysis (La Rue, 2001). The La Rue's Style Analysis is inclusive of three stages: background, observation, and evaluation (ibid). The practice-based methodology enables and explains a nonlinear composition method that embraces both research-based practice and practice-based research to achieve knowledge building, understanding, and new ways of praxis.

The research identifies that HC is a flexible composition system that supplies numerous melodic and harmonic material usable in jazz big band writing. The HC system can be incorporated within common jazz features such as the walking bass line, tone clusters, harmonic sequences, and improvisational melodic and harmonic material. It does this by enabling shorthand ways of communicating what the six-pitches in use are and what tone clusters are featured at any point in a work. The research suggests HC is a novel pathway to composing jazz music that is extremely individualistic and personal, like one's own fingerprints.

DECLARATION

This thesis is an original work of my research and contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Signed:

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Date:

17th September 2021

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CHAPTER ONE: INTRODUCTION (BACKGROUND)

1.1 INTRODUCTION

1.1.1 Introduction to Hexachordal Combinatoriality

This research explores how melodic and harmonic material generated from a dodecaphonic compositional approach known as Hexachordal Combinatoriality (HC) can be used to compose music for a jazz big band. HC emerged in the late 1930's in the music of Arnold Schoenberg, a renowned western art music composer (Straus, 2005). The term HC describes how tone-rows¹ are treated (hexachordal) and the consequence (combinatoriality) of that treatment. Hexachordal refers to the subdivision of a tone-row into two six pitch halves (Straus, 2005). Combinatoriality is the phenomenon that occurs when transformative operations² reveal other tone-rows that share the same hexachordal pitch-class³ content as the original tone-row, albeit in different order (ibid). HC belongs to a broad group of post-tonal composition systems collectively referred to as dodecaphonic (Terefenko, 2018). All dodecaphonic systems are characterised by tone-rows containing ordered pitch-classes. Dodecaphonic systems only provide ways of producing organisational elements (i.e., tone-rows, tone clusters⁴) but not ways of applying these to create music (Straus, 2005; Starr & Morris, 1977). HC distinguishes itself from other dodecaphonic

¹ The *Tone-row* (also known as the *note-row* or *12-note row*) is a collection containing each of the twelve pitches (pitch-classes) found in the octave. All related tone-rows are derived from an initial prime tone-row (Kennedy & Kennedy, 2007; Straus, 2005).

² Transformative operations refer to musical procedures that alter a tone-rows pitch order, intervallic content, or both (Terefenko, 2018). In this research transformative operations include transposition, inversion, retrograde, and retrograde-inversion; all of which are performed on the prime tone-row (P_0) to create subsequent tone-rows.

³ A pitch-class is a group of notes that share the same name regardless of which octave they occur in, i.e., the pitch-class D contains all D pitches regardless of the frequency or octave they occur in. In dodecaphonic music, all tone-rows are constructed using a collection of pitch-classes; typically, this involves the 12-pitch-classes found in an octave. (Straus, 2005).

⁴ This research uses the term *tone cluster* to communicate a harmonic set consisting of two or more pitches.

systems by exclusively using only one of the six-pitch groups available when a 12-tone-row is divided into two equal halves. I hypothesize HC has potential as a compositional system for a big band because it deals with a small number of six pitch-classes and it generates numerous tone-rows populated with the same six pitch-classes (Straus, 2005). The advantages HC offers big band writing are presented in section 1.5 Dodecaphonic Approaches and Hexachordal Combinatoriality.

1.1.2 The significance of the big band in this research

The development of the big band into the standard large jazz ensemble stems directly from the incremental expansion of smaller jazz combos⁵ (Carr, *et al*, 1987). This evolutionary path accounts for the many common musical elements⁶ that jazz big bands and smaller jazz combos share. This commonality is advantageous as it may allow what is discovered in this research to be transferable to other jazz ensemble types. Additionally, the well-defined and established musical practices⁷ attributed to the jazz big band further advance this ensemble type for research purposes as they provide benchmarks that assist in assessing novel composition approaches (Greig & Lowe, 2014: Sussman & Abene, 2012: Nestico, 1993: Carr *et al*, 1987). In this research the terms ‘jazz big band’ and ‘big band’ are interchangeable, representing the same ensemble type.

⁵ Small jazz combos are understood in this context to mean jazz ensembles that consist of less than 6 musicians; these include duos, trios, quartets, and so forth.

⁶ Common musical elements observed in both small combo and big band writing include novel introductions, connecting passages, spaces for improvisation, and original conclusions or codas; along with unique countermelodies or counter-rhythmical-harmonic stabs, bass riffs or harmonic riffs; and the reharmonization of original melody or harmony, and rhythmic variation or alteration to melodic or thematic material. All of which are not part of the original song or musical piece (Sussman & Abene, 2012: Gioia, 2011: Occhipinti, 1997: Carr *et al*, 1987).

⁷ The well-defined and established musical practices observed in the big band genre relate to the role and function of instrumentalists, holistic treatment of melodic and harmonic material, and standardized communication, nomenclature (Greig & Lowe, 2014: Sussman & Abene, 2012: Nestico, 1993: Carr *et al*, 1987).

1.2 AIM AND RATIONALE

The aim of this research is to explore how one HC prime tone-row ⁸ (and the related HC tone rows it generates) can provide all the necessary melodic and harmonic material needed to create a big band composition. The decision to focus on a single prime tone-row was largely made to avoid any potential ambiguities that may occur if multiple HC prime tone-rows were used to create melodic and harmonic material.

The creative outcome is my composition *Cosmica Sidera*. It will address the two significant areas of investigation (i.e., melodic, and harmonic material) by answering questions found in the intersection between HC and big band writing. Questions concerning melodic material include: How are phrases constructed and how are they used to create themes? How does pitch-class order influence theme construction? How can variations to themes be created? In what ways can a theme be harmonised? Can HC provide ways of allowing instrumentalists to create their own harmonic material (e.g., walking bass line or improvised fill-ins)? Questions relating to harmonic material include: In what ways can tone clusters be created? How many pitches should be used (two, three or four) to create tone clusters? Should the tone-row(s) of the tone cluster be identical to, or different to, the tone-row used to create the melodic material? In what ways can tone clusters be used to imply a tonal space or suggest a new tonal space? It is expected that improvisors are not bound by the rules that guide the compositional process; therefore, improvisors are able to play in any manner they feel works.

⁸ The prime tone-row (P₀) is the foundation tone-row from which all other tone-rows are derived via transformative operations such as transposition, inversion, retrograde and retrograde-inversion (Straus, 2005: Starr & Morris, 1977: 1978). Terefenko (2018) estimates that some 9,985,920 possible twelve-tone rows exist, all of which afford dodecaphonic approaches, a large amount of starting material (prime tone-rows) from which to explore existing or novel compositional techniques.

The framework for this exegesis will be informed by a qualitative investigation of Jan La Rue's Style Analysis (La Rue, 2001) and a practice-based methodology. La Rue's Style Analysis provides a three-stage analysis method (background, observation, and evaluation). A practice-based methodology is used throughout the compositional process, and it includes both research-based practice and practice-based research as a way of knowledge building, understanding, and developing new praxis.

The existing literature specific to dodecaphonic compositional approaches and techniques within the jazz genre is scant. This lacuna is even more pronounced when the scope is narrowed to compositional practice(s) based on pitch-class sets displaying a HC relationship. Both Terefenko (2018) and Gioia (2011) cite several jazz musicians (see section 1.4.3 Examples of dodecaphonic compositional systems in jazz) who have attempted to fuse dodecaphonic compositional techniques with the jazz music tradition. This research seeks to continue this avenue of exploration by contributing knowledge and praxis to the existing body of dodecaphonic compositional systems applicable to jazz writing and by adding a new composition to the existing oeuvre that engages both dodecaphonic systems and the jazz big band ensemble.

1.3 MY JOURNEY

Before embarking on this research project, my compositional activity predominantly involved writing material for ensembles that I performed in, and typically involved collaborating with band members confident in writing lyrics. Over a period of 15 years, other compositional opportunities presented themselves in the form of creating original compositions and arrangements for student theatre, student ensembles (choirs, concert bands), and community ensembles (recorder consorts, religious choirs, folkloric ensembles). Although these

opportunities involved a variety of stylistic and ensemble types, they included no genuine theoretical or compositional experimentation. During my Honours year a passion for both improvised music and experimental compositional systems emerged which inspired the combination of these two systems into a practice-based research project.

Towards the end of 2018 I read an abstract by Paulo Perfeito, *Twentieth Century Compositional Techniques Applied to Jazz: Pitch-Class sets in Jazz Composition and Improvisation* (2017), which was a ‘light-bulb moment’ that was a trigger for this investigation. What drew me to experiment in my compositional practice was Perfeito’s theory of incorporation and development of post-tonal techniques in the field of jazz composition and improvisation. Perfeito argues that such a cross pollination could potentially impact all aspects of jazz; from the emergence of new music that is (aesthetically and conceptually) based on a non-hierarchical pitch vocabulary, to pedagogic significance as new tools for improvisation are created or examined to complement the emerging compositional techniques and methods employed (ibid). Perfeito’s abstract also introduced me to the notion of jazz composition engaging in dodecaphonic techniques.

1.4 LITERATURE REVIEW

The following literature review situates this research within the broader area of experimental jazz composition. It details a literary survey that explicates key terms which directly inform my understanding and application of HC in this research. To simplify the discussion, the term dodecaphonic systems is used to encompass all compositional approaches⁹ that employ tone-rows containing ordered pitch-classes. The first two subheadings articulate key terms to establish

⁹ Composition approaches that use tone-rows displaying ordered pitch-classes include *twelve-tone compositional techniques* or *approaches*, *tone-row compositional techniques* or *approaches*, and *serialism* or *serial compositional techniques* or *approaches*.

how dodecaphony is perceived, and how the construct of jazz as an artform is understood in the broader jazz community. The next subheading reveals several historical and recent examples of dodecaphonic jazz pieces, to demonstrate how dodecaphonic systems facilitate highly personalised jazz compositional approaches. The remaining two subheadings address compositional systems that are specifically HC or that combine other size tone-row divisions (i.e., heptachordal, tetrachordal, trichordal, and so forth) with combinatoriality. Here, an explanation of why composers working in the western art music tradition initially embraced this system is given before examples utilising these compositional strategies in both the western art music and jazz tradition are identified.

1.4.1 What the key terms uncovered

The key terms used in this literature survey combined the word *jazz* with *dodecaphonic*, *twelve-tone*, *serialism*, *serial*, and included *composition*, *techniques*, and *approaches*. These terms identify several different types of texts: musical scores (including audio and video) from websites (Jacks, 2018: Dobbins, 2016: Olla-vogala, 2015: Gomes, 2008), music theory and tutorial books (Terefenko, 2018: O’Gallagher, 2013: McNamara, 1977), dissertations (Gunther, 2008), and newspaper and magazine articles (Musso, 2013: Starr & Morris, 1978: Starr & Morris, 1977). The publication dates for these texts are broad. However, the last couple of decades show a marked increase in texts that engage both jazz and dodecaphonic theory. This is not surprising as jazz has always been an artform that, according to Berendt *et al* (2009), is ever expanding and developing in a manner that shows “continuity, logic, unity, and inner necessity that characterize all true art” (p.1). The evolutionary development of jazz has been extensively discussed (Gioia, 2012: Gioia, 2011: Morton & Cook’s, 2010: Berendt *et al*, 2009: Carr *et al*, 1987: Rout, 1968; Dommett: 1964). Typically, these texts chart the prevalent styles and the

compositional and performance tendencies they represent, along with the significant individuals that personify the respective stylistic periods. The commonality that binds the disparate types of jazz that have evolved, is that they all express their time period's understanding of "the spiritual, intellectual, human quality – the level of consciousness" (Berendt *et al*, 2009: p.1). It is therefore unsurprising that the second decade of the twenty-first century finds several authors (Terefenko, 2018: O'Gallagher, 2013) advocating the inclusion of post-tonal theory and practice in jazz. I find Terefenko's (2018) argument that today's jazz practitioners should embrace the *new*, analogous to the argument of why individuals should embrace today's new technologies; both serve to broaden one's abilities to do and know more, and to engage with a larger world.

1.4.2 Is jazz an improvising artform or a compositional artform?

The acceptance of dodecaphonic systems by contemporary jazz authors and commentators is not universal. For example, Cugny & Maudit (2019) and Carr *et al* (1987) refuse to consider that a valid dodecaphonic jazz could exist. While others (Dobbins, 2020: Terefenko, 2018) enthusiastically urge contemporary jazz practitioners to take up at least some of the techniques dodecaphonic models may offer. The rejection of dodecaphonic composition is exemplified by Cugny & Maudit who state that "there is no such thing (or at least only marginally) as *dodecaphonic* types of jazz" (Cugny & Maudit, 2019: p.160). For Cugny & Maudit jazz has all but ignored the theoretical avenues explored by western art music, focusing instead on the importance of improvisation in breaking free from tonality (*ibid*). The idolisation of improvisation is echoed by Carr *et al* (1987), who indicates that the only real genuine attempt of atonality is observed in instances of free jazz, particularly where "the collective improvisations of large groups" (p.16) occur.

Perhaps the downplaying of dodecaphony's ability to expand jazz vocabulary reveals not so much a bias against new harmonic or compositional systems but as Berendt *et al* (2009) indicates, an almost cult-like belief that "innovation in jazz is not measured primarily by an inventory of the materials used, but rather by the possibilities for finding new ways of expressing individuality in an improvised group music" (p.656). Undoubtably, improvisation is considered one of the most recognizable elements of jazz music. Lindsay (1958) describes improvisation as being "part of the magic of jazz" (p.7) which would be a shared sentiment by many who engage with this music. However, Terefenko (2018) reminds us that "twentieth-century music offers an amazing variety of styles, harmonic languages, and compositional techniques" (p. 327) all of which inform jazz practitioners, regardless of their focus (improvisation or composition), and in doing so lead to new and innovative ways to create.

1.4.3 Examples of dodecaphonic compositional systems in jazz

Jazz compositions exhibiting the use of dodecaphonic compositional systems do exist. Historical examples are Matyas Seiber's *Jazzolette No.1* (1929) & *No.2* (1932), Bob Graettinger's *City of Glass* (1947), Gunther Schuller's *Transformation*, John Carisi's *Moon Taj*, Jimmy Giuffre's *Fugue* (1953), Hale Smith's *Evocation* (1966), Bill Evan's *Twelve-Tone Tune* (1971) and *Twelve-Tone Tune Two* (1973) ("Matyas Seiber", 2021: Terefenko, 2018: Gioia, 2011). More recent examples include Bill Dobbins' *Concerto for Jazz Orchestra* (2016), Wilson Gomes' *Twelve-tone Serial Jazz Blues* (2008), Dave Brubeck's *So Lonely* (2007), and Mathias Lundqvist's *Twelve Below* (2007) (Terefenko, 2018: Dobbins, 2016: Gioia, 2011: Gomes, 2008). All these examples utilise twelve-tone techniques: from strict adherence of serial techniques, observed in Seiber's *Jazzolette No.1* (1929) & *No.2* (1932) ("Matyas Seiber", 2021); to more liberal approaches found in Dobbins' *Concerto for Jazz Orchestra*, where tone-rows employing

pre-determined pitch-class orders are used to mostly generate melodic material (Dobbins, 2016). These dodecaphonic jazz examples demonstrate that no two composers employ the same approach. This diversity in compositional approaches can be attributed to the rigidity that dodecaphonic systems display in creating organisational material, while simultaneously enabling flexibility in how the organisational material is used (Straus, 2005). I view dodecaphony's lack of procedural direction as advantageous, because it enables personal interpretation to guide the compositional process.

Known dodecaphonic jazz pieces that utilise combinatorial groups of several pitch-class size include Bill Evens' *Twelve-Tone Tune*, featuring tetrachordal, trichordal, dichordal, and unichordal segments, and Bill Dobbins' *Concerto for Jazz Orchestra*, using melodic motifs consisting of heptachordal, pentachordal and tetrachordal segments (Dobbins, 2016: Musso, 2013). My composition, *Cosmica Sidera*, is closely connected to the above works because it continues the process of exploring dodecaphonic compositional approaches, specifically a HC approach, that utilises musical material generated from related tone-rows subdivided into smaller pitch-class units.

1.4.4 HC music in the western art music tradition

By the middle of the twentieth century, several post-tonal western art music composers¹⁰ expressed dissatisfaction with dodecaphonic approaches (Straus, 2005: Starr & Morris, 1977). The dissatisfaction centred around dodecaphony's inability to provide ways of achieving areas of tonal stability, and therefore offering little possibility of creating and incorporating counterpoint

¹⁰ Dodecaphonic composers identified as being dissatisfied with the compositional options were Anton Webern, Ruth Crawford Seeger, Igor Stravinsky, Luigi Nono, Luciano Berio, Milton Babbitt, among others ("List of dodecaphonic and serial compositions", 2020: Straus, 2005: Starr & Morris, 1977).

lines within a composition (Straus, 2005). To combat this, some composers such as Anton Webern resorted to repeating a single note consecutively within a piece to create implied tonality. Starr & Morris (1977) cite Webern's frustrations:

We felt that a pitch, frequently repeated either in direct succession or dispersed throughout a piece somehow 'got revenge', that the pitch established itself. That must have been satisfying - it was still possible then; but it demonstrated, for example, how disturbing it was if one pitch were repeated frequently throughout a passage which deliberately exhausted all twelve pitches.... In a word, it established itself as a procedural rule that before all twelve pitches had been used up, none of them could recur. The most important thing is that the piece – the thought – the theme – through the working out of the twelve pitches had become a structural unit.

(Starr & Morris, 1977: p.3).

Arnold Schoenberg's HC compositional approach resolved Webern's concerns, as it offered a way of allowing pitches to reoccur without having to resort to the repeated single note method described above (Starr & Morris, 1977). Schoenberg's *Violin Concerto* Op.36 and his much cited, *String Quartet No.4* Op.37 ("List of dodecaphonic and serial compositions", 2020: Straus, 2005) are two examples demonstrating that HC could "fill this gap in row technique [by] allowing rows to function as a means [of realising] Webern's idea of tonal balance in contrapuntal frameworks" (Starr & Morris, 1977: p.4). Put simply, any dodecaphonic compositional approach that divides a tone-row into a small group of pitch-classes can be used in ways that create the illusion of stable tonal areas. The most common tone-row subdivisions are symmetrical in nature, where equal number of pitches are found in each subdivision of the tone-row: typically, these are hexachordal (six), tetrachordal (four), trichordal (three) and dichordal (two). Asymmetrical divisions are also found ("List of dodecaphonic and serial compositions", 2020: Terefenko, 2018: Straus, 2005).

The literature survey identified only a few examples of music using a HC compositional approach, all within the western art music tradition. They include the two Schoenberg pieces cited above, along with Milton Babbitt's *Three Compositions for Piano* (1947) and Luigi Nono's *Variazioni canoniche sulla serie dell'op. 41 di A. Schönberg* (1950). When compositional techniques utilizing other combinatoriality sizes are considered, the number of examples increase. They include tetrachordal combinatorial approaches in Anton Webern's *String Quartet*, Op.28 (1937-8) and Schoenberg's *Variations for Orchestra*, Op. 31 (1926/28) with his BACH motif (B \flat -A-C-B \sharp), and trichordal combinatoriality in Babbitt's *Composition for Four instruments* (1948) and Anton Webern's *Concerto for Nine Instruments* Op.24 (1934). Examples of combinatorial groups exploiting several pitch-class sizes include Luciano Berio's *Nones* (1954), which uses a thirteen-pitch-class tone-row derived from Webern's *Concerto for Nine Instruments* Op.24, that moves between hexachordal and trichordal segments. Similarly, Babbitt's *Composition for Twelve Instruments* (1948, rev. 1954) also modulates between differing pitch-class groups. Dichordal combinatorial segments are noted in Babbitt's *String Quartet No. 2* (1954), and in Australian composer Don Banks' *Trio for Horn, Violin and Piano* (1962) ("List of dodecaphonic and serial compositions", 2020: Terefenko, 2018: Sitsky, 2011: Kennedy & Kennedy, 2007: Straus, 2005).

1.5. DODECAPHONIC APPROACHES AND HEXACHORDAL COMBINATORIALITY

1.5.1. Dodecaphonic (Twelve-tone) approaches

Dodecaphonic approaches are grounded in post-tonal theory and represent numerous and vastly dissimilar compositional systems that engage with ordered pitch-class material (Terefenko,

2018). Dodecaphonic systems include Stravinsky's *Rotational Arrays*, Ruth Crawford Seeger's *Triple Passacaglia*, Boulez's *Multiplication*, Babbitt's *Trichordal Arrays*, along with many other approaches that utilise ordered pitch-class material ("List of dodecaphonic and serial compositions", 2020: Straus, 2005). As mentioned previously, common to all dodecaphonic systems is the use of a single prime tone-row (P_0) to generate all other related tone-rows (Straus, 2005). Typically, this is achieved by the creation of a twelve-tone matrix. Sections 1.5.2 and 1.5.3 below, outline how HC related tone-rows are identified and why the twelve-tone matrix is significant in dodecaphonic compositional systems. All the basic building blocks underpinning the compositional material observed in this research are constructed from the hexachordal division of the HC tone-rows found in the twelve-tone matrix.

1.5.2 How HC related tone-rows are identified

HC related tone-rows are identified exclusively by their hexachordal pitch-class content. The process of identification begins by dividing a single prime tone-row (P_0) into half, creating two hexachordal divisions (i.e., H_1 or H_2); these are then used to establish all HC related tone-rows (Straus, 2005). The next step is to create a matrix from the single prime tone-row to reveal all the possible tone-rows. The final step involves individually checking all the tone-rows in the matrix to identify those containing the same H_1 and H_2 content as the prime tone-row, albeit in different sequential order; tone-rows containing the same H_1 and H_2 are recognised as being HC related (Terefenko, 2018: Straus, 2005: Starr & Morris, 1978). The specific P_0 used in this research is known to produce HC related tone-rows, it has the *raw content name* of $P_0\{045e6t731298\}$. The raw content name indicates the pitch-class order of P_0 as C, E, F, B, F^\sharp , B^b , G, E^b , D^b , A, and A^b , when $C = 0$ (Terefenko, 2018: p.352). This specific P_0 is categorized as an all-combinatorial

hexachord, denoting that all four transformative operations yield tone-rows displaying a combinatorial relationship to the P_0 (ibid).

1.5.3 The significance of the twelve-tone matrix to dodecaphonic systems

The significance of the twelve-tone matrix to dodecaphonic systems is that it provides a quick and easy way of conveying a large amount of information in a visually tabulated format. The matrix shows all the 12 X 12-tone-rows generated from the prime tone-row, their relationship with the prime tone-row, and what transformative operation was used to create the tone-row (Terefenko, 2018; Straus, 2005). Several surveys were undertaken to establish the precise origins of the matrix (who first used it or created it). These yielded nothing concrete, leaving the impression that its creation and use was part of the initial twelve-tone technique development by pioneers in the field, such as Josef Matthias Hauer and Schoenberg (“Twelve-tone technique”, 2020). As mentioned previously, the construction of the matrix begins with a single prime tone-row; all transformative operations are performed on this tone-row only. For identification purposes, all tone-rows are named in the following manner: the upper-case letters depict the transformative process undertaken (i.e., P = transposition of the prime, I = inversion, R = retrograde, and RI = retrograde-inversion); and the lowercase numerals identify the integer the tone-row starts on. Therefore, P_n represents the *prime tone-row* starting on n integer: I_n represents the *inversion tone-row* starting on n integer and likewise for *retrograde* and *retrograde-inversion tone-rows*. Integers 10 and 11 are expressed as t and e respectively; this is done to avoid confusion when these are expressed in a vector. Furthermore, in this research I have attached either H_1 or H_2 (representing the first or second hexachordal division respectively) to the tone-row name to identify which six pitch-class content is in use. Therefore, P_0H_1 would indicate that the first hexachord of the prime (P_0) is being used. When a transposition is applied to the tone-

row, it appears as a capital T with a subscript integer indicating how many semitones the original tone-row has been transposed, i.e., $T_9P_0H_1$ would indicate that a transposition of nine semitones has been applied to tone-row P_0H_1 .

The matrix is read from left to right for P_0 (and all its transpositions) tone-row(s), right to left for all retrograde tone-rows, from top to bottom for all inversion tone-rows and from bottom to top for all retrograde-inversion tone-rows (Terefenko, 2018; Straus, 2005). Figures 1 and 2 show the prime tone-row (P_0) used in this research, all the possible tone-rows this prime tone-row generates, and the specific HC related tone-rows containing the same H_1 (highlighted in red) and H_2 (highlighted in green) as the prime tone-row.

Figure 1: Twelve-tone matrix – showing integers

	l_0	l_4	l_5	l_e	l_6	l_t	l_7	l_3	l_1	l_2	l_9	l_8	
P_0	0	4	5	e	6	t	7	3	1	2	9	8	R_8
P_8	8	0	1	7	2	6	3	e	9	t	5	4	R_4
P_7	7	e	0	6	1	5	2	t	8	9	4	3	R_3
P_1	1	5	6	0	7	e	8	4	2	3	t	9	R_9
P_6	6	t	e	5	0	4	1	9	7	8	3	2	R_2
P_2	2	6	7	1	8	0	9	5	3	4	e	t	R_t
P_5	5	9	t	4	e	3	0	8	6	7	2	1	R_1
P_9	9	1	2	8	3	7	4	0	e	t	6	5	R_5
P_e	e	3	4	t	5	9	6	2	0	1	8	7	R_7
P_t	t	2	3	9	4	8	5	1	e	0	7	6	R_6
P_3	3	7	8	2	9	1	t	6	4	5	0	e	R_e
P_4	4	8	9	3	t	2	e	7	5	6	1	0	R_0
	Rl_4	Rl_8	Rl_9	Rl_3	Rl_t	Rl_2	Rl_e	Rl_7	Rl_5	Rl_6	Rl_1	Rl_0	

Figure 2: Twelve-Tone Matrix - showing pitch-classes, when $C = 0$

	l_0	l_4	l_5	l_e	l_6	l_t	l_7	l_3	l_1	l_2	l_9	l_8	
P_0	C	E	F	B	F#	Bb	G	Eb	Db	D	A	Ab	R_8
P_8	Ab	C	Db	G	D	F#	Eb	B	A	Bb	F	E	R_4
P_7	G	B	C	F#	Db	F	D	Bb	Ab	A	E	Eb	R_3
P_1	Db	F	F#	C	G	B	Ab	E	D	Eb	Bb	A	R_9
P_6	F#	Bb	B	F	C	E	Db	A	G	Ab	Eb	D	R_2
P_2	D	F#	G	Db	Ab	C	A	F	Eb	E	B	Bb	R_t
P_5	F	A	Bb	E	B	Eb	C	Ab	F#	G	D	Db	R_1
P_9	A	Db	D	Ab	Eb	G	E	C	Bb	B	F#	F	R_5
P_e	B	Eb	E	Bb	F	A	F#	D	C	Db	Ab	G	R_7
P_t	Bb	D	Eb	A	E	Ab	F	Db	B	C	G	F#	R_6
P_3	Eb	G	Ab	D	A	Db	Bb	F#	E	F	C	B	R_e
P_4	E	Ab	A	Eb	Bb	D	B	G	F	F#	Db	C	R_0
	Rl_4	Rl_8	Rl_9	Rl_3	Rl_t	Rl_2	Rl_e	Rl_7	Rl_5	Rl_6	Rl_1	Rl_0	

1.6 *COSMICA SIDERA* – COMPOSITION

Cosmica Sidera is an original 49-minute four-movement composition for a jazz big band, consisting of five saxophones (with some performers doubling on soprano saxophone or clarinet), four trumpets (all doubling on flugelhorn), three tenor trombones and a bass trombone, and a rhythm section of piano, double-bass, and drums.

The name *Cosmica Sidera* dates to the 17th century and refers to the four Jovian moons observed by Galileo Galilei. These four moons are known as the four Galilean Moons (“Galilean moons”, 2021). I chose this title because, like Galileo, I feel that this investigation is also peering into the unknown to discover new knowledge and possibilities. In this research, the unknown is the potential HC holds in providing material suitable for jazz big band writing. I have named each of the four movements after one of the celestial objects identified by Galileo: Io, Europa, Ganymede and Callisto (ibid).

Common to all movements is the simultaneous use of multiple tone-rows containing the same six pitch-class content (either H_1 or H_2), typically for the duration of an entire musical section or more. Each instrumental group (saxophones, trumpets, trombones, or rhythm section) is generally allocated a specific related tone-row(s) belonging to the H_1 or H_2 in use. This approach was decided upon because numerous preliminary sketches indicated that it reduced issues of sustained dissonance by providing a way of creating prolonged tonal stability. Subsequently, this approach was found to assist four- and five-part voicing.

1.7 CHAPTER OUTLINES

Chapter 1 commences by briefly introducing and describing HC and outlining its origins. It then discusses the suitability of the big band ensemble for researching novel composition approaches in the jazz genre. The aim and rationale of this inquiry is then described, followed by the personal journey that led to this research. Next, a literature review is presented to give context and orientation to this research, positioning it in the broader field of dodecaphonic composition and jazz composition. Wherever possible, examples of dodecaphonic, HC and jazz music that utilises other types of combinatoriality are given. Following this, key theoretical concepts underpinning this research are unpacked. These include what dodecaphonic music is, how HC is understood in this research, and the significance of the matrix. The chapter concludes by explaining the structure and meaning of the composition *Cosmica Sidera*, that is at the heart of this research.

Chapter 2 details how and why La Rue's Style Analysis and a practice-based methodology are used in this research. La Rue's Style Analysis is explained and insight into how and why this method is adapted to structure this exegesis and provide a music analysis method is given. Next, the relevance of a practice-based methodology to this research is explained, revealing how this methodology is defined in this research and how this definition informs the compositional method developed.

Chapter 3 identifies and discusses the analysis and findings generated by this research. The chapter begins by discussing the analysis of melodic and harmonic material, revealing how these are created, manipulated, and applied both organisationally and procedurally within the composition. The second portion of the chapter ascribes meaning to the analysis, explaining how

the new knowledge gained is understood and how this understanding attributes significance to HC as a composition model applicable to creating big band music.

Chapter 4 presents a conclusion that posits the meaning and importance of this research, the limitations and challenges encountered during this research, before finally suggesting potential future research ideas.

CHAPTER TWO: METHODS & METHODOLOGY (BACKGROUND)

2.1 INTRODUCTION

This chapter details how La Rue's Style Analysis and a practice-based methodology are used in this research. Style Analysis involves three stages: background, observation, and evaluation (Burke, 2021: La Rue, 2001). Collectively, these three stages provide a way of structuring this exegesis, and a template for developing a targeted analysis method. Next, the adaptation of Haseman & Mafe's (2009) and Sullivan's (2009) definition of practice-based methodology is outlined to provide context for the research-led practice and practice-led research processes that frame my compositional method.

2.2 METHOD FOR ANALYSIS

2.2.1 About La Rue's Style Analysis

Musicologist Jan La Rue developed his Style Analysis method to enable a structured analytical discussion, aimed at focusing and progressing understanding of a musical work (Cugny & Maudit, 2019). The way La Rue's method achieves this, as mentioned previously, is by proceeding in three stages: background, observation, and evaluation (Burke, 2021: La Rue, 2001). The background stage establishes the frame of reference of the analysis, contextualising the music by referencing its historical and procedural importance, thereby highlighting the significance of the music (Burke, 2021). The observation stage provides a way of focusing the analysis on those musical elements deemed significant to the research. La Rue's belief that "music should originate from the ear" (La Rue, 1962: p. 91) is reflected in the hierarchy of observation, where the order of analytical discussion is sound, form, harmony, rhythm, and

melody. Each of these are discussed in a small, medium, and large dimension, so that a nuanced understanding of how they function within the composition is revealed (La Rue, 2001). The evaluation stage enables self-reflection and “personal reaction” (La Rue, 2001: p.312) to be expressed when summarizing what was understood by the analysis (Burke, 2021: Cugny & Maudit, 2019: La Rue, 2001).

2.2.2 The adaptation of La Rue’s Style Analysis method

My adaptation of La Rue’s Style Analysis embeds the three stages of the method into the structure of my exegesis. The background stage is represented by chapters 1 Introduction and 2 Methodology and Methods. These chapters contextualise and position the composition within the big band genre and explain the procedural relevance and significance of the compositional approach used. The observation stage is the music analysis method, located in the first part of chapter 3, Analysis and Findings. Here, my adaptation includes only a small number of musical elements described as either melodic material or harmonic material. Discussions on form, sound and rhythm, and their usage only occur incidentally, and only when these impact melodic and harmonic material. The analytical discourse involves the small, middle, and large dimensions. The dimensions provide a way of identifying and discussing each musical elements’ role at that level. Finally, the findings section of chapter 3 embodies the evaluation stage. Here, I use reflective language to highlight and comment on those observations that I believe to be interesting discoveries relevant to the research aim.

2.2.3 The analysis method

The analysis method examines the creation and usage of melodic and harmonic material.

Melodic material consists of themes, their harmonisation and variations, the bass riff, and the three instances where performer(s) are required to create melodic material: walking bass lines, melodic and harmonic fill-ins, and improvisations. Harmonic material consists solely of tone clusters. The examination is undertaken in all three dimensions. In the small dimension, phrases and tone clusters are examined to determine how these are constructed. The middle dimension explores how selected musical elements function within and between sections. The large dimension explores how melodic and harmonic material is used to define sections within a movement and between movements and examines how HC can communicate relevant information needed by performers to successfully create their own melodic and harmonic material when required during performance (i.e., walking bass lines, melodic and harmonic fill-ins, improvisations). Figure 3 provides an outline of the music analysis, denoting the key musical elements examined in the chapter three analysis section.

Figure 3: An outline of the music analysis

MELODIC MATERIAL	ANALYTICAL FOCUS	MUSICAL ELEMENT
Small Dimension	How are HC tone-rows used to construct these?	Phrase(s)
Middle Dimension	How are HC tone-rows used to construct these?	Themes Harmonisation of themes Variation of themes Bass riffs
Large Dimension	How are HC tone-rows used to achieve this?	Walking bass lines, Melodic and harmonic fill-ins & Improvisations
HARMONIC MATERIAL	ANALYTICAL FOCUS	MUSICAL ELEMENT
Small Dimension	How are HC tone-rows used to construct these?	Tone clusters
Middle Dimension	How are they treated and used within sections?	Tone clusters
Large Dimension	How are they treated and used within a movement?	Tone clusters

2.3 PRACTICE-BASED METHODOLOGY

The practice-based methodology employed in this inquiry involves both practice-led research and research-led practice. Practice-led research is represented by the knowledge gained from directly engaging in the composing process, such as creating preliminary sketches, and experimenting with ways of harmonising and voicing melodic lines. Research-led practice refers to me searching out existing knowledge and then codifying what is found to inform my understanding of how I can create my own original works, that express's my own voice. Research-led practice involves reading texts that include relevant post-tonal theory and big band orchestration and arranging, and listening to music that encompasses dodecaphonic compositional approaches, or involves the use of big band or other larger jazz ensemble types, or music that I find inspires me.

2.3.1 A definition of Practice-based methodology that embodies three interconnected conditions

In this research, the definition of practice-based methodology is understood to embody three interconnected conditions:

1. Both the artwork and the practitioner are placed at the centre of the investigation and are inseparable from the artwork and the research (Haseman and Mafe, 2009).
2. The methodology explains a compositional method characterised by a nonlinear way of working, where knowledge building is amassed gradually, involving both practice-led research and research-led practice (Haseman and Mafe, 2009).
3. The methodology incorporates and values critical reflection (Sullivan, 2009).

2.4 COMPOSITION METHOD

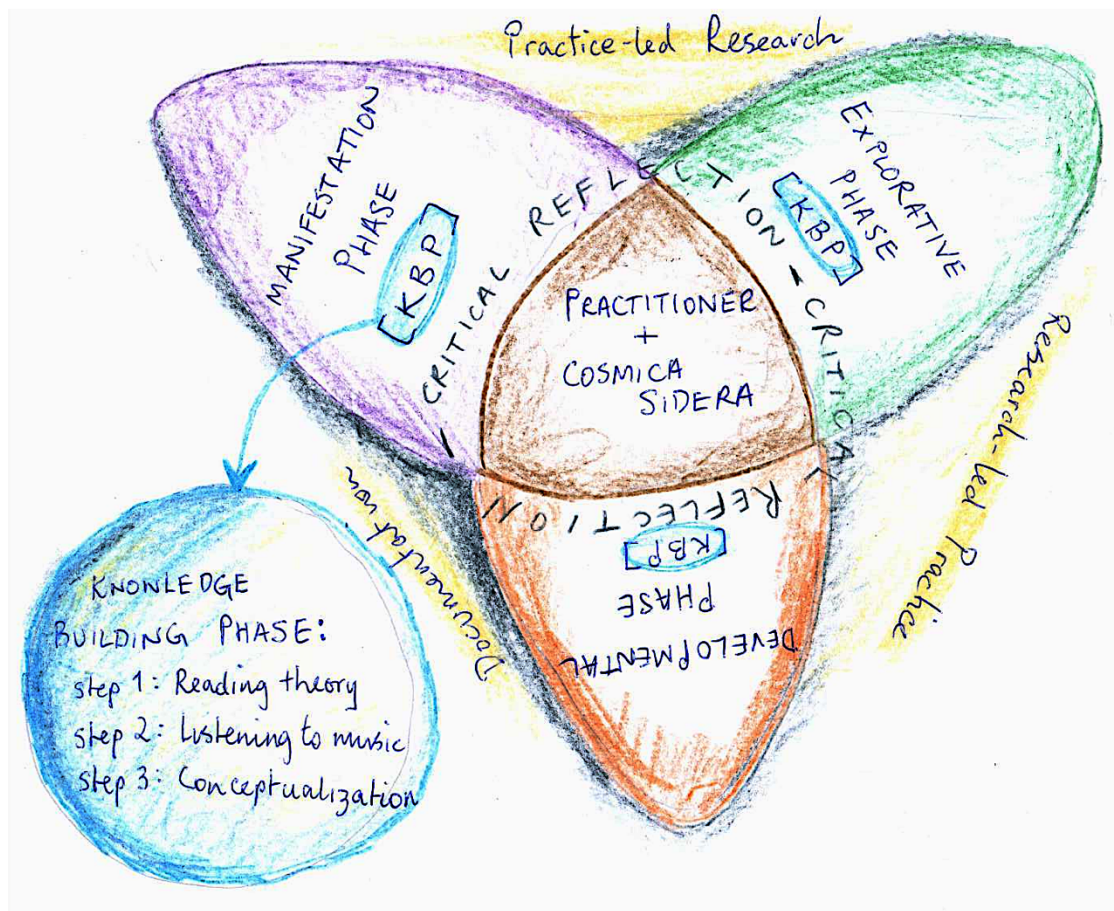
The compositional method used throughout the creative phase of this research, i.e., from preliminary sketches to the final movements, obeyed the following requirements:

1. Only tone-rows displaying a HC relationship to the prime tone-row are to be used.
2. Wherever possible two or more HC related tone-rows should be used.
3. Only one hexachordal division containing the same six pitch-classes of the tone-row (i.e., H₁ or H₂) should be used simultaneously. No mixing of different six pitch-classes should occur.
4. The pitch-class order of the tone-row should be observed, however repetition of a smaller number of sub-divisions of the six pitch-classes (i.e., two, three, four or five) is permissible when creating melodic material. All improvisations are not required or expected to follow tone-row order.

The three interconnected conditions that constitute the definition of practice-based research is understood in this inquiry to directly inform how the structural and procedural aspects of the compositional method operate. Structurally the composition method places me (the participant-researcher) and the artwork (*Cosmica Sidera*) centrally, acknowledging that the two are intertwined. Procedurally the compositional method embraces continuous critical reflection. Thereby enabling revisiting, redoing, restarting, reimagining, and reacting to occur, as novel ways of comprehension and praxis are realised. Often, the resulting directional changes are unforeseen, occurring unexpectedly. The compositional practice is best characterised as appearing somewhat unfocused and nonlinear.

To clarify how the compositional method works, a visual representation was created (see Figure 4 below) to illustrate the dynamic processes at play. This diagram was initially inspired by the interactive cyclic web detailed by Smith and Dean (2009). The practitioner (me) and the artwork (the composition) are placed at the centre of the compositional method. Three main phases intersect the central position, demonstrating how at any time these may be revisited as new information, knowledge and understanding arises. The three main phases are the explorative phase (green), the developmental phase (orange), and the manifestation phase (purple). Embedded within each phase is the knowledge building process. The knowledge building process involves three steps: reading theory, listening to music, and conceptualization (composing). The steps occur in every phase and are viewed as representing the nexus between theory (research-led practice) and praxis (practice-led research).

Figure 4: Visual representation of the composition method



(NB// KBP = Knowledge Building Process)

2.4.1 Explorative phase

During the explorative phase, the knowledge building process included reading texts that address dodecaphonic theory and practice, and big band orchestration and arranging, along with listening to a broad range music. The aim of this phase was to become acquainted with the language, concepts, and practices common to HC, and to deepen my understanding of how dodecaphonic theory is used by others. Western Art Music (e.g., Adams, 2011, tracks 1-3: Yun, 2008, track 9), jazz music (e.g., Ra, 2014: Seim, 2004), and any music or ensemble that engages with or are described as being Avant Garde, post-tonal, or experimental (e.g., Coleman, 1998: Lacy, 1998)

were explored. Conceptualization during this point involved critical reflection on all new knowledge gained, with the goal of putting new knowledge into practice, i.e., creating explorative musical sketches; typically, these involved a small number of bars and incorporated one or two different HC related tone-rows. Figures 5 and 6 below represent standard examples of the initial musical sketches created: as mentioned previously all tone-rows used and explored in this research are HC.

Figure 5: An initial musical sketch using 1 tone-row



Figure 6: An initial musical sketch using 2 tone-rows



2.4.2 Developmental phase

The developmental phase is where the knowledge building process involved the implementation of dodecaphonic theory and HC techniques into practice. Here, previously created explorative sketches were expanded into longer ideas, represented as piano reductions. Throughout this

phase, personal intuition guided by insights gained from previously visited phase(s) and critical reflection were used as tools in evaluating which piano reductions should be pursued or abandoned.

2.4.3 Manifestation Phase

The manifestation phase is where the select number of piano reductions were further developed, ready to be scored. Again, intuition drove the decision-making process regarding which piano reduction should be developed further, and in what manner. The knowledge building process in this phase tackled concerns relating to big band writing, these included practical issue relating to harmonizing melodic and counter-melodic material, the distribution of harmonic material among and between instrumental groups (voicing), underscoring themes and improvisations, and creating unity within each section of the big band. Ultimately, the goal of this phase was to create interesting music that demonstrates how HC works within the big band genre, particularly in relation to big band arranging and orchestration. Several compositional and arranging approaches were explored in this phase, such as various ostinato patterns, tessitura changes, polyphonic texturing, various treatments of melodic material, changes in ensemble density, texture, colour, and dynamics, and so forth.

2.5 SUMMARY

This chapter described how and why La Rue's Style Analysis and a practice-based methodology are used in this research. It details how La Rue's Style Analysis is used to both structure this exegesis and to create an analysis method that addresses the research aim. It outlines the importance of a practice-based methodology in creating a composition method that is sensitive and flexible enough to accommodate a multidirectional way of working and knowledge building. The next chapter is divided into two sections: an analysis section, and a findings section. The analysis section begins by focusing on melodic material. It reveals how themes were constructed, harmonised, and manipulated to function in big band writing. The chapter then outlines the discoveries observed when harmonic material is analysed. Here, tone cluster construction, type and size are described, as well as how these are used to delineate sections, create mood, and enable areas of implied tonality to occur within a movement. The findings section addresses four areas that this author views as representing the intersection between HC and big band writing: how can melodic material be harmonised, how can melodic variations be created, how can the ensemble support the improviser(s), and how can the rhythm section work coherently together while still imprinting their own personalities in their individual parts.

CHAPTER THREE:

ANALYSIS (OBSERVATION) & FINDINGS (EVALUATION)

3.1 INTRODUCTION

Chapter three presents an analysis and discussion of key findings discovered in this research.

Beginning with the analysis section, the chapter describes how melodic and harmonic material were created and used throughout the composition. The term ‘melodic material’ refers to phrases and themes, their variation and harmonisation, the bass riff and walking bass lines, piano and drum fill-ins, and improvisations. The term ‘harmonic material’ is understood to mean tone clusters. The findings section follows next. Here, personal reflection is used to put meaning to the discoveries found in the analysis section. The discussion, as mentioned previously, proceeds by examining four areas that are seen as embodying the intersection between HC and big band writing.

3.2 ANALYSIS OF MELODIC MATERIAL

Analysis of *Cosmica Sidera* showed that melodic material functioned in three ways. Firstly, it provided a mechanism to distinguish intra- and inter-movement sections. Next, it facilitated various compositional approaches; fugato (Io), call and response (Europa, Callisto), composition based on repeated short iso-rhythms (Europa, Ganymede), through-composing (Callisto), and riff-based composition (Io, Europa, Callisto). Lastly, it enabled compositional unity to be achieved as primary and secondary themes, and their variations, were shared among different movements (Europa, Ganymede, Callisto).

3.2.1 Creating themes and variations 1 – the phrase makes the theme

My compositional method, as mentioned previously, typically commences by exploring melodic material. This process begins with the creation of short melodic phrases. Phrases deemed as ‘sounding good’ are then expanded into melodic themes. This method revealed my understanding of what the terms ‘theme’ and ‘phrase’ are. The smallest division of the theme is the phrase, typically it is four or less bars in duration. Two or more phrases establish a theme. Typically, themes consist of eight bars, and often define an entire musical section. Augmenting my compositional method are the requirements specifically established to guide how HC tone-rows are to be used in creating melodic and harmonic material for this research (as outlined on page 24).

3.2.1.1 How are phrases constructed and used to create themes:

The requirements that guided my compositional method directly influenced how phrases and themes were constructed. In the small dimension all phrases were found to be created from six pitches belonging to one of the hexachordal divisions (i.e., H_1 or H_2). Likewise, the middle dimension lens also revealed all themes were constructed exclusively with phrases employing the same hexachordal division. Analysis showed that this was done in two possible ways: by using different phrases generated from the same hexachordal division of one HC tone-row; or by using different phrases generated from the same hexachordal division of different HC tone-rows. Examples of the two possible ways are shown below in Figures 7a and 7b.

Figure 7a: Two phrase theme constructed from the same HC tone-row (R_6H_2)



Figure 7b: Two phrase theme constructed from different HC tone-rows (P_3H_1 & P_9H_1)



3.2.1.2 How the pitch-class order of a phrase behaves in themes:

When analysis shifted to how the pitch-class order of a phrase behaves in themes, three distinct behaviours were found: a unidirectional pitch-class movement, a bidirectional pitch-class movement, and a pitch-class movement that employs sequential repetition. As mentioned previously pitch-class refers to a group of notes that share the same name regardless of which octave they occur in. The repositioning of pitch-classes, with respect of octave movement, was determined in two ways: firstly, by the limitations found in the range of instrument(s) assigned to play the theme; and secondly, by intuition (subjectivity) with the aim of bestowing further interest to the theme. Unidirectional pitch-class movements involved the transition from one pitch-class to the neighbouring pitch-class within a phrase: where pitch-class movement followed the exact order found in the hexachordal division, progressing in a left to right direction. Bidirectional pitch-class movement involved the revisiting of a pitch-class directly after its neighbouring pitch-class has been visited, whereby a right to left to right transition

occurred. Sequential repetition represented a pitch-class movement that jumped back several pitch-classes before repeating the pitch-class order again. Analysis revealed that these three behaviours provided a mechanism for overcoming the limitations of using the same six pitches in creating melodic material over the course of an entire movement or prolonged periods within a movement. Figures 8A, 8B and 8C below give examples of the three types of pitch-class movements.

Figure 8A below demonstrates a unidirectional transition, where the pitch-class order transitioned from left to right. Both phrases are constructed using the second hexachordal division (H_2) of the HC tone-row R_6 . When the pitch-class movement of the theme was expressed in terms of the integer movement the following was observed [123456]. The integer movement is used to numerically demonstrate the transitional movement, from one pitch-class to the next.

Figure 8A: Theme B from Ganymede (unidirectional)

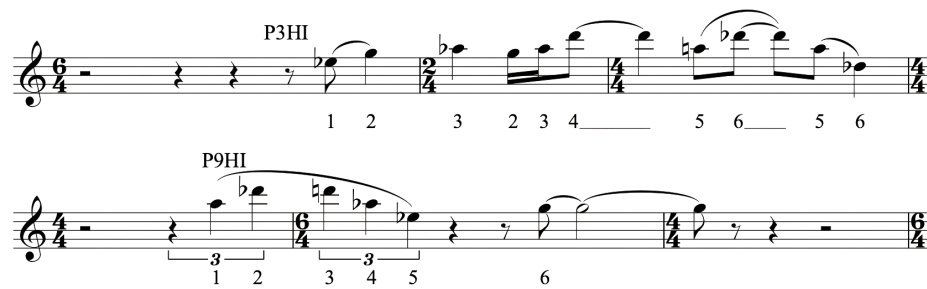


(Appearing at bar 29 [01:01:00], in the piano part)

Figure 8B below represents a bidirectional movement. Here, the first phrase followed a forward-backward-forward step-like movement through the first hexachordal division (H_1) of the HC tone-row P_3 . When expressed in terms of the integer movement the following was observed [1232345656], where pitch-class 2 and 3, and pitch-class 5 and 6 are revisited. The second

phrase was unidirectional, in this instance the first hexachordal division (H_1) of a different HC tone-row (P_9) was used. The complete integer movement for the theme was [1232345656-123456], the dash (-) indicates the division between each phrase of the theme.

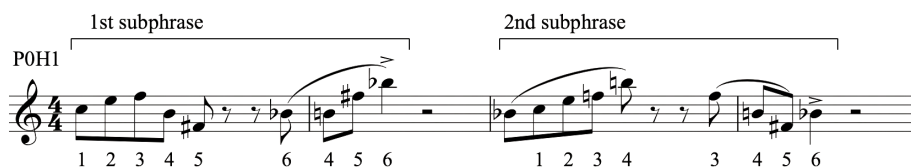
Figure 8B: Theme A variation from Europa (bidirectional)



(Initially appears at bar 34 [01:19:90], in the alto saxophone 1 part)

Figure 8C below exemplifies sequential repetition. Here, the first phrase completes the entire pitch-class sequence, from pitch-class 1 to 6 before repeating the pitch-classes 4, 5 and 6. The second phrase demonstrates a bidirectional movement. The complete theme used two phrases generated from the first hexachordal division (H_1) of the same HC tone-row P_0 . The complete integer movement for this theme was [123456456-12343456]. Analysis revealed that only a few examples of sequential repetition were found in *Cosmica Sidera*.

Figure 8C: Theme A variation from Callisto (sequential repetition)



(Appears at bar 8 [00:17:10], in the tenor saxophone 1 part)

3.2.1.3 Harmonising themes and creating variations:

Analysis of *Cosmica Sidera* revealed that the approaches used to harmonise themes also created variations of those themes. Therefore, the following observations of how themes were harmonised also describes how theme variation were achieved. Theme harmonisation was found to occur in two general ways: by maintaining the rhythmic integrity of the original theme while introducing a new HC tone-row(s), or by altering the rhythmic integrity of the original theme while introducing a new HC tone-row(s). Two possible strategies were observed when harmonisation involved the maintaining of rhythmic integrity: the first strategy substituted the main theme's original tone-row with a different (HC related) tone-row; the second strategy transposed the pitch-class content of the main theme's original tone-row. The former strategy frequently occurred throughout *Cosmica Sidera*. The latter provided a method of creating an accompanying harmonisation to the main theme, that maintained a continuous intervallic distance (i.e., two-, three-, four-semitones, and so forth) and introduced new pitches to the tonal mix; this approach was observed to occur only occasionally throughout the composition. Europa's theme B and its harmonisation theme exemplify the transposition method described above. Here, the harmonisation theme is the result of a transposition of 9 semitones (T_9) being applied to the original tone-row of theme B, and involves maintaining the rhythmic integrity of theme B. This example begins at bar 57 [02:17:90] and involves theme B and its accompanying harmonisation line (theme B1 harmony). These two themes reappear at bar 145 [07:37:00], however on this occasion the themes are joined by a variation theme (theme B variation) and an accompanying harmonisation theme (theme B variation-harmony). The variation theme (theme B variation) is constructed by altering the rhythmic integrity of the original theme and by introducing a new HC tone-row (P_0H_1). The accompanying harmonisation line was also created

by a transposition of 9 semitones, however in this instance it occurs on the theme B variation line. Figure 9 below shows Europa's theme B, and all related themes.

Figure 9: Europa's theme B with accompanying themes

The figure displays four staves of musical notation in 4/4 time, all in treble clef. The first staff is labeled 'Theme B' and 'R6H2'. The second staff is labeled 'Theme B1 - Harmony' and 'T9R6H2'. The third staff is labeled 'Theme B Variation' and 'P0H1'. The fourth staff is labeled 'Theme B Variation - Harmony' and 'T9P0H1'. The notation includes various musical symbols such as notes, rests, accidentals, and slurs, representing the melodic and harmonic relationships between these themes.

When the analysis shifts to examining harmonisation that involves altering the rhythmic integrity of a theme while introducing a new HC tone-row(s), contrapuntal harmonisation is observed. Contrapuntal harmonisation is understood to denote the momentary harmonisation that occurs when two or more melodic themes are simultaneously engaged (Kennedy & Kennedy, 2007). This approach is primarily observed in Io, where a fugato-like treatment of several themes creates a polyphonic texture between the horn sections. The themes used to create the polyphonic texture all employ different tone-row belonging to the first hexachordal division (H_1) of the prime tone-row (P_0): theme A, beginning at bar 89 [01:28:00] uses hexachordal division (H_1) of HC tone-row RI_1 ; theme B, beginning at bar 105 [01:44:00] uses hexachordal division (H_2) of HC tone-row I_7 ; and theme C, beginning at bar 121 [02:00:00] uses hexachordal division (H_2) of HC tone-row P_3 . A fourth theme, a variation of theme B (theme B1-variation) using hexachordal division (H_1) of HC tone-row I_4 , occurs only at the second and third theme statements, at bars

231 [05:42:00] and 293 [07:32:00] respectively. Initially theme B1-variation functions as a harmony line to theme B, however on its second appearance its function changes to that of a fourth contrapuntal line; creating a four-theme fugato-like texture. Figure 10 displays all four theme types present in Io.

Figure 10: The four theme types of Io

The figure displays a musical score for four theme types, labeled Theme A, Theme B, Theme B1 - Variation, and Theme C. The score is written in 4/4 time and features various musical notations including treble clefs, key signatures, and triplets. Theme A is a melodic line starting with a half note, followed by a quarter note, and then a half note. Theme B is a melodic line starting with a half note, followed by a quarter note, and then a half note. Theme B1 - Variation is a melodic line starting with a half note, followed by a quarter note, and then a half note. Theme C is a melodic line starting with a half note, followed by a quarter note, and then a half note. The score includes various musical notations such as treble clefs, key signatures, and triplets.

3.2.2 Creating themes and variations 2 – the bass riff

Analysis of Io, Europa and Callisto reveal that all three movements used a bass-riff (i.e., a melodic theme allocated to the bass instrument, typically of two, four or eight bars duration).

The bass riff was found to be the most common device used in the bass part, occurring in Io, Europa and Callisto. Analysis reveals that the bass riff was one-way faux tonality (i.e., implied tonality) could be achieved and sustained over longer time durations within a movement. The bass riff in Io is of 8-bar duration and involved one variation, where the original tone-row I_4H_1 was replaced by P_3H_2 : both tone-rows used the first hexachordal division of the prime tone-row (P_0). Europa also utilised one bass riff and a variation, both consisting of a repeated 4-bar phrase. The original bass-riff utilised the tone-row R_6H_2 , while the variation used tone-row R_8H_1 ; again, both tone-rows used the first hexachordal division of the P_0 . Callisto employs one bass riff throughout the movement. In this instance the bass-riff was constructed of a repeated 2-bar phrase firstly in P_0H_1 and then in R_9H_1 , together these were looped into an 8-bar theme. Figures 11A, 11B and 11C, below shows all three original themes.

Figure 11A: Original bass-riff for Io



(Beginning at bar 53 [00:52:00] and bar 311 [08:06:00])

Figure 11B: Original bass-riff for Europa



(Beginning at bar 48 [01:58:50] and bar 124 [06:32:20])

Figure 11C: Original bass-riff for Callisto

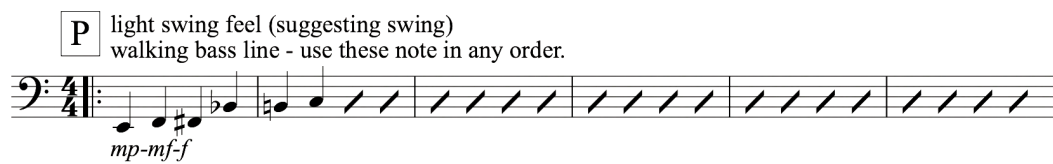


(Beginning at bar 73 [02:36:20] and bar 113[04:32:80])

3.2.3 Creating themes and variations 3 – walking bass lines, improvised fills (fill-ins), and improvisations

There are three instances throughout *Cosmica Sidera* where instructions are given to instrumentalists requiring them to create melodic material. The three instances were: the creation of a walking bass line; instruction to provide fill-ins (melodic, harmonic, or rhythmic); and instances where a specific instrumentalist is required to improvise. Collectively, these three instances are all understood to be standard features in jazz composition-performance (Terefenko, 2018; Chaichana, 2016; Goldsby, 2002; Carr, *et al*, 1987). Instructions for the bass to walk occurred in *Io*, beginning at bars 231 [05:42:00] and 267 [06:50:00]) and in *Ganymede* beginning at bars 110 [04:17:60] and 145 [05:34:80]. Figure 12 exemplifies the instructions given to the bass player when required to walk. The bass score presents the specific six pitch-classes required for the walking bass line in a compact shorthand form; it is hoped that this way of communicating allows the bassist's imagination (and skill) to surface, as they do not have to maintain any specific pitch-class order. When any instrumentalist is required to follow notated parts, "as written" is given.

Figure 12: Example of instruction given to bass when required to walk



(Beginning at bar 231 [04:42:00], in Io)

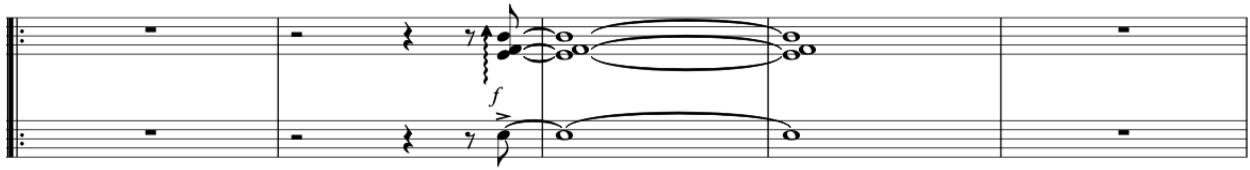
Instruction to create fill-ins was found throughout all movements, and predominantly featured in the rhythm section, most notably in the drum score where the player is required to sensitively accompany the band, soloists or improvisors. This instruction also occurred several times in the piano score, typically as a method of underscoring an improvisation. Figure 13 shows two types of instructions to create fill-ins from Europa, both examples are for the piano and have the function of adding melodic or harmonic interest whilst supporting the tenor saxophone 2 improvisation at bar 77 [03:40:80] or providing a single note fill-in under the horn build up at bar 145 [07:38:05]. Tone clusters are given in both instances, as a reference to the specific pitch-class in current use.

Figure 13: Two examples of fill-in instructions, in the piano part of Io



(Instructions given to piano at bar 77 [03:40:80], Europa)

piano fill in - use single notes only



(Instructions given to piano at bar 145 [07:38:05], Europa)

Improvisational sections occur in all movements. When they occur, no instruction was given as to what the improviser should play. It is hoped that the different types of underscoring would inspire the improviser(s) by providing an evolving musical background from which to develop their improvisation. Three distinctive types of underscoring were found at the commencement of an improvisation: the unaccompanied, the small group format (trio or quartet) and a special case occurring only once in the composition, where the improviser departs from a continuously repeated theme, play on clarinet (1st alto saxophone) in Ganymede. Typically, all underscored parts build up towards the tutti, as sections or instruments were gradually added. On three occasion the improvisation commenced with the instruction to proceed unaccompanied for no less than 40-45seconds: Io bar163 [02:42:00] for baritone saxophone; Europa bar 145 [07:38:05] for piano: and Ganymede bar 10 [00:18:00] for double bass. In all instances where the improvisation was unaccompanied, the instruction to improvise freely was given, until the band is cued in. Small ensemble configurations launch several improvisations: trumpet 2's (trio format) improvisation in Io bar 251 [06:18:00]; tenor saxophone 2 (quartet format) in Europa bar 77 [03:40:80]; bass trombone (quartet format) in Ganymede bar 70 [02:28:00]; and trombone 2 (quartet format) in Callisto bar 65. The final type of underscoring occurs at bar 210 [06:55:00] in Ganymede; here the repeating woodwind melodic statement underscored the clarinet improvisation.

3.3 ANALYSIS OF HARMONIC MATERIAL

In dodecaphonic music, all pitch-classes found in the tone-row are of equal importance “without prioritizing one note over the other” (Terefenko, 2018: p.357). This understanding of dodecaphonic music leads me to conclude that any harmonic and melodic material created must also represent musical elements that are of equal importance. Therefore, my approach treats harmonic and melodic material as having the same significance. In this research, harmonic material refers to tone clusters. Analysis examining the construction of tone clusters revealed that they follow the same approach used to create phrases, i.e., they reflect the requirements specifically established to guide how HC tone-rows are to be used. Viewed from the middle dimension perspective, collections of tone clusters were found to function in ways that define sections within a movement by creating identifiable harmonic material, and signposts that herald the beginning or ending of sections. When the lens was broadened to the large dimension, the collection of harmonically distinct sections established a movement’s musical form, its mood, and character. The ability to create areas of familiarity in the large dimension was attributed to the re-cycling and re-casting of harmonic material throughout the composition and was seen as evoking compositional unity.

3.3.1 Creating tone clusters – from two to six pitches

Viewed in the small dimension, analysis of the harmonic material identifies five possible tone cluster sizes: the smallest size involves two pitches, and the largest containing all six pitches found in the hexachordal division of a HC tone-row. The number of tone clusters available in any H_1 or H_2 tone-row was found to be directly related to the number of pitch-class the tone

cluster used, i.e., dyads clusters result in five potential tone clusters being available in any hexachordal division of a tone-row, triadic cluster result in four, tetradic clusters result in three, and so forth.

All tone clusters were found to be constructed in a manner that followed the pitch-class order of the hexachordal division in use; starting on the first pitch-class and ending when the tone cluster first includes the sixth pitch-class of the tone-row. Figure 14 below shows the possible types of tone clusters available when two (dyadic), three (triadic) and four (tetradic) pitch-classes were used to construct the tonal clusters. In this research, clusters were named by designating upper-case roman numeral to indicate what degree of the pitch-class order the tone cluster begins, i.e., I = the 1st pitch-class, II = the 2nd pitch-class, III = the 3rd pitch-class, and so forth.

Figure 14: Example of dyadic, triadic and tetradic tone clusters

The figure displays musical notation on a single staff in C major, illustrating the construction of tone clusters from a hexachordal tone-row. The notation is organized into three horizontal sections:

- POHI original tone-row:** The first section shows a single melodic line with six notes: C4, D4, E4, F4, G4, and A4.
- Dyadic Tone Cluster:** The second section shows five vertical clusters of two notes each, labeled I through V below the staff. These clusters are: (C4, D4), (D4, E4), (E4, F4), (F4, G4), and (G4, A4).
- Triadic Tone Cluster:** The third section shows four vertical clusters of three notes each, labeled I through IV below the staff. These clusters are: (C4, D4, E4), (D4, E4, F4), (E4, F4, G4), and (F4, G4, A4).
- Tetradic Tone Cluster:** The fourth section shows three vertical clusters of four notes each, labeled I through III below the staff. These clusters are: (C4, D4, E4, F4), (D4, E4, F4, G4), and (E4, F4, G4, A4).

3.3.2 Tone clusters 1 – functioning as faux-tonality



In the middle dimension view, tone clusters were found to create sustained areas characterised by faux tonality. Analysis suggested that this occurred because of the compositional approach used, whereby only tone clusters and melodic material containing the same six pitch-classes found in

the hexachordal division of HC tone-rows were used simultaneously. When areas of faux tonality were considered in the large dimension, only two possible tonal areas were found: those containing the same six pitch-class as that of the first hexachordal division (H_1) or those containing the second hexachordal division (H_2) of the prime tone-row. Both *Io* and *Callista* exemplified movements that remain in one pitch-class area, i.e., the first hexachordal division (H_1). *Europa* and *Ganymede* show examples where both pitch-class areas (H_1 or H_2) were used within a single movement. Figure 15 below shows tone clusters for woodwinds and brass in *Europa*, beginning at bar 137 [07:20:20] in piano reduction form.

Figure 15: Tone clusters from *Europa* in piano reduction form

The figure displays two systems of musical staves for Saxophones, Trumpets, and Trombones. The first system shows Saxophones with R9H1 and P3H2 clusters, Trumpets with P0H1, and Trombones with P3H2. The second system shows Saxophones with R9H1, P6H1, and P3H2 clusters, Trumpets with P3H2 and P0H1, and Trombones with P3H2. Roman numerals I, III, IV, and III are used to label specific clusters.

(Example begins in the horn parts, at bar 137 [07:20:20])

In the above example, triadic clusters belonging to three different tone-rows (R₉H₁, P₀H₁ and P₃H₂) constructed from the same six pitch-classes observed in the first hexachordal division of the prime tone-row were combined to create harmonic and textural interest. Both the woodwinds and trumpets change tone-rows and tone clusters, while the trombones remain in the same tone-row, using tone clusters I, III and IV. Unity between all three instrumental groups was created by re-using the iso-rhythmic motif of  found in the opening bars of Io. This united the two movements. In Europa, the  motif first occurs in the low brass, then moved to the woodwinds, before appearing in the high brass, and finally recurring in tutti form. The way tone clusters were distributed among the instruments follows typical big band arranging conventions, where woodwinds and trombones allocated close intervallic pitches to high voices, with the opposite for trumpets. Typical big band voicing was observed, with the doubling of top note(s) of melodic and harmonic material in the lowest voice (Nestico, 1993).

3.3.3 Tone clusters 2 – functioning as rhythmic motif

Analysis reveals that harmonic material frequently functioned as rhythmic motifs throughout the composition. The rhythmic motif were either explicit, as observed in the opening 69-bars of Io as mentioned above, or implicit, as found in the piano part of the same movement occurring at bar 73 [01:12:00] (see Figure 16 below). The most common type of rhythmic motif involved a repeated iso-rhythm (with the occasional variation); typically involving several tone cluster changes, all belonging to the same six pitch-class hexachordal division of the HC tone-row. Both dyadic and triadic tone clusters were observed throughout *Cosmica Sidera*. Larger tone clusters (containing five or six pitches) were found to occur sparingly, and functioned more as an effect, rather than providing a tonal space.

Figure 16: Piano part showing tone clusters with instructions to freely interpret rhythm

The image displays four systems of musical notation for a piano part. Each system consists of a treble staff and a bass staff. The first system is marked with 'freely interpret rhythm' above the treble staff and 'P3H2' above the bass staff, with a Roman numeral 'I' below the bass staff. The second system has 'P3H2' above the bass staff and a Roman numeral 'III' below it. The third system has 'P3H2' above the bass staff and a Roman numeral 'IV' below it. The fourth system has 'P3H2' above the bass staff and a Roman numeral 'III' below it. The notation includes horizontal lines and dots on the staves, representing tone clusters.

(The piano part from Io beginning at bar 73 [01:12:00])

In the above example, harmonic interest was created by a register change (from bass to treble clef) for each tone cluster, in conjunction with a I-III-IV-III harmonic sequence occurring in the tone-row P_3H_2 . The approach outlined above was repeated throughout Io, and re-occurred throughout the piano score in Europa, and in Callisto between the brass and piano exchange beginning at bar 73. Harmonic material functioning as a rhythmic motif was seen as an uniting feature, as it connected, in the middle dimension, different musical sections within the movement, and in the larger dimension, different movements when it functioned as a reappearing musical feature (a memory).

3.4 FINDINGS – WHAT DOES THIS MEAN?

The following discourse is rooted in personal reflection and is intended to reveal how knowledge gained from the analysis method informs my compositional practice. The discourse in this section, as mentioned previously, addresses four areas that I feel represent the intersection between HC and traditional big band writing: the harmonisation of melodic lines, the creation of melodic variation, underscoring the improvisation, and creating rhythm section unity (Terefenko, 2018: Sussman & Abene, 2012: Cook, 2011: David, 1998: Nestico, 1993). I posit that HC needs to provide ways of accommodating each of these areas if it is to be considered an appropriate model for creating melodic and harmonic material need to compose music for a big band.

3.4.1 Harmonisation of melodic lines

Nestico (1993) states that the success or failure of any big band piece resides in the ways melodic material is harmonised and then distributed (voiced) among the different sections of the ensemble. Therefore, for HC to be considered usable when writing for a big band, I feel it should at the very least be able to provide a mechanism whereby themes can be harmonised beyond simple octave or two-part harmony. In practice, I found that HC provided several mechanisms for harmonising melodic material, and that these methods also generated new melodic material in the form of variations.

The significance of this is that a single HC theme easily provides a plethora of harmonic and melodic possibilities. The way the new material was used determined its function. If it was coupled with the principal theme it acted as a harmonisation line. However, if it is used as a new theme it functioned as a variation. HC's ability to create a multitude of both harmonic and

melodic material from a single theme impacted my compositional practice dramatically, because a large amount of new melodic and harmonic material was quickly amassed once I had created one initial theme. I found that this feature of HC saved me time, because the new material could be used within a single piece of music or it could create other music, i.e., other movements, variations, or totally unrelated pieces. Furthermore, I found that counterpoint themes emerged effortlessly when I altered the rhythm of any new melodic material. This discovery broadened my compositional experience because it provided a way of incorporating a compositional style that I have rarely used previously, polyphony. I had avoided polyphony largely because I felt uncomfortable with my ability to create several melodic themes that I thought would fit together successfully. However, because HC created numerous themes and their variation, involving the same six pitches, I found I had an abundance of melodic material that worked together in a polyphonic manner. This discovery encouraged me to try this compositional style.

Straus (2005) indicates that dissonance is easily achieved in most dodecaphonic systems. I found this to be true. However, because the compositional model only uses the same six pitches from a variety of different HC related tone-rows (i.e., H_1 or H_2), sustained areas characterised by faux tonality were possible. I found HC's ability to provide both areas of tonal stability and dissonance impacted my compositional practice as it gave me a sense of compositional choice; I could create areas of musical lyricism, calmness, and faux tonality and areas that represent the opposite.

3.4.2 Creation of melodic variation

Although the focus on form is beyond the scope of this research, it is worth noting that HC's ability to provide numerous types of variations (melodic and harmonic) significantly eased the

create of and transition to new sections within a movement. This characteristic of HC greatly aided and influenced the way I was able to expand the short piano reductions into long form pieces of music (i.e., a movement). This influence is most noted in the three movements Io, Europa, Ganymede, which are all structured in song-form: sharing common musical sections such as an introduction section, A and B sections, improvisation sections, linking passages, a bridge and conclusion (or coda) sections . Typically, the song-form involves multiple repetitions of the entire, or some part of the form over the duration of a piece (Miller, 2005). Each of these three movements exhibit multiple examples of melodic variation used to achieve and maintain interest when sections reappear.

I found that the most dramatic type of variation occurs when the entire pitch-class area changes from one hexachordal division to another within a movement, i.e., from exclusively using H_1 related pitch-classes to exclusively using H_2 related pitch-classes. I employed this type of variation in Europa and Ganymede. I found this type of variation most effective when used infrequently, because the listening experience is dramatically impacted by the radical change in tonal saturation as one set of six pitch-classes are completely replaced by another set of six pitch-classes. This type of melodic variation also provided a way of dramatically changing the mood within a movement and ultimately the character of the music.

3.4.3 Underscoring the improvisation

Common to all movements of *Cosmica Sidera* are improvisational sections. Providing underscoring for improvisors is a common feature of jazz big band writing (Nestico, 1993: Carr et al, 1987). I found creating underscoring for improvisors was greatly aided by HC's ability to create areas of faux tonality. The most interesting way faux tonality was achieved in

underscoring passages was by using harmonic sequences. I found that even the smallest tone cluster size (dyadic) created harmonic sequences that simultaneously displayed enough tonal change to maintain interest while also implying a faux tonality. In practice, once the tone cluster size and types were decided upon, a harmonic sequence quickly revealed itself. This is because all harmonic sequences were created by following the order of the tone clusters found in the specific tone-row in use. Resulting in a limited number of tone clusters being available. This limitation greatly influenced my compositional practice, as it forced me to only consider and use the tone clusters available. This restriction directed my focus to building, maintaining, and developing interesting underscores via the use of a range of other techniques common to both tonal and atone composition, such as texture, dynamics, riff's, orchestra density, and so forth.

3.4.4 Rhythm section unity

The functioning of the harmonic and melodic material within the different horn sections is not the only area of interest to these findings. The rhythm section provides an equally fertile and important field for investigation and applied learning. Canadian educator, author, composer, and trumpeter Gordon Delamont is cited as saying “the rhythm section is the constant unifying force of the contemporary jazz ensemble” (Nestico, 1993: p.106). For me, Delamont’s *unifying force* represents my idea of rhythm section unity; that is the ability of the rhythm section to function collectively as one instrument, where all musical ideas lock together, demonstrating total cohesion in expressing musical ideas at both the collective and individual playing level. The specific instruments chosen to make up the rhythm section in this research were purposely restricted to the piano trio format (piano, bass, and drums). The focus on the rhythm section is due in part because it is an important section in the big band and because it is a stand-alone ensemble.

3.4.4.1 The bass riff:

I found starting a compositional sketch with a bass riff to be the easiest way of successfully composing with HC material. The bass riff immediately provided a strong implied tonality from which thematic, harmonic, and rhythmic ideas were easily bounced off and evaluated. It is for this reason that the bass riff is the most used bass device in *Cosmica Sidera*, occurring in Io, Europa and Callisto. The piano often joins the bass riff, by either mimicking the bass riff line, creating melodic fill-ins', or comping on tone clusters. The drum kit part consists of either notated passages or passages where the drummer is instructed to create appropriate sensitive support to what is happening musically. Collectively, the bass riff provides one way of creating rhythm section unity by establishing a strong groove that then allows the drums and piano to either join in with, or juxtaposed with, other ideas.

3.4.4.2 Tone clusters in the piano:

A particular dilemma I encountered with HC involved how to communicate what tone cluster is required in any bar or section, in a writing style that allowed the same freedom of choice (voicing) as chord symbols do. The dilemma reflects my belief that for HC to be appropriate in jazz it must provide ways of communicating musical elements such as tone clusters in a simple short-hand way. The solution found, was to notate in the piano part a condensed form of the tone cluster, with the text "ad lib rhythm". Typically, in this scenario the bass is instructed to "complement piano in a sensitive manner", likewise the drums are also expected to accompany in a sensitive way. Examples of this type of rhythm section operation are found in all movements and are typically restricted to a single or a couple of sections only. This type of rhythm section interaction was found to work well when the rhythm section functions in a supportive role, particularly when underscoring a horn theme or an improvisation. I feel this approach provided

rhythm section unity because it established the piano as the primary figure in this section, leaving the bass and drums to work off the piano ideas to collectively create cohesion.

3.4.4.3 The walking bass line:

At the commencement of this research, self-reflection guided me to conclude that what distinguishes jazz from other music types is that it has some very identifiable features, most of which have been discussed previously. The walking bass line is one such feature (Chaichana, 2016: Fuqua, 2011: Goldsby, 2002: Carr, *et al*, 1987). Initial exploratory compositional sketches established that the walking bass line is easily achieved, principally because HC only uses six pitches at any one time. The issue my compositional practice needed to resolve was how to communicate in the simplest way what the specific six pitches the bassist needs to highlight in the walking bass line are. In practice this was easily done by stating the six pitches at the start of the section where the walking line commences, along with the text “walking bass line, use these notes in any order”. When the bass is instructed to walk, I typically score the piano in an accompanying role, providing melodic or harmonic support. My intention here is for the piano to reflect the ideas, rhythms and intensity heard in the bass line. Only two movements contain a walking bass line: Io and Ganymede. I view the walking bass line as another way rhythm section unity can be expressed, because it allows all three members to function together while still expressing individual musical ideas.

3.5 SUMMARY

This chapter communicated the analysis and the findings observed in this research. The analysis section identified how melodic and harmonic material are constructed and harmonised, how melodic variations are generated, and how harmonic material are used to create faux tonality and

to what end. The analysis section of the chapter concluded by unpacking the three instances where the performer(s) are required to input their own melodic and harmonic material. The findings section explored the significance of what was found in the analysis by addressing how this knowledge influenced my HC compositional practice. The discourse in this section unfolded by concentrating on four areas seen as representing the intersection between HC and traditional big band writing. Personal reflection guided the discussion throughout this section of the chapter.

CHAPTER FOUR: CONCLUSION

4.1 CONCLUSION

This exegesis documents the beginning of my experimentation with compositional practices that merge jazz composition with dodecaphonic techniques. The creative outcome, *Cosmica Sidera*, marked several milestones in my compositional development: Firstly, it is the longest musical work I have ever created; being some 49-minutes in duration it demonstrated (to me) that I am able to create music over such a long timescale, and that I am able to conjure up enough musical ideas to fill such a timescale. The longest musical I had written prior to *Cosmica Sidera* is some 40-minute shorter. Secondly, *Cosmica Sidera* is the first attempt at writing music that isn't tonal. I have worked with extended techniques but have never truly composed in a medium that is atonal. The third milestone may seem strange, but the creation of this piece was undertaken with prolong dedication, where over several months I was able to sustain my enthusiasm and diligence; the whole process of creating this piece taught me how to work in a focused manner over a longer period than I have ever done before.

My attempts to catalogue a broad range of literature addressing dodecaphonic jazz yielded relatively little, particularly when compared to the availability of texts engaging with dodecaphonic music in the western art tradition. However, the jazz examples found all pointed to a field of composition that seems to hold potential, especially to composers who are eager to set their own ground rules with regards to the ways they apply musical elements (i.e., melodic, and harmonic material). I found that HC presented very little resistance in providing musical material needed to fulfill the requirements of traditional big band writing. HC's strong influence on the creation of organisational elements and not the procedural elements (i.e., the way musical materials are used to create music) gave me a great sense of confidence. This confidence allowed

me to focus on applying the created melodic and harmonic material in ways that served my needs, reflecting my idiosyncrasies; I felt that I did not need to model my approach to any pre-existing strategies. HC's influence on the organisational elements (i.e., how melodic, and harmonic material are created) also showed flexibility. Particularly as it offered several ways of achieving a single goal: Whether it was the ways a tone-row was treated to create a theme; the ways themes were harmonised to address a specific need within the music (e.g., to be voiced among the specific horn sections); creating both harmonic and melodic variations; or providing ways the rhythm section could stamp their own personality (i.e., such as comping under an improviser). The significance of HC's flexibility in creating musical material and its lack of guidance on the way(s) these materials can be used, left me with the impression HC can serve the needs of any big band composer.

4.2 CHALLENGES

Two compositional challenges of note were observed while undertaking this research. Both challenges relate the issue of how to compose. The first challenge related to my understanding of HC and dodecaphonic music, and the second related to my understanding of how to avoid stagnation within a piece. The initial challenge was most acute at the commencement of the earliest stage of this research. The reason for this challenge was directly linked to my understanding of HC and dodecaphonic music at this point of this inquiry; an understanding that was grounded in a belief that dodecaphonic music equals a strict regulation of and adherence to rules governing how pitch, rhythm, dynamics, timbre, and other music elements were to be treated and applied. My initial preliminary sketches indicated that the rules governing the above musical elements (particularly those central to this research) left me with limited choices. Fortunately, as my understanding grew, I realised that this was not the case; HC (along with

many other dodecaphonic models) was able to accommodate my own ways of creating. I found that the only requirement needed when working with HC was a clear vision of what musical material was needed to achieve the compositional goal, and then the ‘hutzpah’ to create your own rules, or use rules, that serve the desired outcome.

The other challenge, also felt in the early stages of the composition process, was how to avoid musical (particularly harmonic) stagnation when creating a piece of music of longer duration that uses limited pitches. The answer to this potential challenge was found in the same mechanisms that HC provided when facilitating the creation of new melodic and harmonic material. The pathways presented in creating new material were found to also address issues of maintaining interest in music that is of longer duration, e.g., if a bass riff or tone cluster sequence started to sound ‘well-used’, then changing the tone-row used to create it was found to inject ‘new life’ thereby resolving any stagnation issues.

4.3 LIMITATIONS

Unfortunately, due to the global Coronavirus (Covid-19) pandemic, and the resulting ongoing government restriction, any realistic possibilities of a large ensemble (jazz big band) coming together to workshop or record the score or any of its parts was dramatically curtailed. As such, only a midi realisation of the score is provided to give an approximation of what the composition sounds like. Fortunately, during one period of eased restrictions I was able to organise a recording of the baritone saxophone and trumpet improvisation in Io, where individual musicians performed over the accompanying midi audio. Although this is not an ideal way of obtaining a realistic idea of how these sections work, they do give a general sense of how the underscoring functions with the improvisation. The music analysis was solely derived from reading the score. Another consequence of the pandemic and its associated restrictions was the lack of

opportunities to exchange knowledge in a casual conversational environment; commonly referred to as ‘water-cooler moments’. The lockdowns made such exchanges impossible; leaving me to only imagine how beneficial it would have been to have exchanged ideas or hear other people’s thoughts; inputs that I am sure would have influenced or opened this research up further.

4.4 AREAS FOR FUTURE RESEARCH

Potential areas for future research include exploring: the use of HC to create music for other ensemble types (and sizes), including voice(s) (lyrics); the use of HC to create music that incorporates mixed scores (notated & graphic); music making that simultaneously incorporates different compositional systems (both dodecaphonic and tonal); the development of methods, techniques and approaches based in HC (or Dodecaphonic) theory that address areas of jazz performance (i.e., improvisation, harmonic voicing, walking bass lines) or pedagogy. Both the gap in available literature addressing dodecaphonic systems in the jazz tradition, and dodecaphony’s tendency to only provide organisational material (musical elements) but not the procedural processes (ways of applying the musical elements, composing), leads me to believe that this area of experimental jazz composition holds a vast number of opportunities for future research.

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