Analysing Pitch Structure in Late-Period Recordings of John Coltrane: *Interstellar Space* and *Stellar Regions*

Volume I (of II)

John O'Gallagher

A thesis submitted in partial fulfilment of the requirements

for the degree of Doctor of Philosophy in Musicology

March 2021

Royal Birmingham Conservatoire

Faculty of Arts, Design and Media

Birmingham City University

ABSTRACT

The impact of the saxophonist and composer John Coltrane (1926–67) on music is remarkably broad and reflective of a philosophy dedicated to finding new means of expression. Coltrane's earlier tonal and modal music and their cultural-historical contexts are already well-documented; however, *Interstellar Space* and *Stellar Regions* – produced just one week apart in the final six months of his life – are among his least interrogated works. The analytical core of this thesis investigates to what extent Coltrane's performances on *Interstellar Space* and *Stellar Regions*, widely regarded merely as unstructured (free) improvisations, contain evidence of rigour and organised pitch structure. This research aims to challenge the ways that these last recordings are understood, prompting a new dialogue relating to the nature of his music and the nature of 'free' improvisation.

While Coltrane's late-period music is often characterised as motivic, this thesis evidences the widespread presence of trichordal pitch-class sets as a crucial means for achieving unity and binding the motivic surface. Coltrane's eclecticism and esoteric studies are also considered for their potential impact upon pitch structure (Chapter 2). The analysis is based on original transcriptions, utilising a blend of post-tonal, voice-leading, jazz harmonic and improvisational techniques, while focusing on Rahnian set theory as the primary methodology (Chapter 3). It is organised within three themes according to the music's structural homogeneity or heterogeneity: trichordal and hexachordal determinacy (Chapter 4); emergent pc-sets and major-third cycles (Chapter 5); and pc-set generation, integration, and diversity (Chapter 6). The construct (013), revealed as a constant reference in 'Iris', acts as a structural precedent for other pc-set formations within *Interstellar Space* and *Stellar Regions*, and more broadly in other similar loci through Coltrane's late period. This doctoral research establishes Coltrane’s improvisations as highly structured works of art, refuting the notion of free jazz as disordered or chaotic.

VOLUME I

TABLE OF CONTENTS

VOLUME II

TABLE OF CONTENTS

LIST OF FIGURES

ACKNOWLEDGEMENTS

I would like to acknowledge and express my deepest thanks to my supervisors Professor Deborah Mawer and Professor Tony Whyton, for their advice, moral support, and inspiration. Additionally, I would like to thank Jeff Williams, Quinsen Natchoff, Percy Pursglove, Rebecca Nash, and Andrew Bain for their feedback on various drafts of this thesis. In researching this project, conversations with Paul Dunmall, Alan Chase, Louis Belogenis, Jon Irabagon, Lewis Porter, Christopher Dingle, and Kenny Wessel provided valuable information, and I am grateful for their contributions.

I would also like to thank Keith Salley, Rich Pellegrin, and Keith Waters for their editorial feedback on an article that was produced during the early stages of this research. Their insights came at a crucial point and were very valuable.

Although this work had been progressing informally for several years, I am grateful to Hans Koller for encouraging me to begin this research at the Royal Birmingham Conservatoire. Finally, I would like to thank my wife, Bonnie O'Gallagher, for her love, understanding, and support during this process. Through her sense of adventure and openness to change, this thesis was able to be realised.

RELATED PUBLICATIONS

O'Gallagher, J. (2020) 'Pitch-Class Set Usage and Development in Late-Period Improvisations of John Coltrane'. *Jazz Perspectives* 12/1: 93–121. DOI: 10.1080/17494060.2020.1734055.

PART I –

CULTURAL CONTEXTS AND METHODOLOGY

FOR EXPLORING LATE COLTRANE

CHAPTER 1: INTRODUCTION

The extraordinary musical achievements of the saxophonist and composer John Coltrane (1926–67) establish him as one of the great artists in our history. And yet, while numerous publications document the biographical details of his life, and his impact upon music and culture (Brown, 2010; Cole, 1976; Howison, 2012; Kahn, 2003; Kofsky, 1998; Porter, 1998; Ratliff, 2008; Simpkins, 1975; Smith, 2001; Thomas, 1976; Whyton, 2013), there is surprisingly little scholarly research on the musical structure of his late, recorded works *Stellar Regions* (1995) and *Interstellar Space* (1974). This gap in scholarship is perhaps understandable given the enormous musical complexity and the aura of impenetrability that these recordings have as representatives of 1960s avant-garde jazz. Equally, the polarising nature of this music and its frequent anarchic characterisation has contributed to the lack of serious inquiry into its musical structure. Moreover, analytical complications arise from the music's shifting tonal, modal, and atonal characteristics, thus requiring considerations beyond the functional harmonic and modal frameworks often seen in the analysis of Coltrane's music. As musical archetypes that destabilised the conventional definitions of composition and improvisation, the absence of scores for the music of *Stellar Regions* and *Interstellar Space* has also impeded their study, requiring that analysts have specialised skills for creating competent transcriptions from the audio recordings. (The use of transcriptions in musicology is examined in Chapter 3.2.)[1]

While the extant analytical literature on these recordings is limited and typically brief, often appearing within studies focused on broader issues and other works, no detailed musical

[1] Commercial transcriptions are available from Andrew's Musical Enterprises (2016), however, they are at times incomplete.

analyses of *Stellar Regions* and *Interstellar Space,* or comparative analysis of consecutive late-period Coltrane recordings have yet been undertaken. This thesis addresses this gap in scholarship, challenging the persistent narratives attached to Coltrane's late music by providing the first extended and in-depth analysis of his music dating from the 15 and 22 February 1967 – *Stellar Regions* and *Interstellar Space*.

This research began in 2013 as an extension of my musical practice as a professional saxophonist working in New York. The development of post-tonal approaches in my own improvisational vocabulary led to the aural recognition of specific types of trichordal pitch-class sets (pc-sets) in Coltrane's late-period music.[2] More significantly, I discovered that the tenor saxophone and piano harmonies utilise identical trichordal structures for the entire length of 'Iris' (from *Stellar Regions*), indicating a preconceived method for employing specific trichordal pc-sets. This revelation prompted the research that has resulted in this doctoral dissertation. It became apparent after beginning the initial transcriptions that Coltrane's music has an inherent structural quality well-suited to set-theoretic analysis, and so, following a period of wider experimentation, the latter was chosen as the principal methodology. This analytical view has generally been absent from discussions of Coltrane's later music, resulting in limited insights into its pitch structure. And, indeed, the situation has hardly been helped by recent significant misconceptions around music analysis pertaining to what is becoming known as 'Cancel Culture'.[3] By combining academic scholarship with a methodology centred on set theory and practical musical knowledge

[2] Post-tonal theory is a category of analytical theories comprising diverse approaches (including set theory) designed for interpreting music that no longer functions within the norms of 'tonal syntax' (Straus, 1991, p.1).
[3] While this subject is worthy of lengthy discussion, it is beyond the scope of this thesis. Nonetheless, it is important to acknowledge the current debate surrounding 'Cancel Culture' and musical analysis (Powell, 2021).

informed by thirty-years' experience as a professional saxophonist, this thesis looks to offer a distinctive perspective within the discourse on Coltrane's late period.

1.1 AIMS OF THE RESEARCH

The analytical core of this thesis investigates: To what extent do Coltrane's performances on *Stellar Regions* and *Interstellar Space*, widely regarded merely as free improvisations, contain evidence of structural rigour and pitch organisation? Several sub-questions help to elaborate on themes contained in the main question, in particular:

- What kinds of melodic/linear pitch devices are used by Coltrane in the improvisations on *Interstellar Space* and *Stellar Regions* and what suitable methods might we employ to analyse them?
- Are there earlier recordings of improvisations that exhibit the same structural characteristics as those found on *Interstellar Space* and *Stellar Regions*, and if so what are the relationships?
- What patterns emerge from analytical comparison of similar structures found in different improvisations, and what might this reveal about Coltrane's conceptual approach?
- How does Coltrane's improvisational style relate to his compositional style, and is there a clear distinction between the two?
- Are there connections between Coltrane's musical education, extra-musical interests, and the improvisational structures he uses?

This doctoral study aims to gain new insights into Coltrane's creative process and provoke a reconsideration of the analytical tools that may be useful for Coltrane's late music. Furthermore, it aims to challenge the ways that these last recordings are currently understood and interpreted, prompting a new dialogue relating to the nature of his music and the meaning of free improvisation.

Two volumes organise the contents of this thesis, with Volume I consisting of three large-scale sections: Part I –Cultural Contexts and Methodology for Exploring Late Coltrane; Part II – Analyses of *Interstellar Space* and *Stellar Regions*; and Part III – Conclusions. Part I is divided into three chapters (Chapter 1: Introduction; Chapter 2: Influences on Coltrane's Musical Structure(s); Chapter 3: Analytical Issues and Approaches) that lay the foundation for the analyses in Part II; it outlines the thesis structure, research aims, background relationships, narratives in literature, cultural contexts, relevant extant analytical literature, influences on Coltrane's musical structure, analytical issues and justification of methods. In Part II (Analyses of *Interstellar Space* and *Stellar Regions*), Chapters 4, 5, and 6 (Trichordal and Hexachordal Determinacy; Emergent PC-Sets and Major-Third Cycles; Pc-Set Generation, Integration, and Diversity in 'Saturn') divide the contents of these recordings into analytical themes progressing from structural homogeneity to heterogeneity. Additionally, in Chapters 4 and 5, analyses of 'Suite: Prayer and Meditation (Day)' (1970b) and 'Acknowledgement' (1965b) illustrate earlier, analogous approaches to pitch structure. In Part III (Conclusions), Chapter 7 summarises and discusses the analytical findings, in response to the main research question; it evaluates Coltrane's structural characteristics, reflects on the analytical methodology (and other subquestions), and considers the potential implications for Coltrane studies and future research.

Volume II comprises extended illustrations and analyses with musical notation, offered as Appendices to Part I and Part II, and cross-referenced with the main text. This thesis is structured with the intention that the reader should read through Volume I in conjunction with Volume II, referring to the Examples in the Appendices whenever the text of Volume I indicates. Shorter illustrations appear as Figures within the body of the main text in Volume I. Furthermore, it is recommended that the reader listens to the music prior to engaging with the analysis in order to orient themselves within the discussion. Upon engaging with the analysis, the reader may locate and listen to the individual sections analysed through the specified timings provided. For convenience, the following hyperlink is connected to the audio recordings of Coltrane analysed in Part II via the streaming service Spotify: https://open.spotify.com/playlist/4MozUxEveHHsvM7yACsqsr?si=VeJ17IdtSgaVowWyXuNRWw

1.2 BACKGROUND AND RELATIONSHIPS

The posthumously released recordings *Interstellar Space* and *Stellar Regions* exhibit a remarkable interrelationship, with the former widely regarded as John Coltrane's final masterpiece, and the later largely overlooked and misunderstood. With a total of seventeen tracks contained within *Stellar Regions* and *Interstellar Space*, as shown in Figures 1.1 and 1.2, these two recordings encompass the majority of music produced by Coltrane in the final six months of his life (alternate takes within this thesis are abbreviated as (alt tk)).[4]

[4] These individual track timings are listed on the CD back covers of *Stellar Regions* and *Interstellar Space*. Due to issues associated with the mastering and production of the music for different audio formats, these timings sometimes vary by two to three seconds from the original session logs, and from the timings listed on music streaming services.

Recorded just one week apart on 15 (*Stellar Regions*) and 22 (*Interstellar Space*) February, 1967, twenty-one years separate their respective releases in 1995 and 1974. The proximity of the recording dates, overlapping material ('Stellar Regions' and 'Venus'), and related improvisational techniques offer unique windows on Coltrane's style from two perspectives: firstly, in *Stellar Regions* the context of the traditional jazz quartet (saxophone, piano, bass, drums), and, secondly, in *Interstellar Space* the duo (saxophone, drums) – a harmonically neutral environment free of the influence of piano and bass. While John Coltrane and Rashied Ali (drums) appear on both recordings, *Stellar Regions* is augmented by the bassist Jimmy Garrison and pianist Alice Coltrane.

Figure 1.1 *Stellar Regions* (15 February 1967; released 1995)

Track	Title	Duration
1	'Seraphic Light'	8:54
2	'Sun Star'	6:05
3	'Stellar Regions'	3:31
4	'Iris'	3:50
5	'Offering'	8:20
6	'Configuration'	4:01
7	'Jimmy's Mode'	5:58
8	'Tranesonic'	4:14
9	'Stellar Regions' (alt tk)	4:37
10	'Sun Star' (alt tk)	8:05
11	'Tranesonic' (alt tk)	2:48

Figure 1.2 *Interstellar Space* (22 February 1967; released 1974)

Track	Title	Duration
1	'Mars'	10:41
2	'Venus'	8:28
3	'Jupiter'	5:22
4	'Saturn'	11:33
5	'Leo'	10:53
6	'Jupiter Variation'	6:44

The music comprising *Stellar Regions* has many unique qualities. It is the first quartet recording made by Coltrane's late-period group, with none of the music previously released, except for 'Offering' which first appeared on *Expression* (1967c).[5] The contributions made by Rashied Ali and Alice Coltrane to *Stellar Regions* are particularly crucial because they impart both freedom and multi-directionality to the rhythm and harmony that is stylistically distinct from the 'classic' quartet.[6] Additionally, *Stellar Regions* is unusual in that there are signs that Coltrane was reconsidering the concept of extended solos and longer performances for which he had become well-known, choosing instead to create short and concise musical statements on six tracks ranging from 2:49 to 4:40 in duration. While Coltrane's late-period recordings frequently feature quintets or larger ensembles, *Stellar Regions* is more intimate, providing listeners with a new context for considering his later conceptual approach and the characteristics that distinguish this ensemble from Coltrane's 'classic' quartet.

Likewise, the duo format of *Interstellar Space* is unlike any of Coltrane's other recordings and is a model of its type. Although there are a few examples of saxophone and drum duos contained within Coltrane's 'classic' quartet recordings (such as in 'One Down, One Up' (2005) and 'Impressions' (1993)), those duos occur within the confines of longer pieces utilising the entire quartet. More significantly, it is 'Vigil' (1967b), as Coltrane's first dedicated duo recording (from June 1965), which foreshadows the concept of *Interstellar Space*. Since 'Vigil' was released in January of 1967, it may have rekindled Coltrane's

[5] The discovery of a second version of 'Offering', from a November 1966 concert at Temple University, was released in 2014. This November performance of 'Offering' is most likely its debut, preceding the *Stellar Regions* recording by three months.

[6] Coltrane's previous group with McCoy Tyner, Jimmy Garrison, and Elvin Jones is commonly referred to as the 'classic' quartet: a ground-breaking and critically acclaimed ensemble in jazz.

awareness of the duo format's potential, inspiring further duo explorations one month later with the recording of *Interstellar Space*.

As with every newly discovered Coltrane recording, the initial release of *Stellar Regions* was celebrated, although critical reservations were expressed by some, most notably *The Penguin Guide to Jazz* (Cook and Morton, 2004). Its entry describes *Stellar Regions* as an unimportant contribution to Coltrane's oeuvre while further suggesting that he may not have wanted it released, damning *Stellar Regions* as a 'dud album' and 'a murky, undistinguished work' (ibid., p.345). Conversely, I argue that this recording has been overlooked and misunderstood, with *Stellar Regions* containing not only some of Coltrane's most interesting and compelling music, but ground-breaking musical innovations as well. The real importance of the *Penguin Guide's* critique is not in the negative opinion it expresses, but in the way it conveys the idea that something is different about *Stellar Regions*, distinguishing it from other late-period Coltrane recordings. Fundamentally, *Stellar Regions* projects the impression of music on the verge of change. That this recording still strives to find its place among Coltrane's oeuvre speaks to the difficulties critics and scholars have in placing it within the context of the late Coltrane narratives.

Although none of Coltrane's notated scores are currently known to exist for the music contained in these recordings, there is evidence that Coltrane brought some type of written music to these sessions. The saxophonist Alan Chase (b. 1956), a former member of Ali's group Prima Materia, details Ali's recollection of sheet music at the *Stellar Regions* recording session, with Ali telling Chase: 'Coltrane wrote them out [the music] on a staff, on a score [a piano staff] […] Jimmy, I remember he was looking over Alice's shoulder trying to see the notes' (O'Gallagher, 2016a). However, while music notation was provided to the other members of the group, Ali was not given these parts. Chase describes Ali's seeming annoyance at not receiving any notated music since he was a capable pianist and wanted to know what the piano and bass were doing: 'I always asked him, John, you know, what am I supposed to [play], you know, where is the music? And he'd say, oh just, you know, play, you know I just like the way you play […] you'll know what to do' (ibid.). Similarly, in the liner notes of the 2000 re-release of *Interstellar Space*, Ali tells of music at the session:

> There was written music at the date, but John didn't need it because he had written the tunes, and he hadn't written anything out for drums, so we just played, with him sometimes beginning by shaking bells before he played the melody on his horn. (Davis, 2000)

Ali's description of some type of sheet music at the *Interstellar Space* and *Stellar Regions* recordings is intriguing because it sheds light on the sessions as a whole, but more specifically on the track 'Iris'. Upon first listening, 'Iris' has a coherence that gives the impression of a composed piece while at the same time feeling spontaneous and improvised. As with other Coltrane compositions, the line is blurred between where composition ends and improvisation begins. Indeed, this duality was an issue that Coltrane was actively engaged in addressing. In the liner notes for *Live at the Village Vanguard Again* (Hentoff, 1966), Coltrane elaborates on his musical goals: 'I am trying to work out a kind of writing that will allow for more plasticity, more viability, more room for improvisation in the statement of the melody itself before we go into solos'. The topic of composition versus improvisation has been frequently debated in musicology (Foss, 1962; Larson, 2005), but I would argue the real issue, as it relates to 'Iris' and more widely to Coltrane's other music, is that of structure and freedom. The analysis in Chapter 4 illustrates how the trichordal foundation of ‘Iris’ is used to transcend this binary divide.

1.3 THE CONCEPT OF LATENESS IN INTERPRETING ARTISTIC WORKS

In jazz musicology, the recording *A Love Supreme* (1965a) represents a critical boundary for inquiries into Coltrane’s music. The musical stage that follows is commonly known as Coltrane’s late period: a style marked by emotional urgency and experimentalism embracing free jazz and spiritual themes that endured until his untimely death in July 1967. While late style is frequently discussed as a historical framework for the artistic creations of classical composers, with Theodor Adorno’s (2002) examination of lateness in Beethoven’s music a critical fountainhead, late style as an ‘aesthetic category’ (Straus, 2008, p.3) is particularly relevant to Coltrane, with the concept of Coltrane’s late style constructed retrospectively after his death.

The conventional notion of lateness describes particular qualities of reconciliation and transcendence perceived in musical works as they relate to old age and the proximity of death. However, as Edward Said (2004), Joseph Straus (2008), and Christopher Dingle (2017) have noted, there is no uniform definition of lateness. Rather, lateness can encompass a wealth of varied and contradictory traits from artist to artist. This brings into question whether late style exists as a distinct entity. Even the idea that late style is a characteristic of old age is an unreliable benchmark. While some composers may enter into a late style at relatively young ages, older composers do not always have a late style (ibid.). The proximity of death as an indicator of late style is another tenuous correlation because an artist’s death can be sudden and unexpected. Without foreknowledge of imminent death, the impact of mortality on an artist's musical style is suspect. Straus offers the idea of disability (either physical or mental) as a useful corollary to late style because 'Composers who write in what is recognised as a late style often have shared experiences of nonnormative bodily or mental function, of disability, or of impairments resulting from disease or other causes' (ibid., p.6). Straus uses six distinct adjective categories to summarise the various characteristics of late style described in critical literature: introspective, austere, difficult, compressed, fragmentary, and retrospective. Of these six categories, introspective, difficult, and fragmentary can be considered as qualities in Coltrane's music between 1965 and 1967. Alternatively, Dingle (2017) views Adorno-like late style as more deserving of the title 'middle-aged style' because signs of lateness often do not appear chronologically 'late' in composer's works.

When evaluating Coltrane's music for signs of stylistic lateness, some traits appear that both confirm and contradict the historical Adorno model. According to Geoff Dyer (2014), Coltrane's relatively sudden death at the age of forty precludes the possibility of a late period in the manner of Beethoven. However, Coltrane's music between 1965–67 takes on a form that seems indicative of late style, with new means of expression and an embrace of chromatic and rhythmic complexity, fragmentation, and abstraction wrapped in spiritual mysticism. In fact, Dyer contradicts himself, acknowledging aspects of Coltrane's lateness to a degree while simultaneously denying it. He notes nostalgia (used by Dyer to discredit lateness) when Coltrane plays 'My Favorite Things' while also observing 'little is left of the original […] amid all the wreckage', thereby unconsciously recasting the music's rebellion against convention as indicating lateness (ibid.). Adorno's view of late Beethoven, as summarised by Said (2004, para.4), could equally be describing Coltrane's later music:

> [A] moment when the artist who is fully in command of his medium nevertheless abandons communication with the established social order of which he is a part and achieves a contradictory, alienated relationship with it. His late works are a form of exile from his milieu.

For Coltrane, this exile included the estrangement from a large segment of his audience, reflecting the unreconciled state of the late artist (Said, 2007, p.102).

Equally relevant to Coltrane is the spectre of mortality that looms over artistic lateness. While numerous performances were cancelled in early 1967, the first known indications of Coltrane's illness occur in May of that year when intense pain forced him to go to the hospital. While the evidence of a late style begins two years earlier, before symptoms of an illness appear, speculation that Coltrane may have intuited that his life would be cut short feeds into the lateness narrative. The saxophonist Wayne Shorter (b. 1933) and others have suggested that Coltrane might have sensed his impending mortality, motivating his obsessive practice and the constant drive to achieve more with his music (Ratliff, 2007, p.172). This aspect of lateness is also found in a 1961 interview where Coltrane describes negative aspects of his astrological chart, stating: 'I won't live to be very old' (Porter, 1998, p.256). Daniel Berger observes changes in Coltrane over time that resonate with historical lateness:

> How not to interpret retroactively the madness of his improvisations as panic before death, as a great cry from the precipice […] Since *A Love Supreme*, his demeanour had changed. An even greater anxiety had come through. It had become more hidden, but at the same time more noticeable, more directly felt. (Berger, September 1967, p.5, appearing in Porter, 1998, p.290)

Dyer's argument against Coltrane's lateness suggests that performances of older repertoire are nostalgic. However, nostalgia can be an aspect of late style, thus illustrating the complexity of ascribing lateness. Similarly, Stanley Crouch also suggests that Coltrane was nostalgic, regretting that musical path that he had chosen (2006, p.213). He cites as evidence a lost recording session of jazz standards that occurred in Japan in 1966. However, Crouch neglects to note that this recording was a jam session, with local Japanese musicians invited to join Coltrane's group (Devito *et al.,* 2013, p.350). As a type of social event, jam sessions frequently occur when jazz artists are on tour, and I would argue that Coltrane extended this courtesy as a way to form bonds with his Japanese hosts, not out of any sense of nostalgia. Indeed, LeRoi Jones (Amiri Baraka) views Coltrane as anti-nostalgic, proposing that he seeks to kill his former self (2010, p.171).

If we accept that consideration of late style may sometimes prove fruitful, *Stellar Regions* and *Interstellar Space* certainly exhibit many of its traits. The tracks comprising *Stellar Regions* are unusually succinct and of a different quality from Coltrane's other later recordings. While *Stellar Regions* is not a radical departure for Coltrane, it is more focused and concise in realising his ideas. As David Wild (1995) states in the liner notes of *Stellar Regions*:

> The last recordings of Coltrane [...] suggest evolution in new directions. […] More importantly and perhaps even more compelling, they represent a suggestion of the evolution his music would have taken had his life not been cut so short, a tantalizing glimpse of an unrealized future. The February recordings show all the features of the 'late period', yet those elements seemed reharmonized, given added coherence and impact through the

> reappearance of form, of relative brevity, of renewed control.

Equally, in the austerity and concision of *Interstellar Space*, Coltrane strips the music to the bare essentials of melody and rhythm, building cathedrals of sound unencumbered by elements that would diminish his vision. The stunning achievement of *Interstellar Space* leaves us asking the question, what else is there? Although Wild suggests an unrealised future for Coltrane, the artistic precipice that Coltrane seemed to have reached is the dilemma of Adorno's lateness: '[H]e envisages nothing beyond lateness: it is impossible to transcend or surmount it; it can only be deepened' (Said, 2004, para.16). However, in reality, had Coltrane lived longer, his music would have undoubtedly continued, perhaps even evolving into something musicologists could identify as another late style, thereby proving the difficulty with 'lateness' as a critical tool.

1.4 COLTRANE NARRATIVES IN LITERATURE

> Coltrane's salvation will only come as murderer, or anarchist, whose anarchy seems so radical because references to the 'old music' still remain. (Jones, 2010, p.106)

> Coltrane was interested in experimenting […] But there are also rumors about hallucinogenic drugs, which intensify narcissism and spiritual fantasies. […] What Coltrane's late music does prove, however, is that he might well have been caught up in the 'hysteria of the times'. (Crouch, 2006, pp.213–214)

Since the 1970s there has been an ever-increasing body of scholarly work dedicated to John Coltrane, generally known in jazz musicology as Coltrane studies. Some of the earliest literature on Coltrane by authors J. C. Thomas (1976), C. O. Simpkins (1975) and Bill Cole (1976) was important in establishing a framework and narrative, which others such as Eric Nisenson (1995) have drawn on. These are biographical, interweaving interviews with musical discussion. Additionally, Cole's book briefly examines Coltrane's spiritual awakening, though leaving undeveloped the connections between his spirituality and music. Lewis Porter's book *John Coltrane: His Life and Music* (1998) is the definitive work on Coltrane to date bringing new insights into the details of his musical development and the influence his spiritual awakening had on it. Two other significant publications that Porter contributes to are *John Coltrane: A Discography and Musical Biography* (Fujioka, 1995) and *The John Coltrane Reference* (DeVito *et al.,* 2013). These provide an exhaustive day to day chronology of Coltrane's performance schedule and discography and serve as an extensive resource for analysing historical events and their relationships.

The narrative arc which prevails in most of this literature describes Coltrane's gradual artistic descent into musical asceticism and abstraction after recording *A Love Supreme* (1965a). Scrutiny of this narrative reveals two contradictory themes: one biographical, and one musical. The biographical narrative progresses from his early struggle with drug addiction (disunity) to his spiritual awakening and religious devotion (unity) while the musical narrative progresses from earlier musical achievement and success (unity) to abstraction and musical unintelligibility (disunity). The intersection of these two narratives is their progression from the tangible (drug addiction, musical mastery) to the intangible (religious mysticism, musical abstraction), with both narratives emphasising the inscrutability of Coltrane's later music. Although this binary view is admittedly simplistic, it provides a useful means for organising and illustrating how varied narratives feed into one another to expose broader cultural issues.

Coltrane's later recordings have been lightning rods for many discourses, ascribing him various motivations from black nationalism and anti-modernism to spiritual transcendence, transforming him into symbols for each. The mythological Coltrane construct is pervasive in mainstream literature and has overshadowed the study of the musical contents of his later recordings. One such work is *John Coltrane and the Jazz Revolution of the 1960s* (Kofsky, 1998) which frames black nationalism as the force behind advances in jazz and ascribes technical advances for purely artistic reasons as a white classical European sensibility. Kofsky tries to assign Coltrane a predominant role in advancing black nationalism despite the lack of evidence that his interviews with Coltrane provide. John Gennari suggests that Kofsky's inability to pin down Coltrane's commitment to black nationalism 'speak[s], in fact, to an aesthetic that he [Coltrane] was nurturing in the years before his death that refused to be defined by a particular social agenda: call it the aesthetic of transcendence' (2006, Kindle Locations 3900–3901).[7]

Contrasting with Kofsky, Hall interprets the 1960s African American avant-garde through the framework of anti-modernism in *Mercy, Mercy Me: African American Culture and the American Sixties* (2001). Hall frames anti-modernism as a rejection of contemporary American culture's hypocrisy and presents John Coltrane as an example of an anti-modernist artist. However, Hall's use of anti-modernism as a critical tool for understanding

[7] While Coltrane was not known as an activist, discourses by Monson (2007, pp.230–233) and Nisenson (1995, p.154) have explored the connections between Coltrane's music and the civil rights movement.

Coltrane fails to argue convincingly how *A Love Supreme* is an anti-modernist statement. In fact, a strong argument can be made for reading Coltrane as a modernist based on the musical structure revealed in Part II, thus highlighting the difficulty in interpreting Coltrane through a single framework.

Whereas Kofsky and Hall present views on Coltrane in the context of black nationalism and anti-modernism, *John Coltrane and Black America's Quest for Freedom: Spirituality and the Music* (Brown, 2010) is an ethnomusicological work framed around the proposition that discourses on black music, and in this case Coltrane, must 'define aspects of black American culture and from the black American perspective' (ibid., p.10). This group of essays on black culture and spirituality offer perspectives that, in some cases, seem contradictory, arguing for both Coltrane's essentialism and universality. Equally, these essays downplay Coltrane's formal education and favour a romanticised view of knowledge as instinctual, passed on through a black oral tradition.

A similar, conflicting narrative casts Coltrane as an intellectual without being 'too' intellectual, presenting a binary between the intellectual and the anti-intellectual (or organic).[8] T. L. Lott examines Cornell West's characterisations of the academic intellectual (writers and academics) versus the organic intellectual (especially preachers and musicians) within African American culture (2010). Lott is critical of West's distinction of the 'organic' intellectual (as represented by Coltrane) as granted unequal intellectual status as compared

[8] It is essential to note the context of African American music's historical struggle for recognition as the intellectual and artistic equal of European concert music, exposing a background in racism (Gabbard, 1995, p.2). While the modern reverence and esteem afforded jazz would suggest this attitude to be a relic of the past, its vestiges persist today.

to writers and academics, even though West holds the achievements of musicians and preachers in higher regard. The characterisation of Coltrane as alternatively intellectual or organic often appears as a subtext during discussions of his late music. Crouch (2006) simultaneously invokes both, portraying Coltrane as ‘one of the intellectual giants of jazz’ and ‘a country Negro from North Carolina’, conjuring the stereotype of country folk as organic and simple. Within this debate, a statement by Coltrane appears to treat with disdain the notion of intellect in music, emphasising emotional content and furthering this binary (Devito, 2010, p.234) (for more detail, see Chapter 2.3). Equally, the common perception of the jazz avant-garde as abstract (with abstraction equating to intellectualism) is found in opposition to improvised music’s frequent characterisation as organic, unpremeditated, and ‘free’.

This organicism is also a driving component of the spiritual narrative surrounding Coltrane’s late music. The idea that Coltrane transcends earthly, musical concerns and reaches a form of pure expression is an oft-reiterated theme. Inherent in this narrative is the presumption that Coltrane’s spiritual knowledge enables him to reach a higher plateau of musical expression. Beginning with *A Love Supreme*, record titles such as *Om* (1968), *Ascension* (1966a), and *Meditations* (1966c) reinforce this narrative (Whyton, 2013, p.43). Additionally, Coltrane’s rumoured use of LSD promotes the image of Coltrane as mystic. The spiritual aspect of Coltrane’s late music can have the added effect of transforming fans and listeners into ‘followers’ seeking enlightenment. In acts resembling religious devotion, a student at the Berklee College of Music in the 1980s confided to me that they meditated every morning to *Interstellar Space* as a process for spiritual and musical transformation. Similarly, the noted musician Carlos Santana described the same type of spiritual experience: ‘I would often play it [*Meditations*] at four in the morning, the traditional time for meditation. I could hear God's mind in that music' (Thomas, 1975, p.217). This type of deification is exemplified by Coltrane's canonisation within the Saint John Will-I-Am Coltrane African Orthodox Church, thus completing his transformation into a religious icon (Baham, 2015). The spiritual narrative's inherent disregard for musical details (as mere earthly concerns) has influenced discussions of Coltrane's later music, and the types of musical narratives that have developed.

The rhetoric surrounding Coltrane's 'sound' frequently frames 'sound' as a metaphor encompassing the details of his unique playing technique, the music's emotional and transformative power, and the sensual connection that listeners experience: 'Musical structure, for instance, can't contain morality. But sound, somehow, can' (Ratliff, 2007, p.61). The concept of 'sound' as an aesthetic value is problematic because it has frequently been used as a substitute for an inquiry into what elements comprise that 'sound'. Although George Lewis (1996, p.117) articulates eloquently that 'Notions of personhood are transmitted via sound, and sounds become signs for deeper levels of meaning beyond pitches and intervals', he is not arguing against the study of 'pitches and intervals', but for an inclusive understanding of music that reaches beyond its structure. Ratliff's (2007, p.61) proposition that we 'widen our focus beyond the constructs of his [Coltrane's] music, his compositions, and his intellectual conceits' assumes that Coltrane's use of musical structure and his 'intellectual conceits' have already been intensely interrogated, which is unequivocally not the case, and the reason why more studies such as this thesis are necessary.

Another aspect of the sound narrative is the characterisation of Coltrane's later music as primarily focused on 'sound exploration' (Jost, 1974, p.96). This theme is repeated by Lott (2010, pp.134–135) when he states that Coltrane's 'conception of pitch shifted to the overtone series rather than the more limited well-tempered scales, Coltrane gravitated toward the more abstract style of […] Pharoah Sanders and Albert Ayler'. The sound narrative gives an exaggerated emphasis to the timbral and harmonic aspects of his music, foregrounding the idea that they supersede all other musical elements. While Coltrane's late improvisations certainly delve deeply into harmonic manipulation and the timbral aspects of the saxophone as tools for musical expression, his playing is still fundamentally rooted in a melodic sensibility using consecutive sequences of notes.[9] The process of transcribing the music for the analysis in Part II revealed that only a small percentage of Coltrane's improvisations defied conventional notation because of harmonic and timbral manipulation, with the vast majority of the music easily rendered as common-practice notes and rhythms.

A critical narrative emerges in 1961, suggesting that Coltrane had lost his way and describing his music as 'anti-jazz', noise, and anarchistic (Devito, 2010, p.150). This narrative continues to appear today in criticisms of recently found late-period recordings and intersects with broader critical views on free jazz (Crouch, 2006; Dyer, 2014; Green, 2018). Framed within the context of the 1960s jazz avant-garde, the landmark book, *Free Jazz* (Jost, 1974), offers some of the first insightful musical analyses of Coltrane and other avant-garde musicians of this period. In a significant observation which still has not reached wider

[9] It is important to note that Coltrane's timbral variation and harmonics are context-dependent, utilised more or less depending on the emerging circumstances of the music.

acknowledgement, Ekkehard Jost's conclusion that free jazz contains structure (a sentiment shared by authors such as Porter, Jeff Bair, and Jeff Pressing) rebuts the critical anarchistic characterisation. In part, Jost's work acts as a cue for my own. In *Avant-Garde Jazz Musicians: Performing Out There*, David Such looks to criticise Jost's work as failing 'to emphasise the interdependence of the musicians' worldviews, context, and the music itself' (1994, p.12). But, while the scope of Such's book is broad, touching on many subjects, the analysis of *Ascension* is however rudimentary, offering few musical insights beyond the modal framework of the piece.

A pervasive narrative concerning Coltrane's music carves it typically into discrete stylistic periods centred around the recordings *Blue Train* (1958a), *Giant Steps* (1960a) and *A Love Supreme*. This provides a convenient, if not always consistent or accurate, way of grouping Coltrane's music within a linear perspective. The use of late style in this dissertation exemplifies this narrative's usefulness to a point. However, the truth is that Coltrane's music is far more complicated. In Coltrane's later music, older approaches frequently appear in new guises; from the 'sheets of sound' which emerge a decade before, to the distillation and reformulation of Coltrane's melodic and motivic inclinations. Even Coltrane's earlier obsession with major-third cycles is given new life in his later recordings in a more asymmetrical, abstract form. Equally, Coltrane's repertoire defies categorisation into tonal, modal, and atonal periods because of his continued inclination toward composing tonal themes, major-third cycles, emerging pentatonic, whole-tone, and diatonic collections produced by motivic development, coupled by the constant presence of 'My Favorite

Things' which destabilises stylistic periodicity.[10] As seen in Chapter 2, the potential impact of Coltrane's early influences on his later work upsets the stylistic narrative, as does the recent surfacing of a private recording (Coltrane, 2020) from Spring 1963, a timeframe when his more commercial recording with Johnny Hartman is produced.[11] On this private recording, Coltrane is first heard playing an early incarnation of the theme to 'Last Blues' (1998a) and then repeated portions of the 'Vigil' theme in his improvisation. Coltrane and Eric Dolphy follow with a duet where Coltrane teaches Dolphy a melody by ear that is strikingly similar to 'Transition' (1970c), which would be recorded over two years later. That this earlier recording contains explicit references to three late-period pieces ('Vigil', 'The Last Blues', 'Transition') serves to disrupt the style narrative.

1.5 COLTRANE'S MUSIC (POST-1960): MOTIVIC CHARACTERISATIONS

Jazz scholarship has long recognised motivic content in Coltrane's music while primarily using the analytical framework of chord-scale relationships, functional harmony, and modality as the context within which to interpret these formations. Some of the first significant scholarly references to the motivic aspect of Coltrane's improvisations are by Jost (1974), Pressing (1982), and Porter (1985), with Porter's seminal examination of *A Love Supreme* establishing a framework and vocabulary (conjoining the terms 'motivic' and 'cell') for future research. In this discussion, the motivic characterisation of Coltrane's music is

[10] A frequent narrative asserts that Coltrane abandons tonality for atonality in his later work (Porter, 1998, p.279; Kahn,2002, p.254), which is not accurate. The use of 'atonality' by critics as a descriptor for Coltrane's late music serves to insinuate a hyper-intellectualisation of the music, while inherently questioning its authenticity within the jazz tradition. I argue that Coltrane's later music contains both tonal and atonal properties.

[11] The listing for this recording in the *Coltrane Reference* (2013, pp.680–681) omits the duos with Dolphy.

considered from three viewpoints: the motive in jazz literature; developments in Coltrane's motivic use; and motivic characterisations of Coltrane's late music.

Motivic improvisation, as a topic in jazz musicology, may be traced back to the controversial article 'Sonny Rollins and the Challenge of Thematic Improvisation' by Gunther Schuller (1958).[12] In jazz musicology, particularly, the characterisation of music as motivic has proved problematic because of the ways in which 'motivic' has been used to describe different things (Kernfeld, 1983, p.10). Benjamin Givan's 'Jazz Taxonomies' (2003) illustrates how such labels as 'thematic improvisation', 'formulaic improvisation', and 'motivic' have been used historically within jazz tonal analysis, collecting together the sometimes conflicting theoretical language used by authors including Andre Hodeir (1956), Schuller (1958), Thomas Owens (1974), Barry Kernfeld (1983), and Henry Martin (2001). Givan reconciles and summarises these authors' accounts by creating six theoretical categories for jazz improvisation: paraphrase, thematic, formulaic, formulaic-motivic, chorus phrase, and motivic improvisation. While paraphrase and thematic improvisation involve some notion of derivation from the 'head' of a song, the distinction between formulaic and formulaic-motivic improvisation lies in whether or not the improviser's 'habitual formulas' undergo modification (2003, p.482). Similarly linked, chorus phrase improvisation is defined as an improvisation that is not derived from the 'head' or using formulas, but rather is a 'spontaneous invention' whereas motivic improvisation applies developmental procedures to these inventions (ibid.).

[12] Scholars have criticised Schuller for a cultural bias (Monson, 1996, pp.135–136; Walser, 1997), and for misreading formulas that were common in Rollin's playing as being melodically derived from the theme (Givan, 2014).

In the late 1950s and 1960s, motivic improvisation became more prevalent as a way for jazz musicians to create structure within the open formats of modal and free jazz (Waters, 2011, p.54). The term 'motivic cell' is a frequently used analytical label for these modal and free improvised contexts:

> The term 'motivic cell' describes a technique in which a soloist states and develops an underlying identifiable short motive. What constitutes a motivic cell is flexible, but these motives may be identified through repetition of interval, rhythm, contour, pitch, or some combination of those elements. (ibid.)

Waters lists three essential points about motivic improvisation: that motives often rely on transposition (which is often independent of a tonal centre), motives may be derived from the composition, and motives may emerge spontaneously. While these are accurate descriptors for motivic occurrences in the music of various 1960s jazz musicians, for Coltrane, a more profound and less apparent aspect of 'motivic cell' is expressed by post-tonal theory: '[A]n unordered collection of pitch-classes […] is a motive [in] which many of the identifying characteristics—register, rhythm, order—have been boiled away. What remains is simply the basic pitch-class and interval-class identity of a musical idea' (Straus, 2005, p.33). The post-tonal definition of 'motive' is a crucial characteristic of Coltrane's late-period music, providing a means for understanding structurally diverse motivic surfaces as unified emergent processes.

Coltrane's predisposition towards motivic development is evident in his early career, as noted by Porter (1985, pp.598–599; 1998, p.123, p.162), Marc Medwin (2008), and Kernfeld

(1983). The shift that Kernfeld observes in Coltrane's playing from 'formulaic' to 'motivic' with 'So What' (Davis, 1959) is an artistic trajectory that continued until the end of his life. The recordings *Interstellar Space* and *Stellar Regions* represent a culmination of this developing language and are of a different improvisatory category from Coltrane's earlier work. Hafez Modirzadeh points out the change in Coltrane's motivic approach from 1961 to 1965:

> The clearest examples of Coltrane's conceptual growth during these periods are his two televised versions of 'My Favorite Things', the first in November of 1961 in West Germany and again in August 1965 in Belgium (featured in the film *The World According to John Coltrane*). The earlier version continues motivic development in the 1959–60 vein of runs and passages in linear motion, while the latter breaks away with definitive fourth and fifth intervals in cyclic progression, thereby extending the vein set with *A Love Supreme* some months prior. (2001, p.99)

A critical issue for understanding Coltrane's later music is how his musical interests change in early 1960, from a focus centred on harmony, to one centred on melody and rhythm, as stated by Coltrane in November of 1961: 'I was more interested two years ago in harmony than I am now […] Now I'm trying to learn about melody and rhythm' (Devito, 2010, p.100). It is during Coltrane's modal phase that a transition begins to take place, with melodic structures gaining greater autonomy, and referential harmony becoming less stable. The stylistic ambiguities in Coltrane's music have been one reason why investigations into Coltrane's late period have continued to use modal frameworks and the vocabulary of tonal harmony for interpreting musical contexts and improvisational structures that are decidedly 'post-modal' in character.[13] Where post-tonal analytical methods are better suited for revealing the structural traits that unify Coltrane's later improvisations, the entrenchment of analysts within jazz harmonic practice has limited the dialogue taking place.

The evidence in this thesis will show that Coltrane's late improvisations are defined by a conceptual approach that focuses on the internal coherence of the melodic design (revealing motives as one signifier), with his advanced command of tonal improvisation on chord changes absorbed within a new melodic structural model. While Coltrane's motivic improvisation could be perceived as 'derived from spontaneous invention' (Givan, 2003, p.482), the analysis in Part II demonstrates that the motivic structure of Coltrane's improvisations, as exemplified by 'Iris' (Chapter 4), is as a result of conscious effort, and not an 'accident' of spontaneity. Elvin Jones reflects on freedom in Coltrane's playing: 'There is no such thing as freedom without some kind of control, at least self-control or self-discipline […] Coltrane did a lot of experimenting in that direction […] even though it gave the impression of freedom, it was basically a well thought out and highly disciplined piece of work' (Taylor, 1993, p.228, appearing in Lewis, 1996, p.114). Coltrane elaborates on the process of improvisation: 'You have to do a lot of work consciously, then you can leave the rest to your subconscious later on' (Devito, 2010, p.121).

In his analysis of 'Acknowledgement', Porter (1985) describes the most famous example of motives in Coltrane's music, where salient motivic cells are derived from the pentatonic scale, and Coltrane repeats the bass ostinato (generally known as the '*A Love Supreme*'

[13] The term 'post-modal' is offered here as a label for improvisations and contexts which have evolved beyond conventional modal or harmonic frameworks.

motive) through twelve transpositions. The motives described in 'Acknowledgement' predominantly utilise identical contours, note order, and rhythm under transposition at varied distances. These characteristics quickly draw a listener's attention and represent a nascent stage of practices that become a signature of Coltrane's late period, where more varied and complex structures emerge in *Interstellar Space* and *Stellar Regions*. (Chapter 5.4 offers a new perspective on the structure of 'Acknowledgement' and how it relates to *Interstellar Space* and *Stellar Regions*.) Porter's motivic characterisation of Coltrane is echoed throughout associated jazz literature in works by such authors as Ratliff (2008), Whyton (2013), Brown (2010), Kahn (2003), and Modirzadeh (2001). Similarly, Medwin (2008) uses the concept of 'atomism' as a model to encompass 'motive' and 'cell' in Coltrane's improvisations. As a concept adopted from the saxophonist Evan Parker, Medwin's definition for 'atomism' is that 'an atom can be viewed as a musical motive, separated in some way from surrounding solo material' (ibid., p.53). This definition of 'atom' mirrors the general attitude in jazz analytical literature, promoting a binary view of motives in relation to their context, with an 'atom' 'separated from its surroundings, namely the other elements at play in the solo' (ibid.). As the analysis in Part II illustrates, this binary view becomes problematic because the structures that promote unity beneath the motivic surface are crucial contexts that bind the motivic heterogeneity.

Although Jost (1974, p.84) notes the overall 'melodic-motivic' aspect of Coltrane's music beyond *A Love Supreme*, and his creative use of sequences avoids mechanistic patterns, it is the analytical framework 'motivic chain association' – proposed by Jost for Ornette Coleman – that attempts to reconcile the binary view of motive and context (ibid., p.48):

> Coleman invents as he goes along, motives independent of theme and continues to develop them […] one idea grows from another, is reformulated, and leads yet to another new idea. (Jost, 1974, p.50)

Even though Jost makes little use of this connection, the concept of 'motivic chain association' is equally suitable for Coltrane. While closely resembling Schoenberg's 'developing variation' (Haimo, 1997), Jost's definition of 'motivic chain association' is rather open-ended and lacks the detailed and systematic analytical tools that set theory and post-tonal techniques provide and so is not pursued in this thesis (developing variation and *Grundgestalt* are examined in Chapter 3.3).

Concerning motivic observations, authors frequently use analytical terminology with a tonal predisposition, promoting the ideas of 'key centre', 'changing tonalities', or 'key-hopping' (Porter, 1998, pp.277–280; Kahn, 2002, p.180) for what is effectively the transposition of motives within keyless contexts. While some might consider that the distinction between 'key-hopping' and 'transposition' is inconsequential, the reliance on tonal language impedes the ability to penetrate the structural details of the object transposed and the improvisational processes and relationships that unfold.[14] Similarly, tonal language is frequently used for describing other structural features, like the opening fanfare of 'Acknowledgement' (Whyton, 2013, p.23; Ratliff, 2008, p.97) and figures in *Live in Japan* (Coltrane, 1991), relying on the major scale as a reference point (such as describing the constructs as major scale pitches 1–2–5), thus preventing deeper structural insights and demonstrating the analytical

[14] Although Coltrane's score to *A Love Supreme* contains the directions 'motif played in all keys', the distinction between key and transposition is a significant one for analysts.

bias towards tonal perspectives. A tonal bias is also found in commercial transcriptions (such as those published by White) where key signatures are assigned in contexts where their relevance is questionable (such as with ‘Leo’).

Another motivic characteristic associated with Coltrane’s is ‘self-dialogue’ (Jost, 1974, p.94), where rapid, extreme register changes ‘suggest two lines of activity at once’ (Porter, 1998, p.278). In Part II, set theory reconciles the dualistic view of ‘self-dialogue’ as expressions of pc-set unity (Vol. II: Example 4.33; 4.34; 6.5a; 6.5b). For Coltrane’s late-period music, the tonal perspective of jazz harmonic practice should be engaged as a complementary tool that provides further context when musical structures indicate it is appropriate, not as the default analytical position.

1.6 COLTRANE’S LATE PERIOD (1965–67): EXTANT ANALYTICAL LITERATURE

The analytical literature on Coltrane’s 1965–67 music is limited in the number of items and predominantly brief in length, with extended, in-depth analysis occurring in only a few cases. The most frequent loci for discussion are *Ascension*, *Meditations*, ‘Offering’, and ‘Venus’, leaving the majority of Coltrane’s other work only cursorily examined or wholly ignored. To date, there is no book-length analysis of this period.

This final portion of Chapter 1 surveys this analytical literature, while organising it into two categories: firstly, scholarship excluding *Interstellar Space* and *Stellar Regions*; and secondly, scholarship concerning *Interstellar Space* and *Stellar Regions*. In a few cases, these categories overlap. This section begins with overviews of Coltrane’s late period by four authors where multiple Coltrane works are weaved into the commentary. Subsequently, literature that examines the same individual Coltrane pieces are grouped together, progressing by similar themes.

Jeff Bair (2003), Medwin (2008), Porter (1998), and Jost (1974) offer broader overviews of Coltrane's late period that encompass multiple pieces from different analytical perspectives. Bair's work focuses on cyclical patterns in Coltrane's improvisations that correspond to structures in Nicholas Slonimsky's *Thesaurus of Scales and Melodic Patterns* (1947), a known reference for Coltrane (Porter, 1998, p.149). While the analysis is purposely limited to using Slonimsky's vocabulary to interpret short, isolated cyclical segments within fifteen pieces, the majority focus on recordings from the first six months of 1965, where the remnants of modality strain to contain the quickly evolving music. This is the most thorough scholarship to date on the connections between Coltrane and Slonimsky's *Thesaurus*, enabling a general understanding of the impact the *Thesaurus* must have had on Coltrane's structural thinking (Chapter 2.3 examines the construction of the *Thesaurus* and the larger aspects of its influence on Coltrane). However, by carving out cyclical structures from the surrounding music, Bair loses touch with greater structural issues at play, overemphasising the significance of interval-cycles in pieces other than where major-third (ic4) relations are present. As the analysis in Part II demonstrates, interval-cycles are only one technique used by Coltrane for transforming the underlying salient pitch structure. The use of published transcriptions for his illustrations is also problematic because: the transcriptions are transposed to the B♭ tenor saxophone key making comparisons with other work more difficult; and the locations of the illustrations within the recordings are not indicated (Chapter 3.2 addresses transcription in more detail). Nonetheless, this does not diminish significantly from the overall value of Bair's work.

Similarly, Medwin's dissertation *Listening in Double Time: Temporal Disunity in the Music of John Coltrane 1965–67* takes a broader view of Coltrane's late period recordings. Using 'atomism' as a framework to encompass motivic unity, and temporal disunity to describe the multi-directional aspect of Coltrane's late rhythmic style, Medwin explores how Coltrane reconciles these opposing forces. Earlier examples of atomism in Coltrane's music are examined along with considerations of Coltrane's cultural impact, illustrated through the work of Anthony Braxton and Paul Dunmall. While a substantial cross-section of Coltrane's later music is embraced (for example 'One Down, One Up' (2005), 'Offering', 'Evolution' (1971b), 'Mars', and *Ascension*), the majority of this analysis is brief and frequently emphasises tonal harmony and scales, with the lengthiest examinations reserved for 'Ogunde' (1967e) and 'My Favorite Things' (1966h). Although this scholarship lacks detail in the structural aspects of Coltrane's improvisations, it offers many valuable insights into his late period.

Perhaps the best-known overviews of Coltrane's later work appear in Porter's landmark biography *John Coltrane, His Life and Music* (1998, pp.262–292), and Jost's *Free Jazz* (1974, pp.84–104). Porter's summary of the period between 1965 and 1967 is partly biographical and partly analytical, providing a historical contextualisation of *Ascension*, *Om*, *Cosmic Music* (1968), *Kulu Sé Mama* (1967a), and *Meditations* while taking a wider analytical view of *Interstellar Space*. As the first scholarly examination of 'Venus' and the recurring structural aspects of *Interstellar Space*, Porter's observations have had a continuing impact on jazz analytical literature.[15] Similarly, back with Jost, we find a contextualisation of

[15] The current author contributed to Porter's biography by providing several Coltrane transcriptions.

Coltrane’s later music, which provides an overview of its characteristics with *Ascension* significantly featured among more cursory examinations of ‘Offering’, ‘Ogunde’, and ‘My Favorite Things’ (1966h), where Jost notes that Coltrane’s harmonic and rhythmic freedom transforms this frequently played standard in Coltrane’s repertoire.

A seminal work in jazz, *Ascension* is frequently referenced by scholars for its distinctive historical and musical significance. Contrasting perspectives on *Ascension* are offered by Steven Block (1990), John Schott (2000), Such (1994) and Jost (1974). While Block’s article also examines Cecil Taylor, Ornette Coleman, and Anthony Braxton, his analysis focuses on Coltrane’s improvisation, using set theory as a primary methodology, noting: ‘two primary generative devices […] interval cycles and trichordal source sets’ (1990, p.188). As one of the few scholarly works to use set theory for Coltrane’s music, it is highly effective in demonstrating how set theory can reveal its deeper structural traits. Brief investigations by Schott and Such focus on the overall formal structure and modal framework of *Ascension*, differing slightly in their interpretations. Such also notes the general aspects of Coltrane’s improvisation, such as timbral changes, motives, call and response in extreme registers, and tempo but offers little insight beyond surface details. Perhaps the most well-known examination of *Ascension* appears in the monograph *Free Jazz* (Jost, 1974, pp.85–98). Jost offers multiple perspectives on the form and modal structure that differ from Schott and Such, encompassing the stylistic aspects of the individual soloists, the collective improvisations, change of momentum, timbral changes, rhythmic alterations, and the characteristics that differentiate it from Ornette Coleman’s earlier recording *Free Jazz* (1960).

Coltrane's *Meditations* is often referred to as the companion piece to *A Love Supreme* because it expresses a similar type of suite format and spiritual theme. Although *Meditations* is frequently mentioned in literature, David Liebman (1996), Schott (2000), Dan Voss (2014a), and Christa Bruckner-Haring (2008) provide its most detailed analyses. The acclaimed saxophonist and NEA Jazz Masters recipient David Liebman provides the most extensive analysis of *Meditations*, examining each of its tracks, interval structure, transpositional operations, group interplay, and chromatic and diatonic mediation. As an alternative stance, Schott begins his discussion of *Meditations* by pointing out the radical change in approach from Coltrane's first attempt at this material with *First Meditations* (1977). He emphasises the motivic structure and chromatic and diatonic dialectic, marking, in particular, the procedures for transforming the motivic figures of the themes and their frequent dependence on common-tones.

Similarly, Bruckner-Haring surveys the development of 'Love' from *First Meditations* to *Meditations* and the change in orientation from one tonality to changing tonal centres. Comparing two other recordings from 1966, Medwin (2008, p.84) observes how Coltrane merges the 'Leo' theme with 'The Father, and the Son, and the Holy Ghost' in both *Live in Japan* (1991) and *Offering: Live at Temple University* (2014). Finally, an original point of view by Voss (2014a) considers tripartite symbolism and Coltrane's spirituality for their influence on the structure of 'The Father, and the Son, and the Holy Ghost' (1966g) and the overall *Meditations* suite. While all of these analyses offer valuable insights on *Meditations*, their tendency towards brevity, and frequent parallel approaches, is typical of scholarship.

As one of the most prolific and perhaps lesser-known voices on Coltrane, Voss (2013a; 2013b; 2014b; 2014c; 2014d; 2015) consistently offers important analytical insights on late-period pieces such as 'Ogunde'. While typically concise, his examinations explore tonal key transformations and motivic relations that include octatonic and whole-tone perspectives, major-third relations, and voice-leading from original viewpoints. Other complementary views on 'Ogunde' are presented by Scott McGill, Jost, and Medwin. Significantly, McGill (2014) is one of the few analysts to engage set theory for Coltrane, using a segment of 'Ogunde' to illustrate 'pantonal' melodic lines and chromatic saturation resulting from trichords, tetrachords, pentachords, and hexachords. Jost (1974, p.102) takes a broader view of 'Ogunde', coining the term 'rubato ballad' as a descriptor for a type of energised ballad where opposing poles of energy and motion are synthesised. Lastly, the studio and live versions of 'Ogunde' are contrasted by Medwin (2008) with attention paid to Coltrane's improvisational approach and the interactive and rhythmic dynamics of the ensemble.

John Irabagon and Brian Levy similarly focus on rhythmic and metric aspects of Coltrane's music from early 1965. Within the context of the multiple versions of 'Nature Boy' (1998b), Irabagon (2017) explores the presence of 5/4 and 5/2 as a unique development in Coltrane's music. Levy's (2012) analysis of 'Transition' observes 'opposition transcendence' as a phenomenon of ensemble interplay when Coltrane's melodic independence synthesises with the metric-harmonic opposition in the rhythm section. Interestingly, Levy's point of view parallels Medwin's ideas on the synthesis of temporal disunity and atomistic unity.
In a brief analysis of the opening of 'Number One' (1967d), Schott (2000) provides insight into Coltrane's use of pitch structure. Of significance is his observation that 'Number One' is wholly improvised, an unusual occurrence in Coltrane's music, which I similarly argue is the

case for ‘Mars’ (Chapter 5.2). Schott notes the presence of pentatonic and whole-tone collections as supersets for the motives, together with voice-leading patterns, and the repetition and expansion of basic motivic units. The analysis in Part II identifies similar tendencies in greater detail, illustrating structural processes across multiple pieces and recordings.

INTERSTELLAR SPACE AND STELLAR REGIONS

Except for ‘Venus’ and ‘Offering’, the scholarship on *Interstellar Space* and *Stellar Regions* is brief, appearing merely as excerpts within broader studies. Porter notes general characteristics that consistently appear throughout *Interstellar Space* (1998, pp.277–279): frequent arch forms building to a climax and then returning to calm; rapid descending lines, combined with extreme register changes; and motivic shape variations. While Porter suggests that Coltrane’s fast descending figures attempt to ‘create an orchestral effect’ using the top note of each figure as a ‘melody’ with the descending figure as accompaniment (1998, p.278), an alternative interpretation in Part II views them as primarily harmonic and rhythmic (see Chapter 4.3).

‘SATURN’

Using the nomenclature of Slonimsky, Bair’s analysis (2003) of ‘Saturn’ identifies C5 (pp.61–62) and $C2_0$ cyclical patterns (pp.83–85) in close proximity (see Chapter 3.4 for information about set theory, its terminology, and its use as a principal analytical methodology in this thesis). As mentioned previously, because of Bair’s narrow focus, his analysis isolates cyclical features from their context. The analysis of ‘Saturn’ presented in Part II (Chapter 6) differs from Bair’s by arguing that (025) is the salient feature and that the cyclical pattern is a property of the transpositional process. This interpretation provides a broader understanding of the pitch content, independent of its cyclical constructions. Furthermore, it demonstrates an organisational connection between the use of (025) as a structural determinant in 'Saturn', and the use of (013), (023), (024), (027), (026), and (046) as structural determinants in Chapters 4 and 5, where numerous non-cyclical T_n operations occur between trichords. This interpretation also allows for the illustration of inversional relationships between (035) and (025) in Chapter 6. Similarly, because Bair's observation of $C3_0$ (pp.77–78) removes the (04) dyads from their context, their significance as subsets of the previous trichord salience is overlooked, and a critical transformational process is left undescribed.

'JUPITER'

The brief analysis of 'Jupiter' by Bair (2003) notes two interval-cycles and a recurring motivic focus: the presence of C5 within the structure of the theme (p.60); and (03) motives within a complete $C2_1$-cycle (p.82). Again, these examples exclude the relationship between the cyclical pattern and its context. In 'A Historical and Fractal Perspective on the Life and Saxophone Solos of John Coltrane' (Charyton *et al.* (2012)), 'Jupiter' appears along with seventeen other Coltrane improvisations that undergo fractal analysis of their pitch structure. The study concludes that Coltrane's improvisations do indeed display Brownian fractal characteristics. While this study's goals are unique in Coltrane research, attempting to quantify the aesthetic value of Coltrane's improvisation in relationship to its fractal qualities, it does not address the musical structure.

‘STELLAR REGIONS’

Until recently there was no extant literature on any pieces debuting on *Stellar Regions*. Within a larger article focused on themes of continuity through Coltrane’s recorded works, Jason Squinobal (2019) compares ‘Venus’ to the two versions of ‘Stellar Regions’, referencing analyses of ‘Venus’ by Porter and Voss. While Squinobal notes the similar presence of major-third relationships between diatonic tonal centres in both versions of ‘Stellar Regions’ and ‘Venus’, few other structural details are offered.

‘MARS’

Contrasting with his other analyses which focused on cyclical patterns that have duplicates in Slonimsky’s *Thesaurus*, Bair (2003, pp.53–55) takes a broader approach, noting major-third related key centres of asymmetric length in ‘Mars’ as exemplified by two examples: one focused on B♭, D, and F♯ major; and another focused on C, E, and A♭ major. Although very brief, Bair’s observations mirror the more detailed investigations in Chapter 5.3, where all four C4 cycles and their structural relationships are identified within ‘Mars’. Bair also observes a circle of fourths pattern within one section of ‘Mars’ (ibid., pp.57–58), arguing for the salience of the perfect fourth interval. I disagree with Bair’s assessment here because, after considering contour and context, (05) dyads are revealed as temporary salient subsets that project from and to a (027) trichordal salience (Chapter 5.2). These dyads undergo a series of transpositions using segments of C5, C1, and $C2_0$ cycles as transpositional processes. The difference in our interpretations highlights the importance of contextualisation within analysis. Additionally, the analysis in Chapter 5.2 offers alternate perspectives on Porter’s and Medwin’s passing observations concerning the presence of a key and theme in ‘Mars’.

'OFFERING'

As the first scholarly work to utilise set theory for jazz analysis, Pressing's (1982) analysis of 'Offering' remains the most extensive and in-depth work on this piece to date. Significantly, Pressing notes the multiplicative use of ic5, which he considers as the generating force for the entire piece, realising (027) and ic2 from which (024) is generated. Interval-classes 5 and 2, and the corresponding generated pc-sets (027) and (024) form two pc-set streams throughout the piece. Sets of higher cardinality are generated from the components of each of these streams. While Pressing's analysis is perhaps one of the most important works on Coltrane's late-period music structure, it has some problems as well. Pressing omits to detail the harmonic sequences of the rhythm section and how the pitch structure generated from (027) and (024) interacts with it. His analysis also uses a published transcription which contains an inherent analytical predisposition and is presented in the B♭ tenor saxophone key, not at concert pitch, preventing easy comparison with other work. Although Pressing's analysis is presented in a manner similar to other set theory analyses of atonal classical music, it is somewhat unapproachable for jazz-based readers, who would benefit from his insights. This doctoral dissertation attempts to address this challenge by drawing attention to pitch relationships and structural patterns through the bracketing and set identification style of the illustrations, so that jazz-oriented readerships may also be able to discern structural relationships through the represented symbol patterns.

The remaining extant literature on 'Offering' is brief. Bair (2003, pp.91–92) views the symmetrical tetrachord {E, F♯, B♭, C} as paralleled in Slonimsky's *Thesaurus*, marking the tritone interval as the salient structure. This analysis removes the tetrachord from the context of the following (02) dyad salience and the frequent whole-tone segments that occur. Significantly, Schott (2000, pp.363–364) observes chromatic saturation in the opening theme and the presence of (027) as overlapping motivic statements, but he mistakenly marks the rotational permutation of (027) as its inversion (057).[16] A cursory examination by Jost (1974, p.100) notes that Coltrane's fast descending lines are more fitting of the description 'sheets of sound' than his late 1950s music for which Ira Gitler coined this term (1958). He also describes 'self-dialogue' as a characteristic typical in Coltrane's later works such as *Meditations*, *Expression*, 'Manifestations', and 'Reverend King'.

The 'stacked fourths' that begin 'Offering' are regarded by Medwin as virtually identical to the opening of 'Acknowledgment', suggesting that 'it seems obvious that a definite reference is being made, one that goes beyond structural speculation, as with the earlier material, into the realm of quotation' (2008, p.82). Although self-reference may be Coltrane's intention, the analysis in Part II demonstrates that (027), as the feature Medwin observes, is a fundamental improvisational tool throughout Coltrane's late period. Squinobal's comparison of the studio and live versions of 'Offering' (from the Temple University concert in 1966) identifies target notes in the theme's architecture that are embellished by Coltrane. Additionally, he argues that rhythmic cells are structural components intended for improvisational development. These observations are somewhat generalised and leave the embellishments' structural properties and other detailed aspects of the pieces (including the improvisations) unexamined.

[16] As a symmetric trichord construction, there is no inversional member of set class (027).

'VENUS'

Except for works by Porter and Voss, the extant literature on 'Venus' is generally brief and exhibits a narrow focus. In an article that examines a stylistic cross-section of Coltrane's compositions, Bruckner-Haring (2008) notes the structure of the 'Venus' theme as essentially one developing phrase (comparing it to versions of 'Love' (Coltrane, 1966e; 1977b). Additional observations are the rapid descending lines and octave changes within Coltrane's improvisation. As previously mentioned, Squinobal (2019) cites Porter and Voss while noting the similarity between 'Venus' and the two versions of 'Stellar Regions'. Additionally, he argues that the greater length of 'Venus' is likely due to the freedom afforded by the duo format.

The lengthiest and most well-known examination of 'Venus' is that by Porter (1998, pp.279–288), whose analysis encompasses the overall arc of the piece, patterns of tension and release, appearances of a prolonged ascending voice-leading, motivic sequences, and changing key centres. Early in Porter's transcription, I believe there is a misreading of the underlying harmonic structure where the analysis notes passing key centres of E♭, C, B, E♭, C, B, E♭, E, C, E♭, G♭, C (1998, p.280). Subsequently, Modirzadeh (2001, p.99) cites this section as representing harmonic rotations from the 'sharp side' to the 'flat side' of C major. An alternative reading of this section resolves the harmonic movement as simply melodic segments of the diatonic collection, moving through the repeating major-third related keys of A♭, C, and E. This interpretation more accurately reflects Coltrane's fascination with major-third relationships and is confirmed by similar remarks made by Voss (2015). Chapter 5 illustrates this technique in *Stellar Regions* where ascending melodic segments voice-lead through major-third related diatonic collections. The melodic segments may be of varying length and sometimes tonicise different pitch-classes within each of the major-third related referential collections. Similarly, Bair (2003, p.63) notes the emergence of the major-third cycle within this same section of music (letter B in Porter's transcription), and later, the brief emergence of the symmetrical set {B, C♯, F, G} (p.94). While the major-third relationship is present throughout 'Venus' as the overall improvisational framework, the whole-step voice-leading is a crucial feature that is left undescribed in Bair's example.

Finally, Voss's (2015) analysis of 'Venus' alternately contrasts and supports that of Porter, providing a comprehensive description of the widespread major-third cyclical form and voice-leading patterns while noting that virtually the entire piece can be reduced to the diatonic centres of C, A♭, and E major. Voss also details a brief passage where the pitch structure becomes ambiguous, potentially signalling a brief modulation to the major-third related keys G, E♭, B major. Precisely because Porter and Voss already provide a thorough picture of the structural features of 'Venus', this doctoral dissertation will only offer a cursory analysis of 'Venus' where relevant. This strategy is adopted in order to avoid reiterating their findings, and because of the limited length of this dissertation.

While the various Coltrane narratives, concept of lateness, motivic characterisations, and analytical readings create critical contexts for understanding *Interstellar Space* and *Stellar Regions*, the relationship between Coltrane's late-period music and his eclectic musical and extra-musical interests have an unexplored potential to reveal hidden connections and symbolisms.

CHAPTER 2: INFLUENCES ON COLTRANE'S MUSICAL STRUCTURE(S)

INTRODUCTION

This chapter aims to harness Coltrane's embedded multiculturalism and interdisciplinarity as contexts for further research, and as generative frameworks for interpreting the structural features of *Interstellar Space* and *Stellar Regions*. As a research method typically restricted to academic spheres that both draw upon and combine disparate theories, interdisciplinarity – representing a dismantling of barriers between disciplines – offers an elegant structure with which to encapsulate Coltrane's musical approach. Two sets of relationships occur in this chapter: firstly, musical and extra-musical influences on Coltrane; and secondly, extra-musical interpretations of Coltrane by others. Additionally, when pertinent, the discussion of Coltrane's spirituality and interdisciplinarity engages with his own subsequent influence upon culture.

The nature of this inquiry is further complicated by an absence in scholarship that pertains to the represented topics. Extant literature offers only limited verifiable connections between these topics and Coltrane, and as such, the discursive hypothesis often relies, at some level, upon speculation. Although Coltrane's broad interests have been frequently documented, scholarship has yet to examine these complex issues in a way that develops their connections and relationships to the structures of Coltrane's later music. Therefore, there is a need for a focused investigation into how varied musical and extra-musical topics intersect and display similar themes, in order to measure their presence within the musical constructs explained in the analysis of *Interstellar Space* and *Stellar Regions*. This chapter seeks to address this gap by engaging with and expanding on existing musical and extra-musical interpretations in Coltrane literature, and by introducing new ideas through a holistic perspective connecting disparate topics and their intertextualities. The overall approach necessarily mirrors Coltrane's eclecticism and 'reverse engineers' the discussion, prioritising the musical structures illustrated in Part II so that the main topics selected have tangible musical and artistic relevance. The wide range of subjects examined requires that even topics with potential for extensive discussion (for example, the politics of free jazz, influence and meaning in music, spirituality in African-American culture during the 1960s) are still kept brief so as to maintain focus. The omission of some topics similarly reflects the prioritisation of specific themes as more relevant to the discussion at hand, while also reflecting the boundaries and deliberate limits of this thesis.

The communication of musical meaning is a subject centred on two perspectives, finding early definition – very much contemporaneous with Coltrane – in the work of Leonard B. Meyer (1956).[17] Meyer's first perspective regards musical meaning as limited to the perception of those musical elements that constitute an artistic work (absolutist), whereas the second considers these intellectual relationships as also communicating extra-musical meanings (referentialist). Particularly relevant to this chapter's investigation of influences is Meyer's observation about connotations: 'Certain modes of tonal organisation may awaken connotations. […] intervals may be used to indicate special concepts or states of mind' (ibid., p.259). Whilst the contribution of Meyer remains key to our current purposes of potential influence, the field of music and meaning has developed substantially in the interim. The

[17] Meyer used *Gestalt* theory and the pragmatist philosophy of Charles Sanders Peirce and John Dewey to examine emotion in music. Additionally, Peirce (with Ferdinand de Saussure) laid the foundation for the development of Semiotics. While Meyer's work is historically contemporaneous with that of Coltrane, Meyer's ideas are also seen as influencing more recent developments in music cognitive science and the work of such theorists as Fred Lerdahl.

works of scholars such as J. J. Nattiez (1990), Lawrence Kramer (2001), and Peter Kivy (1990) have made important contributions to understanding musical meaning, its signs and signifiers, and intertextualities. In particular, developments in semiotics have enabled perspectives focused on identifying at the level (poietic, immanent, esthesic) at which the analytical discourse functions. Throughout Chapter 2, the topics under discussion generally reflect Meyer's referentialist point of view. Whether or not the associations made accurately ascribe Coltrane's musical intention does not diminish their value, but instead reveals the music's capacity for signifying his eclecticism. The construction of Coltrane's music is often regarded as encoded with hidden meaning. The influential saxophonist and composer Steve Coleman's *Instagram* post (2019) expresses a common sentiment about this covert symbolism:

> [S]ongs like Fifth House, 26-2, Equinox, Satellite, etc., were not yet at the point where they were as symbolically descriptive musically as they were as composition titles. Using composition titles to describe musical symbolism is a simpler approach. Later, Coltrane developed using the geometry of the sound as the symbolism for he [*sic*] was trying to express. (14 January 2019)

Coleman's subtext for 'geometry of the sound' implies that Coltrane's musical organisation is symbolic, connecting Coltrane's spiritual and eclectic interests with tangible structural artefacts in his music. My following discourse explores these musical and extra-musical signs within three overlapping frameworks: World music, Eastern philosophy, and spirituality; science, astrology, and cosmic symbolism; and musical education.

2.1 WORLD MUSIC, EASTERN PHILOSOPHY, AND SPIRITUALITY

The musical traditions of Africa and India are well-documented influences on Coltrane (Cole, 1976; Nisenson, 1993; Porter, 1998; Simpkins, 1975; Thomas, 1975), sharing the pentatonic scale with countless world musical cultures (Van Khe, 1977).[18] Although the pentatonic scale is present in a lesser capacity within Coltrane's earlier 1950s recordings, in 'My Favorite Things' (1961b) it emerges as a crucial component of the improvisation, foreshadowing its fundamental structural role in pieces like 'Acknowledgement' (see Chapter 5.4 for an analysis of 'Acknowledgement' illustrating new perspectives on Coltrane's use of the pentatonic scale). With 'My Favorite Things', Coltrane brings together the musical elements of India (with the extended pedal-point drone), Africa (with 2:3 polyrhythms and triplet rhythmic underpinnings), and the pentatonic scale (as a transcultural, universal signifier). The pentatonicism of Coltrane's later music signifies a bridge between ancient and modern modes of musical expression and a cultural plurality noted by Coltrane during an interview in 1962:

> There's a lot of modal music that's played every day throughout the world. It's particularly evident in Africa but, whether you look at Spain or Scotland, India or China, that's what you'll find every moment. If you really want to look beyond differences of style, you'll realise that there is a common base. That's very important. Sure, British popular music is not the same as South

[18] The pentatonic scale in this discussion is defined as one scale structure with two rotational variations: a major version (e.g. {C, D, F, G, A}), and minor version (e.g. {A, C, D, E, G}). Ethnomusicology makes a distinction between pentatonic scales which contain no semitones (ahemitonic) and those containing semitones (hemitonic). Some musical traditions (such as in Japan) contain both types of pentatonic scales. The blues scale, commonly found in jazz, is generally thought to have developed from the pentatonic scale as it was brought to America through the African slave trade (Kubik, 1999). The pentatonic scale can be derived from the deletion of the flattened-fifth from the minor blues scale. An example of a minor blues scale construction is {C, E♭, F, G♭, G, B♭}. Asher Tobin Chodos examines epistemological issues surrounding the blues scale in 'The Blues Scale: Historical and Epistemological Considerations' (2018).

> American, but take away their purely ethnic characteristics – that is to say, their folk aspects – and you'll find yourself in the presence of the same *pentatonic sound* [emphasis added], of comparable modal structures. It's that universal side of music which interests and draws me, and that's where I want to go. (Devito, 2010, p.181)

Coltrane's exploration of world music and non-Western scales was motivated by this interest in pentatony and the 'universal side of music'.[19] Of particular interest to him were Indian *ragas*, with their performance framework and context communicating added dimensions beyond pitch structure.[20] The creative path from modal to free jazz that Coltrane followed after 'My Favorite Things' mirrors the melodic focus of Northern (Hindustani) and Southern (Carnatic) Indian classical music, and their absence of harmonic systems. *Interstellar Space* signifies this view of the obsolescence of harmony through the omission of the piano and bass and the singular melodic presence of the saxophone attesting to the pre-eminence of idiosyncratic melodic principles.

Examples of Coltrane's interest in the scales of world music are found in his music notebook, copied by Carl Grubbs (Coltrane's relative) and published in biographies by C. O. Simpkins (1975, p.113) and Porter (1998, p.210). Within this notebook, scales from world cultures are collected along with Church and Greek modes, drawing together Western and non-Western approaches to pitch structure (Vol. II: Example 2.1). As the following evidence

[19] Monson notes: 'a considerable segment of the jazz community seems to have been exploring the sounds of non-Western improvisational music in the late fifties and sixties' (1998, p.158). Similarly, Modirzadeh (2001, p.78) states that the concepts of 'universal' and metaphysical principles in music were in circulation during Coltrane's time, with one book – *Introduction to the Study of Musical Scales* (Daniélou, 1943) – expressing many of the ideas that became associated with Coltrane. Modirzadeh establishes that Coltrane would have had access to this book through the Free Library of Philadelphia in the 1950s. Resources such as Alain Daniélou help to establish the context for understanding Coltrane's development.

[20] Coltrane expressed interest in playing with the sitar master Ravi Shankar. During an interview with Yasuhiro Fujioka, Shankar describes giving informal lessons to Coltrane on a few occasions (Devito, 2010, p.128).

will show, the structure of these scales may have been intertextual catalysts, representing transcultural bridges for Coltrane. A closer examination of a page entitled ‘Scales of India’ reveals several underlying scale constructions that parallel Western (modal) scales, pentatonic, trichordal, and hexachordal collections. While the structure of the scales ‘Night, Melancholy’ and ‘Morning, Sad’ are identical to the Greek modes B♭ Dorian and C Phrygian (Vol. II: Example 2.2), the pentatonic scale emerges as the foundation for the *raga* scale ‘Evening, Gay’. Additionally, the scales ‘Morning: Sad’, ‘Night’, and Evening & Night: Praise’ form the construct (024579) from rotations of their ascending scale form (Vol. II: Example 2.3), with this structure corresponding to the saturation of (024579) in *Interstellar Space* (Chapter 4.3).[21] The presence of trichordal constructs on this page, notated separately from the scales (Vol. II: Example 2.2), becomes elevated in its importance in light of the trichordal saturation throughout *Stellar Regions* and *Interstellar Space*, potentially indicating Coltrane’s early interest in these structures (later in Chapter 2 trichords and major-third cycles are examined for their tripartite symbolism).[22] Notably, staves three and six in Example 2.2 contain (025), which is a subset component of the pentatonic scale: a salient T_n-type in ‘Saturn’; and the inversion of (035): a salient T_n-type in ‘Seraphic Light’ and ‘Acknowledgement’. That Coltrane continued to construct his late-period themes as a blend of pentatonic and diatonic resources (while his improvisations run free of these constraints) may be a sign that he valued these musical constructs as ‘transcultural universals’, and as

[21] A subset/superset relationship is a key structural component of ‘Morning, Sad’ where (024579) appears in the ascending portion and the Phrygian scale in the descending portion of this *raga*.
[22] Carl Clements suggests that Coltrane’s motivic approach parallels the ancient Indian musical concept of *vikriti* which similarly focuses on permutations of small groupings of notes (2008, p.161).

'ancient universals': a means of rooting highly complex improvisations within comprehensible musical formats.[23]

While Coltrane's notebook contains signs connecting the 'universal side of music' (Devito, 2010, p.181) to pitch structure in *Stellar Regions* and *Interstellar Space*, other aspects of Indian music are signified more widely in his music. The cyclic view of time and the universe is a basic tenet of Hindu philosophy and cosmology, represented in the rhythmic cycles (*tala*) of Hindustani music (Simms, 1992/93).[24] Cyclic processes frequently appear in *Interstellar Space* and *Stellar Regions*, with interval-cycles used as transpositional processes between dyad and trichordal pc-sets, and in C4 relationships between major key centres. A well-known example of cyclic processes in Coltrane's music occurs in the harmonic progression of 'Giant Steps' (1960c) – with its design built around the major-third (ic4) interval-cycle.[25] Additionally, the Indian musical concept of *alap*, an exploratory introductory section free of metre, also resembles aspects of Coltrane's performance practice with Clements (2008, p.161) observing *alap* characteristics in Coltrane's 'Song of Praise' (1965e) and 'Psalm' (1965d).

[23] In *A Theory of Evolving Tonality* (1932), Joseph Yasser presents theories on the evolution of musical scales, arguing that diatonic and pentatonic scales are 'ancient universals' in music. The terms diatonic scale, major scale, Church modes, and Greek modes all refer to the same configuration of seven notes which, when rotated to start on each of its pitches, results in seven different scale names (modes) and corresponding harmonic sonorities.

[24] Cyclical processes are also an important aspect of the musical cultures of Africa.

[25] The influence of Slonimsky's *Thesaurus* on cyclical patterns in Coltrane's music is the subject of research by David Demsey (1991) and Bair (2003).

The influence of Hindu and Eastern philosophy is also reflected in Coltrane's ideas about the power of music to provoke emotional responses in listeners and to affect the physical world. A frequently cited statement by Coltrane illustrates the blending of music and mysticism:

> I would love to discover a process such that if I wanted it to rain, it would start raining. If one of my friends were sick, I would play a certain tune and he would get better; if he were broke, I would play another tune and immediately he would receive all the money he needed. But what those pieces are, and what way do you have to go to arrive at knowing them, I don't know. The true powers of music are still unknown. To be able to control them should be, I think, the ambition of every musician. The knowledge of these forces fascinates me. I would like to provoke reactions in my audience, to create a real atmosphere. That's the direction that I want to go in, and to go as far as possible. (Devito, 2010, p.182)

Mystical associations and extra-musical symbolism are an inherent part of *ragas*, with their performance connected to specific emotional moods and times. In Coltrane's notebook, the Indian *ragas* scales 'Night, Power and Majesty' and 'Morning, Sad' reflect this extra-musical symbolism, connecting each *raga* to an emotion and time of day. Similarly, three movements within Coltrane's 'Suite: Prayer and Meditation' (1970b), from the recording *Transition* (1970a), contain subtitles seemingly patterned after *ragas,* with each movement evoking a spiritual mood and time of day; 'Prayer and Meditation: Day', 'Prayer and Meditation: Evening', and 'Prayer and Meditation: 4 A.M'. These three movements also use pitch structure in a manner similar to *ragas*, structured around the single pc-set {C♭, C, E♭, F, G♭, A♭} (see Chapter 4.4 for an analysis of 'Suite: Prayer and Meditation (Day)'). Coltrane's music titles often reflect religious or philosophical subtexts, as seen in such works as *Om*, *Ascension*, *A Love Supreme*, and *Meditations*. Although Coltrane's family history was deeply rooted in the African Methodist Church (having two grandfathers as ministers), he embraced a pan-religious view encompassing Christianity, Hinduism, Islam, Buddhism, and Judaism (Porter, 1998, p.11; Monson, 1998, p.157). For segments of the African-American jazz community, the spiritualism of 1960s culture came to replace the traditional Protestant Church as the 'locus of black ethnicity' (Berkman, 2007, p.43) and in effect provided a 'means of cultural affirmation, individual and collective expression, and spiritual sustenance' (Burnim, 1988, p.112; as cited in Berkman, 2007, p.43). Coltrane's interest in Eastern philosophy and esoterica was encouraged by Yusef Lateef (Hall, 2001) and other musicians: 'Sonny Rollins had suggested *Autobiography of a Yogi*; Bill Evans had recommended Krishnamurti's *Commentaries of* [sic] *Living*. Edgar Cayce, Kahlil Gibran, Egyptology, Scientology, Plato, Aristotle; hundreds of books were stacked on the shelves' (ibid., p.131). Indeed, in the 1960s, it was common for artists to engage with Eastern philosophy and unconventional forms of spirituality. Hall notes that the plurality of Eastern and Western thought represented in Coltrane's library signals Coltrane as 'a thinker' and an 'aspiring intellectual' (ibid.). This view typifies the frequently oppositional and essentialist narratives surrounding Coltrane which argue either for his intuitive or intellectual nature.

Although cultural and extra-musical issues are critical to the conversation about Coltrane's spirituality, his essence as a musician is often overlooked. Coltrane's obsession with practising achieves mythic proportions, but obsessive practice is nevertheless a widespread phenomenon among jazz musicians, exemplified by the story of a youthful Charlie Parker alienating neighbours with his constant practising (Crouch, 2013, p.87). The ritualistic, daily activity of practising countless hours provokes self-reflection; it raises questions of artistic motivations, limitations, identity, objectivity, and emotional attachments. The transcendental state that musicians often describe experiencing during a performance and the process of self-realisation within musical practice can foster the development of spiritual and metaphysical views. Coltrane reflects on musicians and ‘truth’ as a moral and spiritual metaphor:

> I think the majority of musicians are interested in truth, you know—they’ve got to be because a musical thing is a truth. If you play and make a statement, a musical statement, and it’s a valid statement, that’s a truth right there is itself, you know. If you play something phony you know that’s phony. All musicians are striving to get as near perfection as they can get. (Porter, 1998, p.259)

While Coltrane was public about his spiritual awakening, a musician’s spiritual connection to their music (and ‘truth-telling’) need not be explicit, with issues of spirituality a common subtext informing the music of Coltrane’s contemporaries and artists today.

2.2 SCIENCE, ASTROLOGY, AND COSMIC SYMBOLISM

The ancient cultures of Egypt, Greece, India, and China considered science, astrology, music, mathematics, and philosophy as related disciplines, with their ideas communicating the unity of celestial bodies, vibration, numbers, and music. Similarly, Coltrane’s philosophy reflected these views and inspired his pursuit of musical forms capable of expressing this unity. During an encounter between Coltrane and the musician David Amram (b. 1930) in 1956, Coltrane articulates his desire to create a musical equivalent to Albert Einstein’s scientific theories:

> [H]e went into this incredible discourse about the symmetry of the solar system […] and how Einstein was able to reduce all of that complexity into something very simple. Then he explained to me that he was trying to do something like that in music, something that came from natural sources. (Ratliff, 2007, p.29)

The blending of art, science, and mysticism detailed in Amram's account is equivalently embedded within Western culture's ancient Pythagorean heritage (which is arguably rooted in the culture of ancient Egypt). This Pythagorean heritage provides a launching point for exploring the connections between 'natural sources' and the musical structures in Part II.

2.2.1 PYTHAGORAS, KEPLER AND ASTROLOGY

Although there is no supporting evidence, Coltrane almost certainly would have been aware of Pythagorean ideas through his musical studies and from reading Plato and Aristotle. Indeed, *The Schillinger System of Musical Composition* (1946), which jazz trumpeter Donald Byrd (1932–2013) is known to have introduced to Coltrane, mentions the link between music, science, and Pythagoras in its introduction (Byrd, 1998). The composer and theorist George Russell was also explicit about the relationship between Pythagorean thought and his theoretical concept *The Lydian Chromatic Concept of Tonal Organization* (2001): 'The Pythagorean ladder of twelve intervals of a fifth is the prototype for the tonal gravity field of a Lydian Chromatic Scale' (ibid., p.53). Significantly, within Russell's highly organised, hierarchical system of musical unity, there is a subtext that alludes to the metaphysical dimensions of Pythagorean thought and the teachings of mystic G. I. Gurdjieff (with Monson characterising Gurdjieff's influence on Russell (1998, p.155)). While this aspect of Russell's work would likely have appealed to Coltrane, the extent of his familiarity with *The Lydian*

Chromatic Concept is unknown, although Coltrane did express his interest when first meeting Russell in 1958 (Russell, 2001, p.178).

The teachings of Pythagoras, with its blend of science and metaphysics, have exerted an influence over Western culture for millennia.[26] The basic Pythagorean tenet which asserts that 'the entire universe was ordered and governed by number, and that music was the audible manifestation of number' (Bonds, 2014, p.23) still resonates today in popularised ideas associating music with modern physics and the symmetries of fractal geometry.[27] Pythagoras's crucial discovery that whole-number frequency ratios 2:1, 3:2, and 4:3 express consonant intervals (an octave, fifth, and fourth) then established the foundation for a tuning system based on the ratio 3:2 (a series of perfect fifths).[28] Although Pythagorean tuning has been out of common use for centuries, the metaphysical aspects of his ladder of fifths and his other ideas still exert a latter-day influence over how the circle of fifths is viewed as a product of 'natural sources' (with Russell as an exemplar of this practice).

In speculating that Coltrane may have held this metaphysical view of the circle of fifths – due to his philosophic inclinations and desire to create music from 'natural sources' – we can gain insights into the potential symbolism of the musical constructs in Part II. As a

---

[26] Scholars believe that Pythagoras lived sometime between 570 and 495 BC. The historical Pythagoras is a mysterious and controversial figure. Regarded today primarily as a mathematician and scientist, Pythagoras's esoteric teachings inspired a cult-like following in the centuries after his death. Although Pythagoras left no written texts, his teachings are related by authors such as Plato, Aristotle, Claudius Ptolemy, and Pliny the Elder.

[27] In *The Jazz of Physics* (2016) author Stephon Alexander links Coltrane's music to Pythagoras, Einstein and aspects of quantum physics. Mathematician Benoit Mandelbrot's *The Fractal Geometry of Nature* (1982) is an influential work that popularised the ideas of fractals (and symmetry) as mathematical representations of natural phenomena – inspiring works using fractal methods for musical analysis and composition.

[28] Pythagorean tuning was used for many centuries until other tuning systems were adopted in the middle ages.

hypothetical context, the metaphysical aspect of the circle of fifths is regarded here as imbuing with potential meaning upon the particular musical structures generated from the additive progression of each perfect fifth interval. The pc-sets produced from the first six movements through the circle of fifths – (027), (0257), (02479), (024579), (013568T) – represent crucial structures in *Interstellar Space* and *Stellar Regions*. Furthermore, as subsets of these collections, (025), (035), (024), (013), (023), (026), (046) saturate *Interstellar Space* and *Stellar Regions* as salient constructs. Consequently, these pc-set constructs, generated from the circle of fifths, have the capacity to represent the metaphysical aspects of the Pythagorean ladder of fifths symbolically for us, and likewise, possibly for Coltrane.

Interestingly, a striking cross-cultural parallel exists between the Pythagorean ladder of fifths and the ancient Chinese twelve *lü* system of descending fourths and ascending fifths – a tuning system similarly reflecting numerological and pentatonic significance. Modirzadeh's (2001) investigation of an enigmatic diagram, drawn by Coltrane and published in the *Repository of Scales and Melodic Patterns* (Lateef, 1981), offers compelling structural links to four ancient Chinese cyclical music theories with subtexts of astrology, numerology, and metaphysics. Modirzadeh states: 'the theoretical parallels raised with [*sic*] Coltrane's document further illustrate his own successful musical embodiment of the cosmological with the practical' (2001, p.87). Although Coltrane studied 'oriental' astrology (Porter, 1998, p.255), Modirzadeh acknowledges that the connections he makes are speculative, with Coltrane's inclusive philosophy necessitating a broader reading of his music's multicultural significance.

COLTRANE'S DIAGRAM

Since its publication, Coltrane's diagram has fuelled speculation about its deeper signification (Hollander, 2016; Mwamba, 2013).[29] Given that the diagram comprises symmetrical structures that reflect mathematic relationships, it inherently contains cyclical properties. However, extant interpretations of the diagram frequently deduce theoretical relationships detached from the pitch structure of Coltrane's improvisations. Before presenting a new interpretation of Coltrane's diagram that correlates with pitch structure in *Interstellar Space*, an overview of its construction is necessary. The diagram's essence lies in its synthesis of the circle of fifths (C5) with both whole-tone collections (WT_0 and WT_1) over a distance of five octaves (Vol. II: Example 2.4a). The clockwise movement from C (#1) on the diagram produces a series of descending perfect fifths (ascending perfect fourths) that alternate between the two whole-tone rings. It is well-known to jazz musicians, as a result of instrumental range limits encountered during practice, that the circle of fifths can produce two whole-tone streams within a configuration of alternating perfect fifths and fourths (Figure 2.1). Antokoletz and Susanni (2012, pp.26–27) elaborate on the synthesis of the whole-tone, chromatic, and diatonic collections:

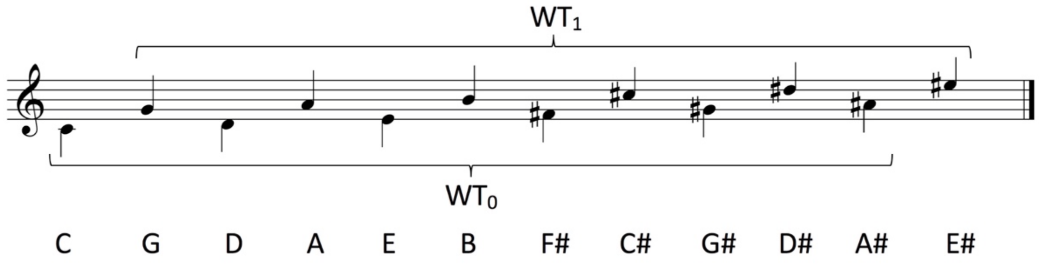
> The chromatic (1/11) and the perfect fifth/fourth (7/5 or 5/7) interval cycles are the only two cycles that generate all twelve pitch-classes and therefore express the same pitch content. The only difference between the two cycles is that of sequential order. […] The whole-tone cycles can therefore be seen as the gateway between diatonic and chromatic spheres of music and it is

[29] In the *Repository*, there appears a second, truncated diagram attributed to Coltrane (Vol. II: Example 2.4b) appears in the *Repository* that corrects a mistake occurring in the first. The mistake in Example 2.4a is seen in the pattern where circles misconnect neighbouring tones to pitch-class A in the circle of fifths. While there has been speculation that this mistake was intentional, it is more likely the result of human error.

> these cycle [sic] that create the binding relationship between the semitone and perfect fifth cycles.

The sophistication of Coltrane's diagram lies in its ability to illustrate the theoretical relationships that bind the chromatic, whole-tone, and diatonic (as found in the C5-cycle) collections together. While the obvious structural characteristics of the diagram are transparent, the circles connecting the twelve pitch-classes of the perfect-fifth cycle with their neighbouring tones are more mysterious. If we interpret the individual circles as transition points for alternating between the whole-tone cycles, a cyclic structure emerges that creates another pathway to the diatonic and correlates to the (024) and (024579) structures in *Interstellar Space* and *Stellar Regions* (for detail, see Chapters 4.3; 5.1; 5.2; and 6.1). Example 2.5 (Vol. II) presents a simplified version of Coltrane's diagram, highlighting the (024) members within the C5-cycle, with encircled transition points between WT_0 and WT_1 that connect the (024) sets. Similarly, Example 2.6 (Vol. II) similarly illustrates this structure from adjacent starting points in the whole-tone rings. The superimposition of Examples 2.5 and 2.6 produces Coltrane's complete diagram (Vol. II: Example 2.7).

Figure 2.1 Whole-tone scale and circle of fifths interaction[30]



[30] This sequence of alternating perfect fifths and fourths duplicates Modirzadeh's illustration of the ancient Chinese twelve *lü* system (2001, p.82).

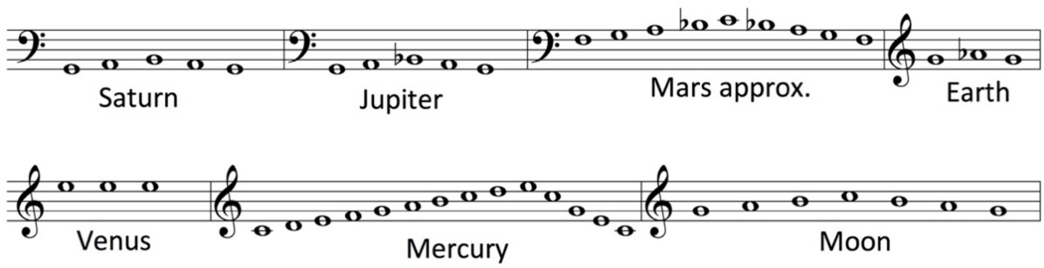
Although some aspects of Coltrane’s diagram are challenging to discern, there is an indication that, within the whole-tone rings, encircled pitch-classes form (024) trichords, further supporting the appraisal of the cyclic presence of (024). It should nonetheless be noted that the same formation appears within Slonimsky’s *Thesaurus* and Sandole’s pedagogy (examined in Chapter 2.3). With the enigmatic circles functioning independently of each other, two pathways manifest (024), (024579), and the diatonic collection, thereby binding the chromatic, diatonic, and whole-tone realms (Vol. II: Example 2.7). Interestingly, within Part II, the construct (024) appears prominently in ‘Sun Star’, ‘Configuration’, ‘Leo’, and ‘Saturn’ (Chapter 5), while (024579) comprising two (024) members related at T_5/T_7, appears in every track of *Interstellar Space* (Chapter 4.3). Coltrane’s diagram provides an extraordinary example of advanced musical thinking, potentially revealing an emerging trichordal awareness that becomes a signature of his later music, and expressing the unified perspective of his philosophy. While this interpretation of Coltrane’s diagram is primarily rooted in its musical bearing, the diagram’s transcultural and transhistorical dimensions encourage further discourse.

JOHANNES KEPLER AND THE HARMONY OF THE SPHERES

The Pythagorean concept of the ‘Harmony of the Spheres’ occupied the imagination of philosophers and scientists well into the seventeenth century and continues to resonate in modern times (Godwin, 1993). In *Harmonices Mundi* (1939), the German mathematician and astronomer Johannes Kepler (1571–1630) describes the physical properties of planetary orbits as producing musical harmonies. Kepler renders a musical mode for each planet based on the mathematics of its orbit around the sun (see Figure 2.2). Correlations between Kepler’s planetary modes and pitch structures in Coltrane’s music are compelling, given

Coltrane's interest in science and astrology. Voss (2012b) draws parallels between Kepler's 'Venus' mode (which emphasises the pitch E), and the theme to Coltrane's 'Venus' (where E is an essential structural tone in C major). While Voss acknowledges however that, as a posthumous release, it is problematic to credit Coltrane with the titling of 'Venus' (and thus inferring any intent over its meaning); and that the structural correlation he presents is tenuous (issues related to the titles of 'Venus' and 'Mars' are examined below). Nonetheless, it was Voss's observation that inspired this doctoral investigation, which has since discovered more compelling similarities between Kepler's modes and Coltrane's music (see Chapter 4.2).

Figure 2.2 Kepler's planetary songs reproduced in modern notation



The trichordal formations (024) and (023), which saturate *Interstellar Space* and *Stellar Regions* as salient trichord structures, are identical to the structure of Kepler's 'Saturn' and 'Jupiter' modes. More significantly, Coltrane's 'Jupiter' and 'Jupiter Variation' themes duplicate the pitch structure and title of Kepler's 'Jupiter' mode, containing three pc-set members of (023) in consecutive ascending perfect-fourth transpositions (the structure of the 'Jupiter' theme is examined in greater detail in Chapter 4.2). Although the theme to Coltrane's 'Saturn' is a minor-blues, members of (024) appear extensively after the theme, matching the structure of Kepler's 'Saturn' mode. Additionally, the 'Cosmos' theme, from the earlier recording *John Coltrane—Live in Seattle* (1971a), is constructed from (02457) which proves to be identical to Kepler's 'Mars' mode. While Coltrane's 'Cosmos' theme undergoes a series of transpositions, it is formed initially from exactly the same pitches as are used in Kepler's 'Mars' mode (Figure 2.3).[31]

Figure 2.3 Coltrane, 'Cosmos' theme formed from (02457)

While these observations are speculative, given the remarkable correlation between Kepler's 'Jupiter' mode and Coltrane's 'Jupiter' theme, and Coltrane's known interest in astrology and science, it is reasonable to consider that Coltrane may have been exposed to Kepler's ideas. So although not definitive, these similarities nonetheless denote really strong intertextualities that encourage further investigation.

ISSUES REGARDING TITLE SYMBOLISM

With the race to the moon fully underway by the mid-1960s (1962–69), and the accidental deaths of Apollo 1 astronauts Gus Grissom, Edward White, and Roger Chaffee occurring only weeks before the *Interstellar Space* and *Stellar Regions* recording sessions, the cosmic themes of these recordings reflect both Coltrane's interests and the societal tides of their time. On the surface, the planetary track titles comprising *Interstellar Space* – 'Jupiter' ('Jupiter Variation'), 'Mars', 'Leo', 'Saturn', and 'Venus' – are suggestive of some

[31] The origin of the word 'cosmos' is credited to Pythagoras (*kosmos*) and implies a view of the universe as an organised system.

programmatic intent reflecting Coltrane's interest in astrology (Porter, 1998, pp.255–256). However, because *Interstellar Space* and *Stellar Regions* were released posthumously, without Coltrane's direct input into their production and title selection, there is contradictory evidence to consider when evaluating elements of their supposed 'cosmic symbolism'. Indeed, Ed Michel, the Head of Artists and Repertoire at Impulse! Records, who discovered the unreleased *Interstellar Space* session tapes, claims that he gave the recording its overall title, 'playing off the planetary-themed track titles listed on the tape box' (Shteamer, 2017, para.15).[32] Significantly, however, the ABC–Paramount recording session log for *Interstellar Space* lists 'Dream Chant' as the original track title for 'Venus', and 'C major' as the original track title for 'Mars' (DeVito *et al*., 2013, p.764), casting some doubt on whether this recording was indeed planned as a more extensive suite, as has been suggested.[33] Of the remaining titles listed on the original session log – 'Saturn', 'Jupiter', and 'Leo' – only 'Saturn' and 'Jupiter' ('Jupiter Variation') reference planets and constitute new pieces at that time of their recording. Additionally, the analytical evidence in Part II indicates that the titles of 'Dream Chant' ('Venus') and 'C major' ('Mars') may have been reversed on the session logs. The analysis in Chapter 5 establishes C major is the referential tonal centre for 'Venus'/'Dream Chant', whereas 'Mars'/'C major' has no tonal centre and is essentially a spontaneous improvisation (see the analysis of 'Mars' in Chapter 5.3). Alternatively, the titles 'Dream Chant' and 'C major' could be place-holders in the session log, but this would not explain the correlation of the title 'C major' to the analytical evidence of C major in 'Venus'.

[32] Michel is presumably referring to the tracks 'Saturn', 'Jupiter', and 'Leo' since these are the only 'planetary-themed' titles listed within the original session logs.
[33] Porter suggests that this recording may have been planned as a suite in the same manner as *Meditations* and *A Love Supreme* (1998, p.277).

The apparent ‘cosmic symbolism’ evoked by *Stellar Regions* is equally complicated and more debatable because the master tapes, reportedly found by Alice Coltrane twenty-five years after their recording, contained no track titles and so all the titles were chosen by her (Wild, 1995). The quartet versions of the piece known as ‘Venus’ from *Interstellar Space*, were retitled (likely erroneously) by Alice Coltrane ‘Stellar Regions’, while a second last-minute title change from ‘Creation’ to ‘Seraphic Light’ (Devito *et al.*, 2013, p.763) occurred in order to avoid confusion with an earlier bootleg recording under the same title. Although Coltrane’s keen interest in science and astrology is well-documented, over time, there has been a gradual blending of his recording’s spiritual and cosmic meanings. It is important to note that the emergence of a space allegory in Coltrane’s music only begins to appear after his death, primarily with the posthumous releases of *Cosmic Music*, *Sun Ship* (1971c), *Live in Seattle*, *Interstellar Space*, *Stellar Regions*, and the proliferation of biographies on Coltrane that detail his eclectic interests (Cole, 1976; Nisenson, 1995; Porter, 1998; Simpkins, 1975; Thomas, 1975). In fact, none of the recordings released during Coltrane’s lifetime (between 1965–67) contains titles evoking cosmic or astrological imagery. This highlighting of contexts illustrates how narratives surrounding Coltrane’s music are a continually evolving cultural phenomenon and cause of further mythology. Once titles have been appended, they inevitably exert some impact on subsequent interpretations of the music.

2.2.2 NUMEROLOGY AND TRIPARTITE SYMBOLISM

Music history is replete with works engaging in numerological and number symbolism (Service, 2010) and discourses about Coltrane frequently reference the potential importance of numerology as an influence on his philosophical ideas and music. While it is likely that Coltrane’s eclectic interests included numerology as a topic often related to astrology, there are no definitive statements from him on this subject. As Demsey notes, Coltrane's use of major-third related tonal centres has been interpreted as reflecting some 'numerological importance representing the trinity, or God, or unity' (1991, p.145).[34] On the one hand, it is problematic to attribute substantive meaning to numerological signs identified in Coltrane's music due to numerology's self-fulfilling bias; on the other hand, it does enable an awareness of Coltrane's interdisciplinarity and how his music embodies broad perspectives.

Within Coltrane's later music the number '3', a symbol of the Trinity, unity, and creation in numerous cultures, frequently appears in musical elements such as trichordal pc-set saturation, rhythmic groupings, compositional structures (for example, 'Seraphic Light' and 'Jupiter'), and the aforementioned major-third related tonal centres.[35] Additionally, Voss (2014a) observes potential signs of tripartite symbolism embedded within 'The Father and the Son and the Holy Ghost'. The circle of fifths, as the primary structural feature of Coltrane's diagram, also contains the number '3' when numerological processes are applied to it. It consists of 12 pitch-classes which, when the integers '1' and '2' are summed (1 + 2), produce the number '3'. Additionally, the circle of fifths, which encompasses five octaves, contains 84 semitones which may be summed initially to '12' (8 + 4 = 12), and then finally to '3' (1 + 2 = 3). This connects the circle of fifths, its structural derivatives, and its transcultural relationships, to the numerological unity represented by the number '3'. Individually the numbers '1', '2', and '3' have ancient associations: '1' supposedly denotes the 'number of primordial being'; '2' represents dualism and 'the creation of polarity and division'; and '3' is

[34] Porter suggests that the numerological aspect of the major-third relationship is potentially significant and should not be underestimated (1998, p.150).
[35] Aristotle notes the number three as an expression of nature and 'all' (1922, 268a, tr. Stocks).

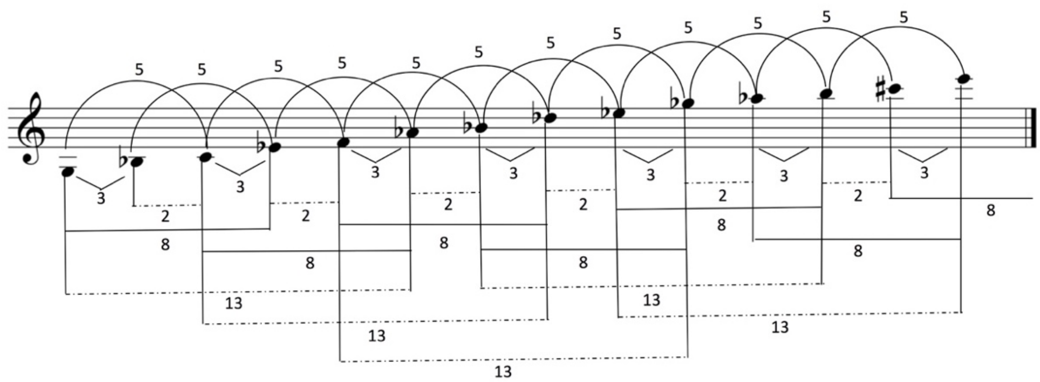
seen to represent 'the embracing synthesis or unity' (Schimmel, 1993, pp.41–58). These numbers, taken compositely, connote ancient transcultural symbols of the 'unfolding of the One into multiplicity' (ibid., p.60). The mathematical concept of 'perfect numbers', an integer that is equal to the sum of its divisors, was first introduced by the Pythagoreans (ibid., p.14).[36] The smallest perfect number '6' (1 + 2 + 3 or 1 × 2 × 3) correlates with structures in 'Iris' and 'Jupiter'/'Jupiter Variation' where trichordal T_n-types (013) and (023) function as crucial structural features expressing the semitone intervals 1, 2, and 3, and their collected sum as the number '6'.[37]

Similarly related to mathematics, the music theorist Erno Lendvai asserts that pentatony 'on an elemental level' is a manifestation of the Fibonacci series (1994, p.236).[38] Interestingly, Lendavai's pentatonic illustration is virtually identical to the theoretical structure described in my analysis of 'Acknowledgement' (see Chapter 5.4), where (035) motives are nested within a C5 transpositional cycle. Similarly, Ravi Coltrane (John Coltrane's son) suggests a deeper symbolic connection between the Golden Mean (a proportion related to the Fibonacci series) and the melodic cells in *A Love Supreme* (Whyton, 2013, p.23). Figure 2.4 expands on Lendvai's model in order to reflect the interconnected pentatonic scale relationships demonstrated in 'Acknowledgement' below. The numbers '2', '3', '5', '8', and '13' represent the number of semitones between the pitches and form the Fibonacci series,

[36] The Pythagoreans were followers of Pythagoras's teachings who promoted and developed upon his ideas in the centuries after his death.
[37] Number '6' is significant as a symbol of the creation myth with the summing of 1 + 2 + 3 reflecting the Bible's three stages of creation (Schimmel, 1993, p.122).
[38] The Fibonacci series is related to the 'Golden Section' (1.618), with its ratio between consecutive numbers of approaching that of the 'Golden Section' as the numbers increase in size. The 'Golden Section' has been used by artists for centuries because it is thought to possess a hidden 'esthesic virtue' reflecting nature and the universe (Solomon, 1973, p.5).

with consecutive integers adding up to the next number in the sequence. While Lendvai's illustration expresses four integers of the Fibonacci series, Figure 2.4 shows how pentatonic scales linked by common-tones within C5 produce five consecutive integers of the series.[39] While it is speculative to consider that Coltrane may have associated the pentatonic scale with the symbolism of the Fibonacci series, our ability to read his music through an interdisciplinary eclecticism encompassing numerology, astrology, mysticism, and science enables a certain meeting-point, or accommodation, between the musical analytical and the extra-musical. We may now gain further insights through examining the more pragmatic issues related to Coltrane's musical development.

Figure 2.4 Fibonacci series 2–3–5–8–13 within C5 nested pentatonic scales



2.3 MUSICAL EDUCATION

The topic of Coltrane's musical education and the formation of his musical ideas is an expansive subject entailing the influences of Charlie Parker, the big bands of Eddie Vinson and Johnny Hodges, Thelonious Monk, Miles Davis and countless others. While it would be impossible to detail Coltrane's formal and informal musical education completely, an

[39] This structure also appears as Exercise #828 in Slonimsky's *Thesaurus*, which is a well-documented resource for Coltrane.

examination of some critical influences reflected in his late-period music provides a broader understanding of the distinctive structural elements that constitute *Interstellar Space* and *Stellar Regions*.

2.3.1 *DENNIS SANDOLE*

Coltrane's studies with Dennis Sandole (1913–2000) at the Granoff Studios in Philadelphia began shortly after his discharge from the Navy in 1946 (Porter, 1998, p.51). While Coltrane's formal studies are believed to have ended sometime in the early 1950s, his close friendship and periodic lessons with Sandole continued until 1965–66 (McGill, 2016, p.2). Sandole's pedagogy focused on advanced harmonic and compositional techniques that borrowed from the classical avant-garde, exotic and synthetic scales, together with unorthodox approaches to chromaticism and polytonality. Sandole first introduced Coltrane to the type of major-third relationships and symmetric divisions of the octave that Coltrane would later develop into the harmonic formula for 'Giant Steps' (Porter, 1998, p.147). The high value that he placed on individuality and his unorthodox pedagogy left a lasting impression on Coltrane, encouraging the latter's idiosyncratic musical development.

Although it is hard to establish a direct line of influence, T. S. McGill's (2013) research into Sandole's pedagogy nevertheless offers a valuable resource that illuminates many structural characteristics of Coltrane's late-period music. McGill notes that tetrachords were a standard tool used by Sandole for constructing scales with specific harmonic profiles.[40] While Coltrane's music from the 'Giant Steps' period is known for its tetrachordal salience

[40] The labels attached to Sandole's tetrachords often reference composers such as Messiaen, or multicultural sources (ibid., p.17).

and possibly reflects some aspects of Sandole's tetrachordal pedagogy, it is the broader, constructive approach to pc-sets represented by Sandole's tetrachord system that is mirrored in the trichordal saturation of *Interstellar Space* and *Stellar Regions*.[41] Additionally, the appearance of Coltrane's interval-cycles (in complete and partial forms), used as transpositional processes for dyad, and trichord formations in *Interstellar Space*, are, at the very least, analogous to Sandole's method of using short segments of interval-cycles as root movements for chord progressions.

As an additional intertextuality, symmetrical scale constructions taught by Sandole prove identical to Messiaen's sixth and third mode of limited transposition (ibid., p.27). Within 'Saturn', Messiaen's sixth mode appears as an expansion of the prominent (024) construct (see Chapter 6.1), while in 'Jupiter' mode three is found as a transpositional alteration of the theme built from (023) (Chapter 4.2). The appearance of these symmetrical scales both within Sandole's pedagogy and in *Interstellar Space*, during improvisational sections focused on their trichordal subsets, suggests that Coltrane was likely aware of their structural relationships. Furthermore, Sandole's illustration of Messiaen's mode three emphasises its (023) trichordal structure as a melodic applications built on dominant-seventh chords (ibid., p.27). This observation supports the idea that trichordal formations, as theoretical constructs, were likely part of Coltrane's education.

Another technique taught by Sandole was the concept of added intervals, whereby 'combinations of intervals' were added 'to more basic harmonic formations to create […]

[41] Sandole stated that techniques for working with tetrachords formed part of Coltrane's studies with him (ibid., p.27).

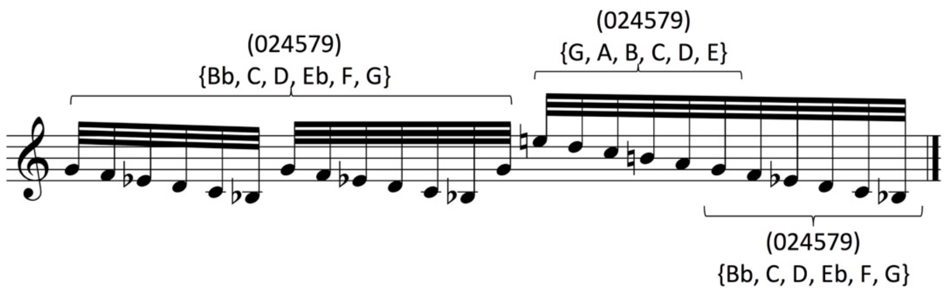
polytonal relationships that are not diatonic in origin' (ibid., p. 27). Interestingly, McGill's example of Sandole's technique, as applied to a B♭–7chord, bears a remarkable theoretical similarity to the hexachord that forms the structural basis of Coltrane's 'Suite: Prayer and Meditation (Day)'. While the (014679) hexachord of 'Suite' has several harmonic profiles, it is perhaps best described as an F–7 chord with the addition of pitches G♭ and C♭ (see the analysis of 'Suite': Prayer and Meditation (Day)' in Chapter 4.4).

A further intertextuality concerns the similarity between Sandole's method for creating bitonal and polytonal scales and Coltrane's fast descending figures within *Interstellar Space*. A page from Sandole's unpublished book, *Scale Lore* (Vol. II: Example 2.8), contains the direction 'make transition to next key on any note of previous key scale', which essentially describes how Coltrane uses common-tone pivots between pitch collections. A striking parallel appears between Sandole's construction of a bitonal scale combining C and A major through common-tone pivots (Figure 2.5) and Coltrane's improvisation in 'Mars' where {G, A, B, C, D, E} and {B♭, C, D, E♭, F, G} are synthesised during a region of (024579) salience (Figure 2.6). Similarly, common-tone pivots connect pentatonic collections within 'Acknowledgement' (see again Chapter 5.4), and major-third related diatonic collections in 'Venus', 'Stellar Regions', and 'Mars' (Chapter 5.3).

Contained within the *Scale Lore* polytonal scales page (Vol. II: Example 2.8), Sandole forms a cyclical scale from T_5 related (024) trichords which are connected by irregular bracketing (Figure 2.7). This formation is noteworthy since it emphasises (024) as a trichord structure (which is a frequent feature in Coltrane's music), and since this scale structure is identical to the hidden cyclical feature of Coltrane's diagram illustrated in Examples 2.5 and 2.6 (Vol. II), where (024) members within the C5-cycle use encircled transition points to alternate between the WT_0 and WT_1 rings. Additionally, as another intertextuality, this construction replicates scale #833 in Slonimsky's *Thesaurus*, which Coltrane used extensively as a resource. As a pedagogical pioneer in jazz improvisation and composition, Sandole's lasting influence on Coltrane should not be underestimated: he encouraged the eclecticism and use of advanced theoretical resources that are hallmarks of Coltrane's music.

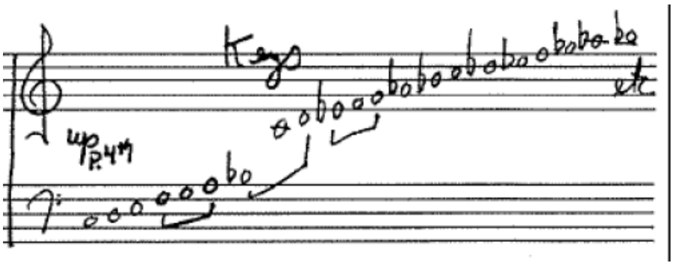
Figure 2.5 Bitonal scale combining C and A major (from *Scale Lore*)[42]

Figure 2.6 {G, A, B, C, D, E} and {B♭, C, D, E♭, F, G} synthesis in 'Mars' (04:20)



[42] This illustration appears in McGill (2013, p.34).

Figure 2.7 *Scale Lore* polytonal construction featuring C5 related (024) members[43]



2.3.2 *SLONIMSKY, SCHILLINGER, AND HODEIR*

The publication of Nicholas Slonimsky's *Thesaurus of Scales and Melodic Patterns* in 1947 coincides with Coltrane's studies at the Granoff Studios. As noted earlier, Slonimsky's *Thesaurus* is an acknowledged resource for Coltrane, which several scholars have linked to the development of 'Coltrane Changes' and the use of cyclical formations in Coltrane's later music (Demsey, 1991; Bair, 2003).[44] From a theoretical standpoint, the majority of the *Thesaurus* (pp.1–136) is essentially a compendium of pc-sets of various cardinalities and constructions, placed at symmetrical distances spanning 1, 2, 3, 5, 7 and 11 octaves. For those exercises where Slonimsky's generative scale processes produce identical pc-set T_n-types in symmetrical juxtaposition, the symmetrical distance functions as a transpositional operation for these pc-sets.[45] This aspect of Slonimsky's book is crucial to understanding its potential influence on Coltrane's melodic constructions.

---

[43] This illustration appears in McGill (2013, p.22).

[44] It was rumoured that Barry Harris (b. 1929) introduced Coltrane to the *Thesaurus*, but Harris has denied this (Porter, 1998, p.323, n.13).

[45] Jon Fiedler notes that the *Thesaurus* displays exercises reflecting the principles of pitch multiplication, an advanced theoretical process that Pierre Boulez invented in the 1950s for developing the content of his serial compositions (2017, para.8). This correspondence places Coltrane's parallel approach to pitch structure, which displays similar characteristics to pitch multiplication, at the forefront of music theoretical developments in the late 1950s and 60s. This is even more remarkable when considering that Coltrane's music is primarily improvised.

Slonimsky's exercises embody three ideas that are pervasive in Coltrane's late music: the concept of pc-sets (especially trichords) as melodic devices; the use of transposition as a developmental tool for pc-sets; and the use of interval cycles as a transpositional process. Similar to Sandole's pedagogy, the *Thesaurus* also contains bitonal arpeggios, polytonal scales, and pentatonic scales with classical and multicultural origins. Additionally, twelve-tone patterns appear in later parts of the book. My analysis in Part II demonstrates several close correspondences between exercises in the *Thesaurus* and Coltrane's improvisations.

Slonimsky makes a point of mentioning Joseph Schillinger's theoretical work *The Schillinger System of Musical Composition* (1946) in his introduction to the *Thesaurus*. While designed as a treatise on composition, which proposes mathematical processes for developing melody, harmony, rhythm, and counterpoint, the contents of the *Schillinger System* are equally applicable to the musical concerns of improvisation, with Schillinger stressing that his system is not dependent on style. Moreover, although Schillinger's system is relatively unknown today, it was influential in segments of the jazz community, including such artists as Muhal Richard Abrams, Benny Goodman, and Roland Wiggins.[46]

Several theoretical correspondences are found between Schillinger's concepts and the structural content of Coltrane's improvisations. In a chapter titled 'Theory of Pitch-Scales' Schillinger proposes a broader conception of scale that is equivalent to the post-tonal concept of pc-set, marking out 'One-unit Scales', 'Two-unit Scales', 'Three-unit Scales', and 'Four-unit Scales'. While the scales in Schillinger's list are autonomous melodic cells

[46] Donald Byrd claims that he introduced Coltrane to the *Schillinger System*. The Schillinger House of Music opened in 1945 in Boston and eventually became Berklee College of Music, one of the world's leading jazz schools.

independent of diatonic constraints, this system's flaw is that the scale formations, as ordered pc-sets, do not recognise the structural equivalence of pc-sets reduced to normal form (p.103). Coltrane's use of dyads and trichords mirrors Schillinger's concept of 'Two-unit' and 'Three-unit Scales'. Schillinger also discusses creating dyad subset derivatives of trichordal sets (p.107), and methods for 'modulating' between pitch-scales by using 'common units' (p.129), with both of these techniques frequently seen in Coltrane's music. Additionally, Schillinger proposes 'taking a smaller group of intervals or units from the original scale' as a method for 'evolving pitch-scales', with an illustration showing how to segment a heptatonic scale progressively down into its dyad components (pp.119–120). This process is similarly seen in Coltrane's music, as exemplified by 'Suite: Prayer and Meditation (Day)' (see Chapter 4.4), though of course such intertextuality does not of itself establish any neat direct cause and effect.

Nonetheless, Coltrane's connections to both Slonimsky and Schillinger, whose monographs encompass theories rooted in contemporary classical music, offer another example of Coltrane's eclecticism and inclusivity. This relationship also highlights a tension that may occur when discussing jazz and classical music, and a trope that criticises comparisons as supposedly attempting to validate jazz through European aesthetics. This dialogue exploring Coltrane's relationship to classical music serves to advance an understanding of his inclusivity and to contextualise his music. When asked about classical music during interviews, Coltrane would be dismissive of his knowledge in a typically humble manner. However, he showed a keen interest in learning about contemporary classical music and twelve-tone music, in particular.[47] One book about contemporary classical composers that Coltrane is known to have read is *Since Debussy: A View of Contemporary Music* (Hodeir, 1961).[48] While Hodeir's monograph offers an introduction to the music of Webern, Schoenberg, Messiaen, Stravinsky, Berg, Boulez, and Bartók, it also outlines some basic compositional techniques, including Messiaen's modes of limited transposition and twelve-tone construction.[49]

The topic of twelve-tone music appears in two interviews with Coltrane occurring three years apart, which seemingly display a contradictory tone. In November 1962, Coltrane stated that he was listening to more contemporary classical music and that he intended 'to do an exhaustive study of the twelve-tone works' (Devito, 2010, pp.187–188).[50] When questioned about integrating twelve-tone technique within jazz, Coltrane stressed the importance of 'doing it' [using twelve-tones] as a 'natural evolution' of musical development, citing that he had not reached a point where he wanted to play 'consistently just in a manner of twelve tones' (ibid.). While this interview takes place two years before *A Love Supreme*, Coltrane's statement anticipates its sequential motivic features and the pc-set salience of his late period: 'I still like to play over a chord base, although I do like to play

[47] *French Music and Jazz in Conversation: From Debussy to Brubeck* (Mawer, 2014) illustrates how jazz and classical music have been engaged equally in a reciprocal, fruitful dialogue of influence for most of the twentieth century.

[48] As an example of his interest in classical music, Coltrane reportedly would play along with a recording of Bartók's *Concerto for Orchestra* (Porter, 1998, p.125).

[49] During the 1950s and early 1960s, there were few theoretical texts on twelve-tone music theory beyond academic journals. George Perle's *Serial Composition and Atonality: An Introduction to the Music of Schoenberg, Berg, and Webern* (1962) is one of the first books on this subject that would have been available to Coltrane. Interestingly, 1962 is also the year that Coltrane expresses his intention to undertake an 'exhaustive study' of twelve-tone music.

[50] This interview took place on 17 November 1962, shortly after Dolphy left Coltrane's group. The subject of twelve-tone music may have been on Coltrane's mind as a result of Dolphy's constant presence during this timeframe.

passages which do contain twelve tones, but I build them in my own way of structure, you know? Sequential structure' (ibid.). Ravi Coltrane believes that the structure of *Interstellar Space* reflects a twelve-tone approach intended to convey some kind of astrological symbolism: 'John had sort of devised a 12-tone system based on the planets and various star groupings' (Shteamer, 2017).[51] Although 'Saturn' contains a twelve-tone aggregate derived from (024) (discussed in Chapter 6.2), the analysis in Part II demonstrates that chromatic saturation and twelve-tone usage is not necessarily Coltrane's overall goal, but that the priority lies more with pitch and interval integrity.

Three years later, when asked about improvising serially during an interview in 1965, Coltrane's response is seemingly apathetic; 'Damn the rules, it's the feeling that counts. You play all twelve notes in your solo anyway' (Devito, 2010, p.234). This statement is frequently offered as evidence of Coltrane's anti-intellectual musical aesthetic. Unlike the interview from 1962, this remark is not part of a formal interview with a question-and-answer format, but instead appears as an isolated quotation within an article composed mostly of author Joe Goldberg's impressions. A more nuanced view of these conflicting statements on twelve-tone music would reconcile them as indicating of the duality of spirit and intellect in music. It can be argued that what Coltrane is saying is that music must convey feeling no matter how it is constructed, not that musical construction is meaningless. As illustrated in Part II, Coltrane's late-period music displays a structural design that is remarkably similar to compositional procedures used in post-tonal classical music.

[51] What Ravi Coltrane possibly alludes to is a group of unfinished pieces by Coltrane based on signs of the zodiac that use all twelve chromatic pitches in some kind of twelve-tone configuration. Alice Coltrane mentions this in the liner notes of *Transfiguration* (1978).

2.3.3 JAZZ CONTEMPORARIES

While many of Coltrane's contemporaries merit discussion regarding their influence, for our purposes, as focused on *Interstellar Space* and *Stellar Regions*, the influences of five saxophonists are explored: Eric Dolphy (1928–64), Ornette Coleman (1930–2015), Pharoah Sanders (b.1940), Albert Ayler (1936–70), and Archie Schepp (b.1937).

Dolphy's relationship and subsequent influence on Coltrane can be understood as one which reaffirms Coltrane's innate eclecticism and interest in advanced theoretical resources and twelve-tone music. While Dolphy's aesthetics converge with Coltrane's, his music is distinct, stretching the boundaries of jazz with angular leaps and unconventional harmonic and melodic approaches that reflect the diverse influences of birdsong, Hindustani music, Art Tatum, Anton Webern, Alban Berg, Charlie Parker, and Milton Babbitt (Thomas, 2008, p.80).[52] Composers including Hale Smith and Gunther Schuller helped to introduce Dolphy to the classical music community in New York where he occasionally found work, and there are indications that Dolphy likely studied with the noted modernist composer Stefan Wolpe in 1961 while he was employed by Coltrane (Lange, 2014).[53] Although Coltrane and Dolphy's relationship began in 1954 (DeVito, 2010, p.153), it was during Dolphy's tenure in Coltrane's group (1961–62) that the two would speak daily about music and record the twelve-tone theme generally known as 'Miles' Mode' (Coltrane, 1997) (Thomas, 2008, p.80). While

---

[52] Contained in a trove of Dolphy's music held at the Library of Congress is an annotated alto saxophone part for Milton Babbitt's *All Set* (1963) and the sheet music for Edgard Varèse's *Density 21.5* (1946), inscribed by Varèse to Dolphy. It is important to note that *All Set* is Babbitt's jazz-inspired piece, with Dolphy's possession of this piece representing a circular chain of influences.

[53] Wolpe (a former student of Anton Webern) also taught noted jazz composers Gil Evans and George Russell. There is a tradition among jazz musicians in seeking out and studying with classical composers. Charlie Parker's desire to study with Stravinsky is well-known, but there are numerous other examples of older and more recent generations of jazz musicians who have studied with notable classical composers: Andrew Hill is known to have studied with Paul Hindemith; Dave Brubeck with Darius Milhaud; Ben Monder with George Perle; and Russ Lossing with John Cage.

'Miles' Mode' was attributed initially to Coltrane, scholars have argued more recently for Dolphy's authorship under the alternate title 'The Red Planet' (Shoemaker, 2019; Voss, 2012). Whether or not Dolphy's authorship is unequivocally proven, the originality of his ideas and engagement with advanced musical theories and contemporary classical music (especially twelve-tone music) likely had a significant impact on Coltrane's thinking. Coltrane's statement in 1962 emphasises both Dolphy's and Ornette Coleman's importance to his musical development:

> A year ago we had quite a few standards which made up a third of the book, but now a number of people, certainly Ornette [Coleman] and Eric [Dolphy], have been responsible for other influences. (Devito, 2010, p.117)

For jazz musicians of the early 1960s, Coleman's music represented a paradigm shift in the way that jazz was conceived and what it could represent. While the free jazz of the 1960s was not an organised artistic movement *per se*, it signified a way of seeing music that empowered artists' creative freedom, encompassing a variety of visions of what music could be, and how it could act as a force for change. Although Coltrane continued to use the piano into his last recordings, he credits Coleman with shifting his musical focus away from harmony to melody (Devito, 2010, p.102). Additionally, Coleman's impact on Coltrane can be found within the rhythmic elasticity, asymmetrical phrasing, and new type of motivic improvisation (Jost, 1974, p.48) developed in *Interstellar Space* and *Stellar Regions*. More generally, Coleman's influence resonates as an artistic archetype, embodying an unorthodox and individualistic musical approach that reflects non-linear thinking and the synthesis of interdisciplinary ideas.[54]

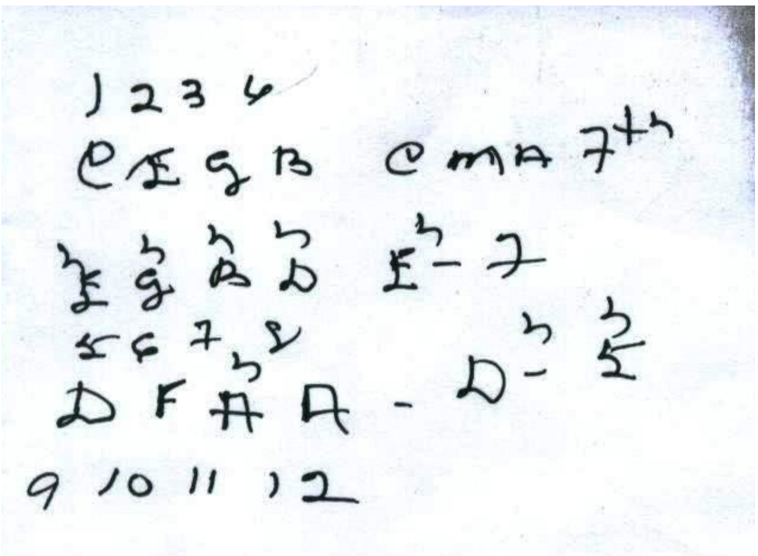
In order to understand the full potential of Coleman's influence upon Coltrane's use of pitch structure, it is necessary to engage with Coleman's enigmatic musical concept 'harmolodics'. While a precise definition of 'harmolodics' remains elusive, clues to its tenets are found in concrete musical constructs described by Coleman's long-time band member Kenny Wessel (O'Gallagher, 2016b). These 'harmolodic' forms exhibit a theoretical similarity to the melodic structures of *Interstellar Space* and *Stellar Regions*, and intertextual relationships with Dolphy and Slonimsky because of their twelve-tone structure. During a personal interview, Wessel described two groups of Coleman's 'harmolodic chords': firstly, tetrachords C major7, E♭ minor7, and D minor with an added flat fifth; and secondly, triads C minor, G♭ minor, E major, and B♭ major. Wessel explained that Coleman would describe each of these 'harmolodic chord' groups as 'ringing' all twelve notes but did not identify them as twelve-tone rows, or give instructions for their use, saying cryptically: 'if you really understood this, […] you would really know how to play' (ibid.). What these groups of 'harmolodic chords' reveal is that Coleman's 'harmolodics' comprised tangible musical structures and that there is significance in the presence of all twelve notes.

Through personal correspondence with the saxophonist Paul Dunmall (b.1953), we find evidence of Coltrane's connection to Coleman's 'harmolodic chords' (O'Gallagher, 2019). A note given to Dunmall by Coleman illustrates the lesson that Coleman gave to Coltrane in

[54] Coleman was known to quote Buckminster Fuller and was keenly interested in his futurist ideas (Wessel, 2020).

the 1960s (see Figure 2.8).[55] Remarkably, this note features the first group of ‘harmolodic chords’ described by Wessel. Additionally, another striking parallel occurs between Coleman’s second group of ‘harmolodic chords’ and constructs in Slonimsky’s *Thesaurus*, entitled ‘Division of Twelve Tones into Four Mutually Exclusive Triads (Two Major, Two Minor)’ (1947, p.177). While the analysis in Chapter 6 describes just one instance of chromatic saturation with a twelve-tone aggregate derived from (024) (as distinct from Coleman’s ‘harmolodic chords’), Coleman’s conceptual premise exerts a wider influence upon *Interstellar Space* and *Stellar Regions*.

Figure 2.8 Ornette Coleman’s note to Paul Dunmall (courtesy of personal correspondence)



The prevailing discourse on Coltrane’s late-period music overwhelmingly emphasises its sonic and timbral aspects. In the 1960s, Sanders, Ayler, and Schepp led the younger generation of avant-garde tenor saxophonists in developing new concepts of sound.

[55] The note in Figure 2.8 and story behind its acquisition were communicated to me in personal correspondence with Paul Dunmall (27 June 2019).

Coltrane's position within the avant-garde and his relationship to these saxophonists was that of a mentor. However, these younger musicians also had a profound effect on Coltrane's sound concept, inspiring Coltrane's experiments with harmonics and timbral variation. While Coltrane's expressive use of sound brought additional power and urgency to his music, his playing was fundamentally rooted in more traditional melodic (constructive) approaches. As the member of an older generation, his musical foundation was based in a melodic and harmonic sensibility that reflected the language of bebop, formed from over a decade of apprenticeships in big bands and small groups, which the younger musicians did not share. This generational divide is evident in Coltrane's recordings with Sanders. As Medwin notes: 'While Coltrane relies occasionally on extra-musical utterances to make his point, these timbral twists and turns would be the property of Pharaoh Sanders more than they were of Coltrane, leaving the latter to play mostly pitched tones in his solos' (2008, pp.55–56). Additionally, the saxophone's timbral and harmonic variety provided Coltrane with a gateway into microtonal sounds simulating the alternate tunings of world music – his long-held fascination. Ultimately, Coltrane's embrace of younger musicians, and of the expanded sound palette of the avant-garde, serves to demonstrate his inclusive philosophy.

The intersecting threads of influence in this discourse, both the substantiated and speculative, enable a greater understanding of how Coltrane's complex background and interests are potentially manifested in the music of *Interstellar Space* and *Stellar Regions*. Although several aspects of Coltrane's musical education parallel remarkably the structural approaches in Part II, this in no way diminishes Coltrane's extraordinary accomplishments but rather illustrates the crucial relationship that artists have with their environment and culture. Coltrane's revolutionary artistry is a testament to his unique abilities, vision, and devotion to forging an individual musical identity from diverse resources. The specific impacts of the influences posited here are further nuanced within the analyses in Part II.

CHAPTER 3: ANALYTICAL ISSUES AND APPROACHES

INTRODUCTION

For more than a decade, jazz scholarship has generally come to be represented in terms of a complicated binary: cultural studies and music analysis.[56] In order to clarify the definition of music analysis in this context, it is used here to mean investigations into the musical construction of a piece (notes, rhythms, harmony, motivic development, phrasing, articulation and the like), whereas other types of analysis might bring ethnomusicological or cultural approaches to understanding music-making (such as work by Paul Berliner (1994) and Monson (1998)). While it is futile to omit one or the other, it remains the case that the New Jazz Studies (which emerged in the 1980s) has been a dominant focus in scholarship, with the role of jazz analysis often lost in the debate. Therefore, detailed analytical investigations such as this thesis are critical in advancing the conversation on Coltrane: bridging the binary divide through sensitivity to sociocultural issues; demonstrating how analysis can play a crucial role in current jazz studies; and how cultural studies and analysis work best in conjunction to reveal the nature of Coltrane's later music.

As touched on in Chapter 2, a recurrent theme in criticisms of jazz analysis is its supposed attempt to 'classicise' jazz through (European – classical) analytical viewpoints of musical coherence and unity (Walser, 1993, p.348). However, Walser's argument that a chief purpose of analysis has been to legitimise jazz through demonstrating its motivic coherence now appears outdated and narrow, ignoring more practical motivations for analysis and the

[56] This divide is similarly found in music analysis as exemplified by the essays of Joseph Kerman (1980) and Kofi Agawu (2004).

interconnected history of jazz and classical music: ‘Coltrane was as much an heir to all that Bach and his descendants gave the world as he was to the blues’ (Crouch, 2006, p.214). The meaning and nature of analysis are always evolving, and the jazz – classical divide is not so easily defined. Scholars such as Deborah Mawer (2014), Mervyn Cooke (2002), and Jeremy Barham (2009) have expounded on the relationship between jazz and classical music as an ongoing dialogue throughout the twentieth century. Furthermore, questions as to the value of musical coherence and unity in analysis are issues debated not only within jazz scholarship but also within the broader community of music analysts (Morgan, 2003). Current perspectives offered by Nicholas Cook on the nature of analysis and musical meaning navigate a new path for analysis beyond the traditional concerns for coherence, pressing ‘into service’ tools originally envisaged as a means of demonstrating unity:

> [T]ools conceived under the formalist regime as means of demonstrating music’s unity and autonomy may just as well be pressed into service as means of measuring degrees of unity, charting the limits of music’s autonomy, and locating aporias and points of slippage; they then become the instruments of what I referred to as a critical theory of musical meaning. (2001, p.191)

Cook’s prioritisation of music’s emergent properties creates an environment where music can be understood as comprising variable states of unity, disunity, and interaction. This perspective crucially informs the analysis in Part II, where musical structures emerge, diverge, interact, and transform within Coltrane’s improvisations. Other topics interrogated in Chapter 3 engage with a range of relevant issues impacting the analyses in Part II: Working with Audio Recordings in Musicology; Issues of Transcription; Structural Stability in

Atonal Music; Set Theory as a Primary Methodology; and Motivic and Voice-Leading Approaches. Finally, this chapter concludes by outlining the organisational agenda of the analyses in Part II.

3.1 WORKING WITH AUDIO RECORDINGS IN MUSICOLOGY

> [R]ecording has fundamentally transformed how music […] is composed, performed, heard, mediated and understood. (Dingle, 2019, p.2)

It can be argued that audio recordings define the arc of jazz history and its propagation. Due to the social nature of jazz as a predominantly improvised music without notated scores, recordings are its crucial texts, with their fixed quality exerting an underlying determinacy: 'To some extent, recordings in jazz take the place – and assume the same textual authority – of scores in European music' (Hodson, 2007, p.1). As the textual equivalents of musical scores, recordings are essential sources for jazz study. Recordings facilitate repeated listening that live performances do not, enabling the critical analysis of an artist within the context of their time, within current practices, and with regard to changes in their performance techniques. Therefore, recordings are crucial to any analytical attempt to understand and analyse Coltrane's music:

> [A]nalytical practice positively *requires* recordings for analysis of jazz improvisation: they enable repeated listening, which favors the kind of in-depth exploration that characterizes analysis; they guarantee the potential for intersubjective corroboration of analytical insights; and their textualization through transcription facilitates the application of common analytical tools. (Butterfield, 2001–02, p.328)

While recordings serve as a window on a historical past, they equally refer to an 'eternal present' (Dingle, 2019 p.4), generating their own resonances and multiple meanings. Furthermore, as documents integrally tied to social environments, recordings are 'powerful cultural artefacts that can affect peoples' lives, inspire future generations, and act as a beacon for social change' (Whyton, 2013, p.18). The recordings *Interstellar Space* and *Stellar Regions* exemplify the idea of recordings as 'cultural artefacts', with their posthumous releases (separated by decades) having an ongoing effect on cultural attitudes, perceptions, and narratives. Interestingly, as posthumous releases, their ethics become an issue of debate, with critics accusing record companies of monopolising on famous artists by releasing sub-standard music that artists might not want made public (Haynes, 2018).[57] Conversely, this brings into question whether an artist is always the best judge of their art. Critical speculation as to what impact an artist's sense of mortality has on the quality of their posthumous releases is a relevant issue for Coltrane, with the shorter length of several pieces within *Stellar Regions* questioned as potential signs of his undiagnosed illness (Porter, 1998, pp.288–289; Wild, 1995). However, this conjecture is neither supported by similar evidence on *Interstellar Space* (recorded one week later) and *Expression* nor by the content and energy of Coltrane's solos. Moreover, if we did not have access to Coltrane's posthumous recordings, no analysis of this music would be possible, and our understanding of his musical accomplishments would be seriously diminished.

Musicological analyses of performances as represented by recordings (and by extension music scores and transcriptions) are the object of criticism by Carolyn Abbate (2004).

[57] A critical entry for *Stellar Regions* in *The Penguin Guide to Jazz* (Cook and Morton, 2004, p.345) speculates that Coltrane may not have wanted it released (see Chapter 1.2, p.9).

Abbate argues that recordings and scores serve to distance musicologists from the experience of music and that the act of musical performance itself should be the main focus of study. One useful distinction that Robert Philip makes between live performances and recordings is that recordings have the effect of normalising a listener's reactions with repeated listening, mediating startling and novel qualities in music through familiarity (2004, Kindle location 5452). While live performance communicates many tangible and intangible qualities, Abbate's analytical point of view is extreme and limits the ability to investigate myriad musical issues. Equally, this perspective ignores the fact that recordings can be the primary performative text: an artefact wholly produced by tools available in the studio. Moreover, however desirable in theory, in instances where the artist is already deceased, there is obviously no possibility of analysing a live performance.

Another aspect of the live concert and studio recording binary concerns their performative differences. Audience feedback during live performances creates an atmosphere of excitement, while studio recordings are viewed generally as less spontaneous and more considered. However, there is an underlying contradiction in these viewpoints since studio recordings are often also the most revered documents in jazz and other musics. Henry Martin explains: 'On some live performances, the spontaneity and excitement insufficiently compensate [for] the lack of forethought and balance more characteristic of studio work' (2001, n.89, Kindle location 2405). Although numerous significant live recordings distinguish Coltrane's work, it is his studio recordings – such as *Blue Train*, *Giant Steps*, *A Love Supreme*, *Ascension*, and *Interstellar Space* – that have nevertheless had the most far-reaching impact. As Martin suggests, although studio recordings may display the characteristics of 'forethought and balance', this is not to say that they are without spontaneity and risktaking. In Coltrane's late period (1965–67), the studio functioned as a laboratory for experimentation, as a place to take more chances, and to flesh out ideas away from audiences (Davis, 2000). This topic of the studio as laboratory presents a challenge for musicologists in defining the relationship between artistic process (for example: improvisation and experimentation), the (recorded) artefact that it creates, and a listener's perception and understanding of that recorded work. Beginning in the 1950s, the introduction of the long-playing (LP) phonograph record format, and a growing awareness of jazz as a fine-art, created extended soloing conditions that allowed musicians to experiment with motivic-cum-thematic development, thus facilitating the later growth of modal and free jazz (Martin, 2001, n.152, Kindle location 2570).[58]

The recording studio also functions as an important tool for artists, enabling music development through editing and recording multiple alternate takes. Editing varied recorded takes into one master track is a powerful tool for realising idealised versions of an artist's vision. While there is no evidence that edits occur in *Stellar Regions* or *Interstellar Space*, we know that the idea was agreeable to Coltrane because editing was used to fix a note squeak in 'Resolution' (from *A Love Supreme*) (Porter, 1998, p.332), and inserts were recorded and left unused during the *Sun Ship* session. Similarly, the recording of alternate takes is a common way for jazz artists to refine a piece, providing musicologists with a window into the creative process that is akin to musical sketch study (Sallis, 2015, pp.3–4). In the progression from take to take, alterations in the performance of the theme, group interaction, and the content of the improvisations reveal the creative aspects that are

[58] For further reading on this topic, see Jed Rasula's article 'The Media of Memory: The Seductive Menace of Records in Jazz History', found in Jazz *Among the Discourses* (Gabbard, 1995).

unique to a take. Additionally, the sequence in which these takes occur impacts on our understanding of the relationships between them. With the recordings *Stellar Regions* and *Interstellar Space*, the mislabelling of the 'Sun Star', 'Tranesonic', and 'Jupiter Variation' alternate takes undermines their significance as being in fact the first recorded takes of 'Sun Star', 'Tranesonic', and 'Jupiter'. It is through examining the recording session logs that the track lengths reveal these changes by Impulse! Records. An awareness of the correct sequence in which the tracks were recorded significantly impacts upon our observations and directly informs the analysis in Part II.

In the same way that alternate takes provide an opportunity for critical reflection on the development of a piece, the contrasting of two or more recording sessions can provide insights into artists' focus of interest, the evolution of their ideas, and changes in their style. The sign of constant change is a fundamental trait in Coltrane's music, found early in his career as recalled by Eddie Vinson (1917–1988): 'That ol' boy was something. He changed his playing every six months almost. Even now you can never tell what he's going to be playing six months from now' (Devito, 2010, p.146). Coltrane's words emphasise this point, revealing an underlying philosophy: 'Progress in jazz can be made consciously' (ibid., p.121). Through examining and contrasting the structural content of *Stellar Regions* and *Interstellar Space* – recorded only one week apart – an underlying improvisational focus is revealed across the two recordings taken as an entity. Furthermore, the analyses in Part II demonstrate that the contents of these two recordings represent an evolution in Coltrane's approach to pitch structure derived from earlier recordings, thereby rebutting the persistent notion that Coltrane's later music breaks fundamentally with his earlier style.

3.2 ISSUES OF TRANSCRIPTION

In the musicological study of classical music, the compositional score typically functions as a crucial primary source, with its recorded performance(s) producing a secondary source for study. However, because recordings are primary texts in jazz, musicologists and analysts frequently work through repeated listening and transcription. While the common definition of a 'transcription' is understood as the notation of an audio recording, it also has meanings encompassing the transfer of a musical work from one medium to another (such as from orchestra to piano), and the notation of live performances as exemplified say by Liszt's thematic elaborations. For jazz musicians, transcription also implies a larger pedagogical meaning – the memorising by ear and embodying of a piece of music through its performance as a means to develop jazz improvisational skills. This type of transcription has been a crucial factor in the development of jazz throughout its history.

The value for musicians in producing transcriptions for themselves seems self-evident since the act develops aural skills and technique, instilling a far greater familiarity with the music's structure and stylistic nuances than can be attained from working with published transcriptions. However, in musicology (and frequently in Coltrane studies) analytical interpretations are often based on published transcriptions. This usage is understandable given the extensive time commitment that transcription requires and the specialised skillset needed. The danger for musicologists, though, is that by using commercial transcriptions, control of the first analytical stage is relinquished and distancing from the music can occur. As the first analytical statement about a piece of music, the act of transcription 'acknowledges the analyst's point of view, reveals theoretical agenda, musical background – all the usual, but significant predispositions' (Martin, 2001, Kindle location 247). More positively, I would argue that the act of transcription also engages the musicologist in a distinctive relationship with the music, enabling insights that otherwise might not occur. For this reason, all the musical analyses in this thesis use my original transcriptions. While inherently these transcriptions are interpretations and cannot wholly represent the music, I have attempted to be as faithful to the recordings as possible by accurately documenting the pitches, rhythms, rests, and other significant features relevant to the analytical focus.

Overall, the transcription process for this study has encountered numerous challenges. In approaching this work, I bring over thirty years' experience in creating transcriptions for my own use and publication as a professional saxophonist. Given the complexity of Coltrane's music, it was necessary to use a commercially available computer programme (the Amazing Slow Downer, Roni Music, 2001) for altering the speed of some pieces and sections. Various speed adjustments were used to slow down specific fast improvisational passages while repeatedly referring back to the original speed to validate observations and to avoid documenting possible extraneous artefacts in the sound produced by the speed alteration. Since proofing the transcriptions was important to ensure quality and accuracy, commercial transcriptions – published by *Andrew's Musical Enterprises* (White, 2016) – were employed comparatively as points of reference. While there are methodological differences between White's transcriptions and my own, this approach helped to ensure a rigorous transcription process. Comparison was not possible in instances where White's transcriptions remain incomplete, such as with 'Leo'.

Except for 'Saturn', which has a theme clearly in 3/4 metre, the music comprising *Stellar Regions* and *Interstellar Space* is played freely without a fixed metre and therefore is transcribed without a metre or bar-lines. While Coltrane's themes may reference major and minor tonalities, the music wanders chromatically between thematic statements avoiding any referential tonality, and so the notational methodology of atonal music was employed, eschewing the use of key signatures. I argue that this practice achieves greater clarity despite the visual density that sometimes results from the marking of accidentals. Indeterminate pitches (especially notes that are muffled or do not speak clearly) are indicated by 'x' note-heads. Similarly, accidentals embedded with arrows indicate significant intonational variants (as either up or down). The tenor saxophone material is notated one octave higher than it sounds to avoid frequent changes between treble and bass clefs. Diamond note-heads indicate harmonics resulting from the manipulation of the saxophone's sound: such harmonics typically ring above their louder fundamental pitches, and so both pitches are notated. In some instances, where a series of harmonics sound independently in the *altissimo* range (E5 or higher) – as a result of throat shape, air, and embouchure manipulation – the harmonics are notated without any fundamental pitch (the method used for identifying pitch registers is explained in section 3.4 below). Other aspects of the musical performance such as grace notes, glissandi, and falls are conventionally notated.

Since the music is free of any consistent, metered tempo and no regular periodic synchronisation occurs between players, the methodology employed for rhythm notates the relative temporal relationships between pitches. The rhythmic values appear according to their relative proportion and context, within the saxophone part, and between the combined ensemble (as in 'Iris' with the saxophone, piano, and bass). This transcription method is similar to that of White's, although I include rests to represent moments of silence or breath, whereas White generally does not do this. In my view, the inclusion of rests more accurately represents the music, and also provides visual cues for readers to follow the music with greater ease when combined with listening.

Passages in the saxophone part that involve extended techniques presented a more significant transcription challenge than conventional melodic lines. Traditional notation eventually became inadequate in representing individual sections of music where rapid descending melodic lines transform into explorations of sound, texture, and the manipulation of harmonics. However, although worthy of study, the content of these sections invariably falls outside of the analytical focus of this thesis.[59] Other transcriptive issues encountered concerned the recording's balance between instruments. Balance issues were most prevalent in 'Iris' where the recording levels of the piano and bass were mixed lower than those of the saxophone. Determining the octave doublings in the piano voicings was thus more difficult because of this imbalance. Additionally, identifying the piano pitch content played by the left hand posed another challenge during loud and intense sections. During these passages, the low frequencies in the bass and drums begin to cover up the piano's lower register. Various types of sound equalisation available within the Amazing Slow Downer software (Roni Music, 2001) have been applied to seek to address these audio issues. Despite this intervention, during one intense and dynamically loud section in 'Iris', the bass pitch content remains obscured, and so only the rhythmic content and melodic shape are indicated.

[59] Timbral issues in avant-garde jazz are explored in 'Timbral Virtuosity: Pharaoh Sanders, Sonic Heterogeneity, and the Jazz Avant-garde in the 1960s and 70s' (Solis, 2015).

Upon completion of the 'Jupiter Variation' transcription, significant points of difference were found in comparison to White's transcription. After re-examining these discrepancies carefully numerous times, it was determined that White's transcription contains two sections that are written one semitone too high. This error appears in his transcription shortly before rehearsal mark letter E, continuing halfway to letter F, and then again for the entirety of the passage labelled letter G. While White's transcriptions are a valuable resource for students and scholars, this instance clearly illustrates why it is important in musicology to produce one's own original transcriptions. The transcription of 'Leo' also presented difficulties regarding variations in the intonation of the saxophone: during particularly intense and expressive passages, the saxophone intonation sometimes becomes sharp, posing a challenge to the transcription process. For this reason, Tony Sonic Equaliser was used to quantify the pitch variance during the statement of the theme constructed from pitches E4 and E5: it indicated the frequency of these respective pitches as 340.95 Hz and 689.325 Hz, significantly higher than the frequency standards of 329.63 Hz and 659.25 Hz. In other sections where intonation issues occur, it was not possible to check with the equaliser because the recording's complexity inhibited precise readings. However, the application of this process to the theme provided useful baseline data.

3.3 ISSUES OF STRUCTURAL STABILITY IN ATONAL MUSIC

Stellar Regions and *Interstellar Space* have a complex harmonic character, displaying elements of tonality, broader modality and atonality within two different types of ensemble contexts. While studies of Coltrane's music have frequently engaged with its tonal properties, its atonal aspect is less clearly understood. According to Fred Lerdahl, an analytical method for atonal music should address the principles of hierarchical listening. In adapting several main concepts for atonal analysis that were founded in *A Generative Theory of Tonal Music* (1983), Lerdahl states:

> In the absence of distinctions in tonal stability, the listener organizes the musical surface by its fluctuating salience, through the processing of factors such as duration, loudness, density, and registral extremes. The atonal prolongational theory represents this fluctuation by progressively reducing out events that are less salient in their immediate prolongational context, leaving a residue of perceptually prominent events at each reductional stage. (1998, p.306)

Lerdahl proposes a set of criteria (1989, pp.73–74) for establishing the salience of these more 'prominent events' within local regions (conditions a.– g.) and global regions (conditions h.– j.) as 'salience conditions' (see Figure 3.1). During the process of analysis, he prioritises the observation of local salience conditions before moving on to the global salience conditions. While Lerdahl's atonal prolongation theory is not used as an analytical tool in this study, its salience conditions prove highly relevant in describing elements that contribute to structural stability in Coltrane's improvisations. Examples of this phenomenon are seen where the duration of specific pc-sets is relatively extended in Coltrane's solos, with accented, repetitive rhythmic patterns creating structurally stable areas. Additionally, parallel usage of pitch structure sometimes appears between sections that are temporally disconnected.

Cognitive research by Nicola Dibben (1999) supports aspects of atonal prolongational theory, suggesting that listeners hear in terms of structural importance, while being influenced by issues such as metrical, rhythmic and durational structure, dissonance, and the horizontal movement of voices. Although Dibben's research proved inconclusive as to the effect that pitch commonality has upon a listener's perception of structural stability, I would argue that consecutive pc-sets that share common-tones often increases the sense of structural stability. Coltrane's improvisations display a smoother motivic surface with less harmonic fluctuation where common-tones are shared between pc-sets. Additionally, the emergence of interval-cycles as transpositional processes for pc-sets produces instability from their motion and greater stability upon their conclusion.

Figure 3.1 Salience Conditions, as defined by Lerdahl (1989)

a. attacked within the region
b. in a relatively strong metrical position
c. relatively loud
d. relatively prominent timbrally
e. in an extreme (high or low) registral position
f. relatively dense
g. relatively long in duration
h. relatively important motivically
i. next to a relatively large grouping boundary
j. parallel to a choice made elsewhere in the analysis

The post-tonal concept of centricity, that is, the structural prominence of specific pitches or pitch-classes, shares similarities with aspects of Lerdahl's atonal prolongation theory and its salience conditions. Joseph Straus (2005, p.131) states a similar set of contextual criteria for establishing pitch centricity such as duration, frequency, register, dynamics, rhythm, and metric placement which prove useful to my own approach in Part II. As concepts particularly applicable to Coltrane, pitch centricity, and by extension the idea of the referential centre, is expanded by Straus to include pc-sets and T_n-types as referential centres if they are 'sufficiently reinforced'. While Coltrane's improvisations may exhibit pitch centricity, a more significant impact on structural stability results from the saturation of pc-sets and T_n-type referential centres. Straus states:

> A sense of centricity often emerges from the use of stable, referential collections. Composers often use certain large sets as sources of pitch material. By drawing all or most of the smaller sets from the single large referential set, composers can unify entire sections of music, particularly if the referential set is associated with a specific pitch or pitch-class center. (2005, p.140)

As previously touched on in Chapter 1.5, the increased use of motivic development in modal and free jazz (including by Coltrane) mirrors that of post-tonal concert music, where motivic development is an essential concept for promoting structural stability (Schoenberg, 1995, p.169). This idea of motivic development is exemplified by Schoenberg's concept of *Grundgestalt* or 'basic shape' – a piece's central motive that grows through its repetition and developing variation – which theorists such as David Epstein (1987) have expanded upon. Crucially, in many post-tonal works, and as the Coltrane analyses in Part II point out, the notion of a motive is often synonymous with that of a pc-set (Straus, 2005, p.33). The highly influential theorist Allen Forte (see section 3.4 for further discussion of Fortean set theory) elaborates on pc-set motives as manifestations of intervallic consistency and structural stability:

> Motivic applies not only to pitch configurations that have identical or nearly identical surface characteristics […] but also to pitch

> configurations that are expressions of the same pitch-class set, configurations that may differ radically from one another with respect to order, register, rhythm, and other features, yet still retain fundamental properties in common, the most basic of which is, of course, interval content. (1985, p.475)

Within the recordings *Stellar Regions* and *Interstellar Space*, 'Iris' is the most evocative of Schoenberg's principle, with the pc-set motive synthesising ideas of variability and cohesion over its entire length. More broadly, within jazz analysis, Ed Green (2008) has drawn upon the idea of *Grundgestalt* as a relevant and overlooked way of investigating Duke Ellington's music and jazz improvisation in general. Green engages with the interplay of conscious and unconscious creative procedures – recognised as significant issues by *Grundgestalt* theorists – and the way the musical potential of the 'idea' unfolds through the act of improvisation (ibid., p.216). As Green points out, 'it is precisely this interplay of mind at its most sharply conscious and mind in touch with varying levels of subconscious spontaneity that characterises the creative act' (ibid.).[60]

The affinity between the structural content of Coltrane's improvisations in Part II and Green's critical use of *Grundgestalt* for jazz, which considers the impact of both conscious and unconscious improvisational processes upon motivic development, brings into focus the point that there are aspects of improvised performances that promote structural stability while being exceedingly difficult to quantify. As expert improvising musicians who embodied musical principles and knowledge of the jazz tradition, the instincts of Coltrane and his band

[60] Interestingly, the concept of improvisation as an animating force for motivic variation in composition was also a central idea for Schoenberg (2010, p.439).

members periodically synchronise aspects of their performances to create areas of greater structural stability spontaneously.[61] This stability can involve myriad elements such as rhythm, phrasing, harmony, dynamics, density, and timbre. Ultimately, the collected issues around atonal structural stability involve positions that relate fundamentally either to the listener's or the creator's perspective. An analytical consideration that is inclusive of both of these viewpoints will provide a broader understanding of the music examined in Part II.

3.4 SET THEORY: ADVANTAGES, LIMITATIONS, AND USE AS PRIMARY MEANS

Musical set theory (often grouped within the theoretical umbrella of *post-tonal theory*) invokes concepts that are, ostensibly, 'foreign' to the practices of jazz improvisation. However, there are numerous parallels between the theoretical principles of set theory and approaches that are inherently part of a jazz musician's practice, which thus constitutes one of several advantages in employing set theory for jazz analysis. While operating within a fully chromatic twelve semitone nomenclature, rather than as a seven-note scale, the concept of pitch-class space in set theory is found nevertheless in the type of chord symbol systems that many jazz musicians use. Chord symbols in jazz convey harmonic information and movement in pitch-class space, without specifying voicing or pitch placement. The set-theoretic concepts of superset and subset are similarly found in well-known jazz pedagogical approaches where chord scales are segmented into tetrachordal pc-sets (comprising specific chord tones and tensions), for use as melodic applications upon corresponding harmonies (Bergonzi, 1992).

[61] While this topic is certainly worthy of further research, it is beyond the scope of this dissertation. For more on improvisation and self-organisation see 'Improvisation and the Self-Organisation of Multiple Musical Bodies' (Walton, et al. 2015), and *Sync or Swarm* (Borgo, 2005).

Indeed, another standard jazz pedagogy forms hexachords from the combination of two triads (combinations of major, minor, augmented, and diminished) as motivic structures that are applied to various harmonic scenarios (Weiskopf, 1995). Furthermore, the concept of intervallic consistency as enabling structural coherence within post-tonal music is also found as a principle in chromatic improvisational methods (Bergonzi, 2000; Liebman, 1991; O'Gallagher, 2013).[62] As the pedagogical practices of Sandole in Chapter 2 demonstrate, many of these approaches to pitch structure date back to early points in jazz's evolution. Moreover, within Coltrane's improvisations, there is wide-ranging evidence of a motivic focus on three-note sets, which is another reason for the use of set theory being advantageous. The prominence of trichords offers a significant clue to the presence of an improvisational framework concentrating on pc-set structures and interval content. Since set theory provides specialised tools to address music constructed in this manner, it has been adopted as the principal methodology used for these analyses (for other, more circumscribed, analytical work using set theory for Coltrane, see again Chapter 1.6). Although set theory and its analytical tools represent the primary means, this study employs a hybrid approach that also incorporates aspects of motivic and voice-leading analysis (see section 3.5 below) as well as jazz improvisation and its harmonic practice, to enable a greater understanding of the pitch structure.

The two major approaches to pc-set theory are outlined by Forte (1973) and John Rahn (1980), with a principal difference between them concerning methods for naming a pc-set's 'representative form'. This study uses Rahn's method for naming a pc-set's 'representative

[62] It can be argued that Coltrane has been an influence on many of these pedagogies.

form', indicated by the term 'T_n-type' (transpositional-type).[63] It is preferred as an alternative to that of Forte (whose prime forms recognise equivalence among inversionally-related members) because Coltrane's improvisations predominantly demonstrate transpositional (T_n) relationships (additional set-theoretic terminology and concepts are based broadly on those described by Straus (2005)). In accordance with Rahn's method, parentheses are used as an abbreviation for the enclosed representative forms when naming T_n-types (e.g. (013) = (013)T_n). Integers represent the pitches of the chromatic scale (C through to B) from 0 to 11 (10 = T, 11 = E) within the enclosed representative forms. Although *Basic Atonal Theory* (Rahn, 1980) uses commas between integers when naming a pc-set's T_n-type, in this study they have been eliminated for clarity and because their use is not standardised within theoretical literature. Pc-sets are presented in the analyses, primarily either as T_n-types (e.g. (013), (024), etc.), or in normal form – with pitch-classes enclosed by braces {} (for example {D, E, F} and {A, B, C}) – to illustrate the structural relationships at multiple levels. The operation of pc-set transposition is represented by 'T_n, where T stands for transposition and n is the interval of transposition' (Straus, 2005, p.39). Similarly, the operation of pc-set inversion is represented by I_n, where I stands for inversion and n is the index number (inversional axis). An index number is produced by the mod-12 summing of integers contained within inversionally related pc-sets. Pc-sets may be written using integers, or pitch-classes depending on the analytical situation. When it is necessary to identify specific pitch registrations, these are indicated by using Scientific Pitch Notation (also known as American Pitch Notation (Hamm and Hughes, 2021)) designating a letter, accidental (when needed), and a number for the octave placement (for example, G4 or G5).

[63] Milton Babbitt is acknowledged as the father of post-tonal theory, authoring influential theoretical works, musical compositions, and mentoring students from as early as 1948.

Finally, interval cycles are indicated by the letter C, followed by a number representing the generating interval (1 through to 6). Specific transpositions are denoted by a subscript number indicating the first pitch-class of the cycle as an integer.

The substantial advantage in using set theory, in conjunction with post-tonal theory, over other methods is that it provides a framework for identifying motives played by Coltrane as members of specific pc-set T_n-types, so facilitating a deeper understanding of the musical structure than terms like 'cell' or 'motive' (which have dominated much of the discourse on late-period Coltrane) can achieve. Furthermore, I contend that set theory provides useful tools for identifying: (1) transpositional and inversional relationships between pc-sets, (2) subset and superset interaction, (3) intervallic cohesion resulting from the projection of specific intervals through groups of pc-sets, (4) the transpositional combination of pc-sets, (5) the interval content as ordered and unordered pitch intervals, or as pitch-class intervals, and (6) the use of interval vectors to understand the intervallic profile and sonority of given pc-sets. Yet another advantage of set theory is that it provides a means for recognising structural unity in instances where the motivic surface is fragmented, either through registral partitioning, or where the pc-set structure expands and contracts.

While set theory remains an extremely useful analytical tool, it is of course not without its limitations and critics. Forte's numbering system for cataloguing pc-sets has often been criticised as arbitrary and difficult to memorise (Pople, 1994, p.119). More significantly, the assumption of inversional equivalence has been a significant problem for many theorists. Critics argue (Lerdahl, 1989, p.66; Pople, 1994, p.119) that inversional equivalence ignores the differences in sonority between pc-sets, as exemplified by the sound of major and minor triads which Forte categorises as members of the same set class. However, these two issues are not relevant to my study which favours Rahn's method for naming a pc-set's T_n-type as its 'representative form', and because inversional relationships are illustrated between T_n-types.

One particular criticism levelled at Fortean set theory by Lerdahl concerns the 'absence of analytic connections among pitch-classes within an assigned set' (1989, p.66) since some pitches may be structurally more important than others. I would argue that the incorporation of aspects of atonal voice-leading (see section 3.5 below) addresses this issue. Another frequent criticism is that there are no formalised criteria for segmentation. Lerdahl (ibid.) suggests there is potential for the creation of a system of segmentation that modifies the 'well-formedness' rules and 'preference' rules outlined in *A Generative Theory of Tonal Music*, though he also acknowledges there may be opposition to his system because more precise operations pertain within set theory (which he questions on perceptual grounds). Nicholas Cook views the problem of segmentation pragmatically, embracing its human element since he views analysis as ultimately subjective and not a science. He argues that this does not invalidate analysis, but 'that whatever validity or meaning it may have must be a musical one, not a scientific one' (1987, p.151). Straus also emphasises that segmentation is subjective and that note groupings should reflect the music in some meaningful way, stressing the importance of detailed listening (2005, p.60). Segmentation should 'try to forge meaningful networks of relationships, teasing out particularly striking strands in the musical fabric' instead of searching for only one musical source (ibid.).

The nature of the analyses in Part II is focused mainly on a single melodic line, and thus many of the issues that would typically be encountered regarding the segmentation of musical scores with multiple instrumental staves are not present. In determining the criteria for segmentation in this study, my most obvious, and natural choices have often been informed by where Coltrane rests. As Block states: 'Simple segmentations, suggested largely by the performers' pauses, seem appropriate to analysis of free jazz because these compositions are often created and/or elaborated spontaneously. […] the relationships that fall out of such segmentations seem clear, rich, and structurally important' (1990, p.202). Beyond this principle, the segmentation criteria in Part II are based upon repeatedly listening for musical characteristics such as motivic parallelism, registral proximity, rhythmic emphasis and grouping, and repetition. Christopher Hasty similarly stresses the importance of listening, organising segmentation into a two-step process: 'The first step is introspective in nature and entails listening to the music very carefully and noting various structural perceptions. In the second step rules are devised to form a theory which might account for these perceptions' (1981, p.55). Furthermore, other segmentations in Part II reflect recurring structural patterns in Coltrane's improvisations, serving to enhance the understanding of the developmental procedures taking place. In some instances, more than one analytical segmentation is offered to address specific complexities and issues. When musical events require, overlapping segmentation is used to facilitate a deeper understanding of the unfolding relationships and structural networks being formed.

While the various criticisms of set theory clearly hold some validity, they do not detract from the overall usefulness of its analytical tools. In instances where set theory is insufficient for revealing meaningful structural connections, the analyses in Part II engage with jazz harmony, improvisational practices, and voice-leading approaches.[64] Although hybridised analytical approaches are useful for many types of twentieth-century music, as seen in Mawer's *Darius Milhaud: Modality and structure in the Music of the 1920s* (1997), the hybridisation of the analytical techniques in this thesis is essential because Coltrane's music is first and foremost improvised, embodying a musical heritage distinct from the practices of twentieth-century post-tonal music that set theory was initially designed to interpret. As Block notes in 'Pitch-Class Transformations in Free Jazz':

> The art of free jazz seems to require that the improvisers […] think more in terms of relationships defined by interval class; in both tonal and non-tonal contexts. For this reason, free jazz has an affinity to early twentieth-century concert literature […] While early twentieth-century composers constructed their pc-relations, jazz musicians heard them in improvisation – which suggests that pitch-class and non-tonal relations can develop naturally out of musical practice. (1990, p.202)

3.5 MOTIVIC AND VOICE-LEADING APPROACHES

The principal analytical approach in Part II maps the way that pc-sets are used as motivic structures, examining them for traits as a compositional and improvisatory methodology: hence, it is still important to pay sufficient attention to this motivic domain. As Edward Pearsall notes, post-tonal techniques based on Forte's methods (1973) allow for the recognition of motivic variation such as 'rhythmic augmentation and diminution, interval expansion and contraction, the deletion of motivic pitches, the insertion of non-motivic

[64] For resources on jazz harmony and improvisational common practice see *The Jazz Harmony Book* (Berkman, 2013), *The Jazz Theory Book* (Levine, 2011), *The Jazz Piano Book* (Levine, 1989), and *A Creative Approach to Jazz Piano Harmony* (Dobbins, 1994).

pitches, tonal adjustments to intervals, chromatic inflections, truncation, reordering, fragmentation, additive processes, transposition, and other ordered as well as unordered operations' (2004, p.71). While contour and rhythm are considered as important surface characteristics of the motives, this thesis focuses on which pc-sets are utilised and how they are transformed, so revealing the underlying structural unity that binds the motivic surface. The analytical approach to motivic contour adopted in Chapter 4.1 is similar to a method outlined by Pearsall (as inspired by Lora Gingerich (1986)) that focuses on two gestural aspects of motives: 'contour' and 'ordered interval content'.

During the analysis of 'Iris', motives are examined as rotational permutations of the trichordal pc-sets that emerge. These rotational contours are labelled (N, N1a, N1b, N2, R, R1a, R1b, R2a, R2b) to promote an understanding of the issues involved in the creation of the motivic surface, and how these are reflected globally within all the improvisations examined in this study (see Chapter 4.1 for detailed definitions of these labels). The contextualisation of pc-set motives highlights homogeneous or heterogeneous relationships, according to their T_n-type. Brief disruptions within regions where homogeneous T_n-type salience has been established are identified as representing a type of divergent property. In Chapter 4.2, seven such categories serve to organise these events according to how they disrupt the T_n-type homogeneity.

The characteristics outlined in these divergent categories are equally relevant in musical contexts where there is no single salient T_n-type. In these instances, the motivic surface results from the integration and generation of heterogeneous pc-set T_n-types. The transformational processes between T_n-types express expansions and contractions of the pc-set structure. Moreover, structural cohesion results from the projection of salient interval-classes across the varied motivic surface. Salient interval-classes are sometimes represented in the analysis as dyad components of consecutive trichordal and tetrachordal supersets, while the relationships between subsets and supersets constitute an essential aspect of motivic development. Additionally, an analytical priority is the identification of patterns resulting from the transposition and inversion of pc-sets: these potentially express repeated patterns, interval cycles, referential pc-sets, and supersets.

Although the analytical focus in Part II, beyond set theory *per se*, is mainly motivic, voice-leading formations do nevertheless emerge that are periodically significant. As the preeminent theorist in this field, Heinrich Schenker (1868–1935) looked to the prolonged background voice-leading of a piece to reveal its more profound underlying unity, represented by what he called the 'Ursatz' (Schenker, 1979). Much more recently, adaptations of Schenker's methods by Steve Larson (2009) have established the value of Schenker's theory as a tool for analysing tonal jazz. Frequently, the voice-leading techniques in Coltrane's solos mirror the transpositional movements of the pc-sets. However, motivic contour, registral partitioning, and shifting pitch centricities also sometimes create areas of voice-leading interest. In these cases, the hybridisation of jazz voice-leading practice (focused on minimal voice-leading and parsimony) and a modified, post-/atonal prolongational approach (Salzer, 1962) are implemented to illustrate these formations.[65] While not strictly Schenkerian, my adapted method provides a means of contrasting the

[65] The term 'guide-tone' is often used in jazz as a synonym for voice-leading. See *How to Improvise* (Crook, 2002, p.48) for examples of guide-tones in jazz practice.

background voice-leading structure with the motivic surface, so shedding light on the motivic process as it unfolds.

Additionally, in my analysis, a voice-leading approach inspired by Straus's atonal transformational model (2003) serves to illustrate the common-tone connections from set to set.[66] These examples appear in pitch-class space to provide greater insight into the pc-set transformations as theoretical constructs within an improvised framework. While Straus's method maps pitch-class transpositions and inversions through sequences of pc-sets, my approach focuses strictly on common-tone pivots as T_0 voice-leading transformations. Finally, a hybrid of transformational and prolongational approaches is used to describe the transpositional voice-leading from the zero integers of consecutive pc-sets, providing a means to illustrate cyclical voice-leading motion.

3.6 OVERVIEW OF *INTERSTELLAR SPACE* AND *STELLAR REGIONS* (AND CRITERIA FOR SELECTION OF LOCI IN PART II)

The analyses in Part II illustrate three perspectives on pitch structure that focus upon Coltrane's melodic lines. Although the ensemble on *Stellar Regions* is a quartet, a detailed examination of the piano and bass only occurs in the analysis of 'Iris' due to its unique

[66] Straus categorises atonal voice-leading models as expressing three approaches: prolongational, associational, and transformational (2003). Straus's method belongs to the transformational category and explores voice-leading as mappings of pitch transpositions and inversions. Klumepenhouwer networks (Lewin, 1990) and Neo-Riemannian theory (Lewin, 1982) are related to this analytical approach with the former focusing on networks using nodes and arrows to identify transpositional and inversional transformations within pc-sets and the latter using PLR common-tone cycles to understand chromatic relations between triads with tonal qualities. Associational models deal with lines of pitch-classes which are organised by shared registers and other musical contexts (Forte, 1988b; Morris, 1998). Prolongational models – a theoretical subject of criticism and debate (Forte, 1988b; Straus, 1987) – are extensions of Schenkerian theory that adapt tonal models of analysis for atonal music (Lerdahl, 1989; Salzer, 1962). This model of analysis has been used to examine jazz with tonally functional properties (Larson, 1998; Larson, 2009; Mawer, 2014).

structure. The remaining pieces from *Stellar Regions* focus primarily on the saxophone part, although the analyses contextualise this part within the prominent features of the ensemble. While consideration of the harmonic and rhythmic influence of the piano, bass, and drums is important, a detailed analysis of the ensemble interaction is beyond the scope of this dissertation. In *Stellar Regions*, once the ensemble moves beyond the tonal references of the themes, the group's approach is essentially free, allowing each performer musical autonomy. Coltrane elaborates on this process in an interview of 1966: 'we don't follow what the piano does any more, because we all move in our own directions, see. I like it for a backdrop, you know – of its sound' (Devito, 2010, p.293).

While the music was studied in its entirety as part of the research, the focused parameters of this dissertation necessitate that the selected analyses should highlight the significant features of each piece. The musical loci are identified through intensive and repeated listening, using criteria based on the perception of motivic content and structural development. This listening process was a constant activity throughout the research. Analytical priority is given to pc-set motives; interval consistency and development; pentatonicism, tonal references and major-third movements between diatonic collections – commonly known as 'Coltrane changes' (Yamaguchi, 2003); and the interplay of all these elements. Transitions between varied salient regions also constitute an area of analytical interest. Where passages of unclear pitch structure emerge, these are examined in relation to the surrounding pitch structure.

Since *Stellar Regions* and *Interstellar Space* comprise an abundance of music, and since insightful analyses of 'Offering' and 'Venus' already exist within jazz literature (Pressing, 1982; Porter, 1998; Voss, 2015), these specific pieces are examined only peripherally. The remaining tracks on these recordings ('Seraphic Light', 'Sun Star', 'Sun Star' (alt tk), 'Iris', 'Stellar Regions', 'Stellar Regions' (alt tk), 'Tranesonic', 'Tranesonic' (alt tk), 'Configuration', 'Jimmy's Mode', 'Mars', 'Leo', 'Jupiter', 'Jupiter Variation', 'Saturn') are organised according to three predominant analytical themes, which gradually crystallised through the process of research: 'Trichordal and Hexachordal Determinacy' (Chapter 4); 'Emergent PC-Sets and Major-Third Cycles' (Chapter 5); and 'PC-Set Generation, Integration, and Diversity' (Chapter 6).

Chapter 4 presents evidence of trichordal determinacy as a technique unifying improvisation and composition in 'Iris', 'Jupiter', and 'Jupiter Variation'. There follows an examination of hexachordal determinacy as an emergent, combinative property within 'Jupiter, 'Jupiter Variation', 'Mars', 'Leo', 'Venus', 'Saturn', 'Offering', and 'Configuration'. The evidence of a structural methodology in 'Iris' establishes a valuable precedent for evaluating analogous formations across Part II. Chapter 5 is organised, firstly, by examining emergent pc-set salience within *Stellar Regions* ('Tranesonic', 'Tranesonic' (alt tk), 'Seraphic Light', 'Jimmy's Mode', 'Sun Star' (alt tk), 'Sun Star', 'Configuration') and *Interstellar Space* ('Leo', 'Mars'). Secondly, it focuses on an investigation of major-third related diatonic collections within 'Stellar Regions', 'Stellar Regions' (alt tk), 'Venus', 'Leo' and 'Mars' as a related pc-set approach that exploits subset and superset relationships and cyclical transpositional processes. The analytical progression in this chapter connects corresponding pieces through their shared pc-set structure, facilitating the illustration of common features. Finally, the analyses in Chapter 6 examine the entirety of 'Saturn', demonstrating how diverse pc-sets are generated and integrated. The pc-set heterogeneity that 'Saturn' exhibits is in clear contrast to the homogeneity of 'Iris', with the consecutive extended salience of constructs (024), (013), (025), and (027) preceding an integrated melodic surface comprising numerous T_n-types. The positioning of 'Iris' and 'Saturn' as the first and last analyses in Part II represent the two ends of a spectrum from homogeneity to heterogeneity.

Analyses of Coltrane's earlier music from December 1964 ('Acknowledgement') and June 1965 ('Suite: Prayer and Meditation: Day') at the conclusions of Chapters 4 and 5 contextualise the structural features of *Stellar Regions* and *Interstellar Space*, revealing parallel theoretical frameworks that foreshadow later developments in pitch structure. Investigations into musical and extra-musical influences upon pitch-structure are incorporated where they can be supported by compelling evidence.

PART II –

ANALYSES OF *INTERSTELLAR SPACE* AND *STELLAR REGIONS*

CHAPTER 4: TRICHORDAL AND HEXACHORDAL DETERMINACY

INTRODUCTION

The analyses in Part II begin by presenting evidence of an important trichordal determinacy within the recordings ‘Iris’, ‘Jupiter’, and ‘Jupiter Variation’, thus working across the two album recordings. Initially, a framework for this determinacy is established by the continuous presence of the pc-set construct (013) as a referent in both the saxophone and piano in ‘Iris’. Analyses then interpret its related inversion (023) as a structural determinant for both the theme and improvisation within ‘Jupiter’ and ‘Jupiter Variation’. Subsequently, the construct (024579) is illustrated as an emerging hexachordal determinant across *Interstellar Space*, also occurring within ‘Offering’ and ‘Configuration’ (from *Stellar Regions*). In conclusion, the analysis demonstrates how these instances of determinacy are foreshadowed by a related hexachordal construct (014679) in this earlier work ‘Suite: Prayer and Meditation (Day)’. Together, these analyses establish T_n-type homogeneity as a crucial technique for achieving structural coherence through *Stellar Regions* and *Interstellar Space*.

Within this framework, the music considered in Chapter 4 (and across Part II) exhibits a wide range of characteristics: (1) the use of one T_n-type as a structural determinant; (2) the segmentation of a hexachord as a means for melodic variation; (3) the emphasis on trichordal motives that are repeated, fragmented, and combined in various ways; (4) the manipulation of chromatic pitch structure to engage with tonal harmony, and more specifically, the blues; (5) the use of common-tones in transformations between pc-sets; (6) harmony which is derived from a salient pc-set; (7) the referential use of one pc-set within a series of pc-sets.

Taken collectively, these varied pieces display two broad approaches to pitch structure: melodic surfaces that result from breaking down larger pc-sets into smaller segments; and melodic surfaces built up from the combination of smaller pc-sets. While the crucial feature of these reductive and constrictive approaches is that a single pc-set's structural configuration is used as the means for achieving unity, there is also a creative freedom allowing spontaneity and the disruption of the determinant structure. As a reminder to the reader, whenever the text cross-references to Examples (as supporting analytical evidence rendered in musical notation and tabular arrangements), these are found in Appendix B in Volume II.

4.1 'IRIS': AN EXEMPLAR OF PC-SET DETERMINACY

On the surface, 'Iris' displays characteristics that are indicative of Coltrane's 'rubato-ballad' style, where an arc form builds intensity until a release before the conclusion.[67] However, the underlying architecture of 'Iris' is unique in Coltrane's oeuvre, exhibiting an innovative structural design that has gone unrecognised by scholarship. While earlier pieces such as 'One Down, One Up', 'Acknowledgement', 'Sun Ship', and 'Creation' (1965f) blur the line between improvisation and composition, 'Iris' goes one step further, making the two domains indistinguishable. Coltrane achieves this by employing what set theory identifies as T_n-type (013) as a structural determinant in the saxophone and piano for the entire duration of 'Iris', while using transposition as a primary transformative means. Since there are no alternative versions of 'Iris', its preconceived facets as a composition cannot be clearly assessed beyond the (013) structure. However, it is likely that the (013) set structure and

[67] Jost originally coins the term 'rubato-ballad' as a characterisation for 'Ogunde' and other similar energetic ballad type works by Coltrane (1974, p.102).

the ascending contour of the initial melodic gesture are its primary foundations, leaving the remaining details to be improvised. The constant presence of (013) also as a harmonic accompaniment in the piano establishes this trichordal development as of primary importance to Coltrane's musical conception. As an archetype for an improvisational approach encompassing both motive and harmony, 'Iris' has a significance that resonates throughout *Stellar Regions*, *Interstellar Space*, and Coltrane's other late-period work. Equally, the evidence of (013) as a constant structure challenges and problematises the critical characterisation of Coltrane's late-period improvisations as anarchic and 'free'.

'Iris' is extraordinary as the only work in Coltrane's oeuvre where the theme, improvisation, and harmony are entirely formed from one trichordal T_n-type. While other pieces by Coltrane display a similar synthesis of melody and harmony, none achieve the homogeneity of 'Iris'. The extensive score analysis (saxophone, piano, bass) in Example 4.1 illustrates the saturation of (013) in the saxophone and piano for the duration of 'Iris'. As with several other pieces from *Stellar Regions*, Coltrane promotes concision and structural homogeneity by excluding other soloists, playing continuously for the entire length of the piece. This Chapter examines 'Iris' from three analytical perspectives – set-theoretic, motivic, and harmonic – in order to illustrate the varied structural aspects of (013).

In cataloguing the many (013) appearances in 'Iris', sequential subset fragments have been excluded from the final tally. A count of the saxophone pc-sets reveals that all twelve members of (013) are present, with a total of 62 individual pc-set occurrences. The most frequent pc-sets – {A♭, A, B} and {D♭, D, E} – appear 8 times (Example 4.2). Similarly, the piano contains all twelve members of (013), totalling 105 individual occurrences, with the most frequent pc-set being {C, D♭, E♭} (Example 4.3). No significant correlation is found between the most favoured sets used by the saxophone and piano, indicating that the pc-set choices were, most likely, freely made. In 'Iris', nearly twice as many members of (013) are played by the piano as compared to the saxophone. Primarily these sets overlap, but on occasion they briefly synchronise. Example 4.4 illustrates this relationship, assigning a ratio (saxophone: piano) for the number of pc-sets that occur in each voice during specific time-spans. This evidence demonstrates that the saxophone sets are predominantly harmonised with more than one trichord by the piano.

'Iris' also displays a strong correlation between the transpositional operations used for members of (013) and the interval content of this T_n-type. The combined occurrences of T_1/ T_{11}, T_2/ T_{10}, and T_3/ T_9 in the piano represent 99 out of 104 T_n operations occurring from set to set in 'Iris' (Example 4.5). A similar focus on these operations is found in the saxophone with T_1/ T_{11}, T_2/ T_{10}, and T_3/ T_9 occurring in transpositions from set-to-set in all but three instances (Example 4.6). Analysis of the bass content reveals no significant structural presence of (013). However, the most frequent interval-class (ic) is ic1 (Example 4.7), with the chromatic movement of the bass sometimes resulting in its pitches becoming part of the trichords played by the saxophone and piano. The continuous presence of members of (013) in the saxophone and piano, as well as the correlation between the interval-class content (ic1, ic2, ic3) of (013) and the most frequent T_n operations that appear from set to set (T_1/ T_{11}, T_2/ T_{10}, T_3/ T_9), reveals that the intervallic components of (013) project across multiple structural levels of 'Iris'.

Perhaps the most crucial feature of Coltrane's improvisation is the usage of common-tones when moving from set to set. Of the 82 sets identified, 76 share common-tones with their neighbours. Example 4.8 represents these sets vertically, with horizontal boxes connecting the common-tones (the numbered circles in Example 4.8 are explained below). A frequent improvisatory technique uses the last pitch of the set currently being played, as the first pitch in a new set transposition (Example 4.9a, b, and c).

In one of the most compelling instances of common-tone connections between sets, Coltrane effectively uses the pitch D as a pivot between {C♯, D, E} and {D, E♭, F}, combining these trichords into one repeated descending melodic figure (Example 4.10). This event is imitated and modified moments later with (013) and (045). In Example 4.11, the construct {E, G♯, A}, a member of (045), appears as an expansion of (013), with pitch-classes G♯ and A used as common-tones between {G♯, A, B} and {E, G♯, A} in a repeated descending gesture. The common-tone expansion and contraction between (013) and (045) becomes a crucial aspect of Coltrane's late-period improvisational style. This technique enables Coltrane to construct melodic surfaces that move through a variety of T_n-types, developing shared pitch and interval content while periodically resting on one construct (Chapter 6 offers more illustrations of this pc-set heterogeneity).

(013) DIVERGENCES

During the entire length of 'Iris' (almost 4 minutes), there are only seven brief instances where Coltrane's use of pitch structure does not adhere to (013). In particular, these divergences are important because they signify two improvisational properties: (1) improvisational plasticity within pc-set salience; and (2) dedication to the structural prominence of (013), indicated by its return after each divergent event. In the tabular graphic Example 4.8, seven divergences from (013) were identified by a circle containing a number for each instance: the critical feature of these events is that they exist in dialogue with their surrounding contexts, as illustrated in the following two notated examples.

In divergence #4, the (024) member {A♭, B♭, C} is inserted between the (013) sets {C#, D, E}, {C, D♭, E♭}, and {B, C, D} (Example 4.12). Additionally, an upper-register, common-tone anchor (C) connects {A♭, B♭, C}, {C, D♭, E♭}, and {B, C, D}; the elimination of {A♭, B♭, C} from the set sequence reveals the descending semitone transpositional pattern {C♯, D, E}, {C, D♭, E♭}, {B, C, D}. Similarly, divergence #6 shows the construct (035) emerging as an intervallic expansion of (013). Within the set pattern {C♯, D, E}, {B, D, E}, {C♯, D, E}, the pitch-classes D and E are retained between the pc-sets (Example 4.13). While these are only two examples, all seven divergences reside within the context of an extraordinary (013) consistency. Coltrane's music demonstrates an improvisatory plasticity within the parameters of (013), with each divergence characterised by a unique relationship. Additionally, the use of common-tone connections between pc-sets is revealed as the principal structural device in 'Iris'.

MOTIVIC RELATIONSHIPS AND SURFACES

In stark contrast to the frequently cited and more constrained (035) constructs famously appearing in 'Acknowledgement', the motives in 'Iris' display a wide variety of contours and characteristics reflecting the rotational permutations and interval content of (013). While the initial ascending three-note motive played by Coltrane, A – B – G♯, is perhaps the most important gesture in 'Iris', numerous others appear as well. The structure of this figure also represents one of the primary chord voicings used by the piano: this places the major-seventh interval as the outer shell of the voicing which creates an open sounding harmony. In the supplementary motivic analysis, the six rotational permutations of (013) are used as a tool to illustrate the motivic structure of Coltrane's improvisation, comprising ordered pc-sets in normal order, first and second rotations, and their corresponding retrogrades. These basic formations are referred to in the analysis as 'rotational motives' (or RMs) and are designated N, N1, N2, R, R1, and R2 (as explained in Figure 4.1 below). Additionally, while both N and R always sound as scale-like figures in Coltrane's improvisation, two contour forms appear for N1, R1, and R2. These are indicated in the analysis by the labels N1a and N1b, R1a and R1b, and R2a and R2b (see Figure 4.2 below).

A larger, scale-like formation that comprises overlapping RMs is a critical recurring background structure in the saxophone and is referenced in the analysis as the 'scale' (013) (Figure 4.3 below). Example 4.14 illustrates the emergence of the 'scale' (013) within Coltrane's improvisation at 00:56, with the omitted pitches marked by an 'x'. Pitch-class C is used here to pivot between two pc-sets – {A, B♭, C} and {C, D♭, E♭}. This broader, scale-like approach to (013) demonstrates a marked evolution in Coltrane's structuring from the previously fixed, sequential motivic patterns of 'Acknowledgement' and other earlier work.

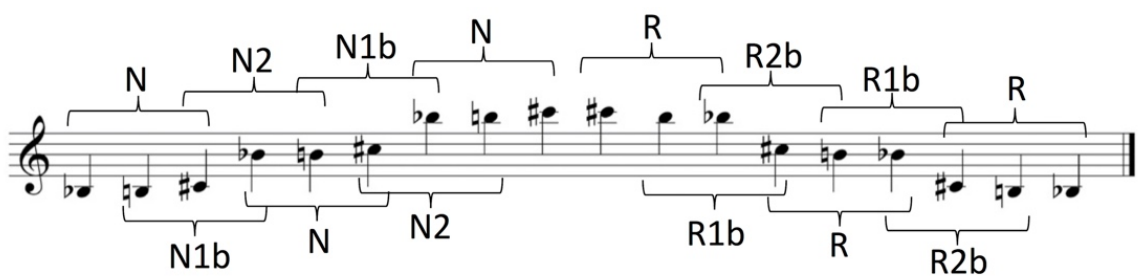
Coltrane's improvisation displays a complex motivic surface with a variety of characteristics. The contour and trichordal structure of RMs are often rhythmically stressed; additionally, repeated notes can occur in the same octave and different octaves within these RMs. Segments of the 'scale' (013) can create overlapping RMs, with temporally displaced adjacent two-note and three-note structures emerging within the scale pattern. In particular, RM dyad fragments are crucial to Coltrane's motivic language: these dyads anticipate and extend RMs and can be repeated multiple times, rhythmically displaced, juxtaposed in different octaves, and often use contrary motion to create compelling melodic contours (Example 4.15).

Figure 4.1. 'Iris': Analytical labels for the six rotational motives

N Normal Order {0,1,3}	N1 First Rotation {1,3,0}	N2 Second Rotation {3,0,1}
R Retrograde Normal Order {3,1,0}	R1 Retrograde First Rotation {1,0,3}	R2 Retrograde Second Rotation {0,3,1}

Figure 4.2. 'Iris': Contour forms of N1, R1, and R2

Figure 4.3. 'Iris': 'Scale' (013)



Example 4.16 illustrates one instance where RM dyad fragments anticipate a larger RM: here an antecedent phrase constructed from (02) precedes the consequent emergence of N1b. This is followed by a transposed N1b motive which has its first pitch repeated three times, echoing the three repeated (02) dyads of the antecedent. The (02) rhythmic development, A4 to A5 octave leap within the first phrase, and the construction of two phrases from {F♯, G, A} signals an entirely different type of motivic approach by Coltrane from the sequential motivic patterns widely characterised as a trademark of his late-period style. In a contrasting illustration of an RM extension, the material N is lengthened by dyad subsets (01) and (02) through two trichordal transpositions (Example 4.17). Again, Coltrane has developed the overall ascending motivic contour by juxtaposing the pitch-classes, forming (02) in different registers.

A similar RM extension is illustrated in Example 4.18, where Coltrane plays an overall descending contour, beginning with R2b in the *altissimo* register and followed by an (02) extension two octaves lower. Two more iterations of (02) ensue, with contrasting contours and in different octaves, before a transformation of the pc-set structure to (045) – diverging from (013). This type of common-tone transition between two T_n-types is a sign of Coltrane's flexibility and the importance within his improvisation of trichordal salience.

Sometimes RM extensions generate new areas of salience. In Example 4.19, the (03) extension of R1b generates a brief series of (03) dyad transpositions until the improvisation refocuses on (013) and {B, C, D} emerges. (As an instance of interval-class projection promoting structural unity, this type of motivic development is examined further in Chapter 6.) Additionally, a complex variety of motivic structures can appear within a short time-span.

In Example 4.20, a sequence of four pc-sets sharing common-tones – {C, D♭, E♭}, {B, C, D}, {G♯, A, B}, {G, G♯, B♭} – reveals a complex motivic surface, comprising: (03) and (02) dyad fragments of {C, D♭, E♭}, (02) anticipations of N1b in two transpositions, and overlapping transpositions of N1b and N1 sharing pitch-class G♯. In other instances, Coltrane's motives are built more simply, using just one trichord to construct antecedent and consequent relationships (Example 4.21). Here (01) anticipates and extends N1b, revealing the 'scale' (013) as a hidden background structure. This is answered by a consequent comprised of N1b and N1. The N1 of the consequent appears as a development of the final (01) of the antecedent. In order to illustrate motivic development within an emerging context, the following analysis provides a phrase by phrase account of the first minute of 'Iris'. While it is exhaustive in detail and lengthy, this is necessary for engendering a broader understanding of Coltrane's motivic constructs.

From a saxophone-based motivic stance, 'Iris' begins with five phrases of irregular lengths and similar ascending and descending contours (see Example 4.22). Phrases one, two, and three follow a similar pattern, beginning with two statements of N1b, followed by a sequence of RMs that end on a dyad subset of R. Meanwhile, phrases four and five continue the ascending and descending contour while introducing new RMs (R1a, R1b, R2a, R2b). A *glissando* gesture spanning the interval of a descending minor third is another important figure developed during this section, first appearing as part of the contour of N1a and then developing as an extension of other RMs. The 'scale' (013) emerges as a recurring background figure across this entire section, providing continuity between the five phrases.

In phrase one, after the initial presentation of N1b, the overlapping of N1b, N, and R relate as a segment of the 'scale' (013), missing only one pitch (B). The pitches A and G♯, an (01) dyad subset of R, completes phrase one and echoes the final two pitches of R, one octave lower. An antecedent-consequent relationship emerges between phrases one and two. Phrase two begins with the sequence N1b, N1b, and N1a, whereby the N1a motive appears as a contrasting contour to the first two statements of N1b. Here N1b and N1a overlap and share the common-tone G as a result of the modulation from {G, A♭, B♭} to {F♯, G, A}, rhythmically unified into one gesture. A critical recurring melodic gesture in this section is the *glissando*, which first appears within the contour of N1a from A to F♯ (03). Pitches G and A – an (02) subset of R – begin the next ascending gesture, with its contour at first suggesting the beginning of another N1b motive; but instead, the contour changes direction and R follows, with its contour of R echoing the A to F♯ *glissando* in N1a. The second occurrence of N1a in this phrase reinforces its earlier appearance, and is followed by an A♭ to F *glissando* – an (03) subset of N1a – to conclude the phrase.

Phrase three begins once more with a sequence of two N1b motives, but this time they are played more rapidly and span two octaves, ending on the descending figure E to F (an extension and subset of N1b). Here the ordered pitch interval -11 (between E and F), which previously appeared as an incidental structure in phrase one and two, takes on greater prominence due to the rhythmic stress on the note F. The second half of this phrase constitutes a development and elaboration of the first half, rhythmically connecting the overlapping N and N1b motives to create the four-note figure: E – F – G – E. This figure mimics the first half of the phrase, with a nested appearance of overlapping N and N1b motives within N1b – N1b. The descending figure E to F (-11) reappears, now embedded within the consecutive motives R and N, with the pitch F again sustained and rhythmically stressed. In the last figure of this phrase, the appearance of the 'scale' (013) references the first phrase, while the descending *glissando* from A♭ to F (03) echoes the final *glissando* gesture at the end of the second phrase. In this way, the ending of phrase three synthesises the endings of phrases one and two.

Breaking from the pattern of the previous three phrases, phrase four begins with N and the first appearance of R1a and R1b (the contrasting contour for R1a). A descending minor third *glissando* gesture and (03) subset of R1b (A – F♯) extends the phrase, generating a series of (03) dyads that descend semitonally. Here an ordered pitch interval of +11 is seen between F♯ and F which mirrors the previous occurrences of -11 in phrases one, to three. Subsequently, the final fifth phrase begins with the first appearance of R2a. The rhythmic momentum begins to build as the sequence of N, N, N, R, R reveals a complete segment of the 'scale' (013) that spans two octaves. This 'scale' (013) segment ends with an extension of R using pitches C and B – an (01) subset of R. As the next figure begins, R2b makes its first appearance as a rapidly repeated motive that builds in intensity, eventually developing into repeated segments of 'scale' (013).

Thus, the motivic constructs of 'Iris' display complex relationships reflecting the rotational permutations of (013). The manner in which the motivic surface is constructed is far more intricate than the limited, transposed motivic pattern of 'Acknowledgment' for which Coltrane is better known. This advanced motivic approach is not exclusive to 'Iris', but is found with various pc-set T_n-types and in homogenous and heterogeneous contexts, across both *Stellar Regions* and *Interstellar Space*.

HARMONIC STABILITY, DISSONANCE, AND PC-SET INTERACTIONS

From a harmonic stance, ‘Iris’ has an elusive quality, suggestive of both tonality and atonality. While other pieces by Coltrane, such as ‘Expression’, ‘To Be’ (1967f), and ‘Offering’, share qualities with ‘Iris’, their harmonic structures are quite different. In ‘Expression’, ‘To Be’ and ‘Offering’, conventional harmonies support a clearly discernible theme which eventually dissipates into improvisation. The sheet music to ‘Expression’ (*The New Real Book Vol. 2* (Bauer and Sher, 1991)), shows how this composition can be represented in a lead sheet format, containing melody and chord changes. By contrast, the harmonic effects in ‘Iris’ defy conventional chord symbols and depend upon the interaction of two (013) streams as melody and chords, framed against the chromatic movement of the bass. Additionally, unlike ‘Expression’, ‘To Be’, and Offering’, no clear distinction between theme and improvisation is present in ‘Iris’.

Harmonic stability constantly fluctuates in ‘Iris’ due to the pc-set interactions, so that this harmonic interplay is better understood through examining the pc-sets produced by combining two members of (013) at all transpositional distances. Figure 4.4 below illustrates the six collections that are produced from these mergers: the two most dissonant combinations, (01234) and (01235), contain the highest number of ic1 and ic2 in their interval vectors and result from merging pc-sets related at T_1/ T_{11} and T_2/ T_{10}. Although the interval vector of (013457) contains the same number of occurrences of ic1 and ic2 as (01235), its total distribution is weighted towards consonant intervals. Further examination of four of these collections reveals they are subsets of three larger supersets: the octatonic collection, Olivier Messiaen’s third mode of limited transposition, and the Locrian hexachord.[68] Thus, when (013) members are related at T_3/ T_9, T_4/ T_8, T_5/ T_7, or T_6, they tend to reflect the harmonic characteristics of these supersets. In instances where (013) sets are related at T_1/ T_{11} or T_2/ T_{10}, chromatic clusters are present, and dissonance tends to increase.

A significant harmonic quality inherent in the structure of (013) is that of the major-seventh chord, formed as an incomplete voicing by chord tones 1, 7, and 9. All notes of a major-seventh chord (with added ninth and eleventh) are represented when T_5/ T_7 related (013) members are merged. This occurs in Example 4.24, when sets {B♯, C♯, D♯} and {E♯, F♯, G♯} overlap, implying a C♯ major-seventh chord (a feature examined in more detail later).

Figure 4.4 ‘Iris’: T_n-types that result from merging two members of (013)[69]

(013) PC Sets	T_n Operation	T_n-type	IC Vector	Quality
a + *b*	T_1, T_{11}	(01234)	<432100>	Chromatic Pentamirror
a + *b*	T_2, T_{10}	(01235)	<332110>	Major Second Pentacluster
a + *b*	T_3, T_9	(01346)	<223111>	Octatonic Subset
a + *b*	T_4, T_8	(013457)	<333321>	Messiaen’s Third Mode Subset
a + *b*	T_5, T_7	(013568)	<233241>	Locrian Hexachord
a + *b*	T_6	(013679)	<224223>	Octatonic Subset

[68] The construction of Messiaen’s third mode is (0234678TE) (Messiaen, 2007).
[69] The descriptive qualities ‘chromatic pentamirror’ and ‘major second petacluster’ in Figure 4.4 appear in Solomon’s table of pc-sets (2005).

While the dialogue between the (013) sets in the saxophone and piano is a crucial aspect of the harmony, the bass exerts a tremendous influence on the final harmonic result, acting independently of the (013) structure and relating to the other voices in three ways: (1) by alternately supporting one of the voices via consonant interval relationships; (2) by synthesising all the voices into a cohesive harmonic sonority; (3) by acting to negate the harmonic activity of the other parts. Pedal points are established by the bass periodically through 'Iris', temporarily creating pitch centricity with which the other voices interact. As the music builds in intensity, it also becomes more harmonically unstable due to the greater pitch and rhythmic activity in the bass. The drums mirror this bass activity, beginning with light, textural effects on brushes, with a change to sticks as the music intensifies and rhythmic propulsion builds.

The following harmonic analysis of the opening of 'Iris' illustrates the interplay of the (013) sets and the bass, identifying transient harmonies with chord symbols in order to gain an understanding of their tonal effect. Additionally, other factors arise that influence harmonic perception, such as rhythmic synchrony, pitch duration, and pc-set duration. The perception of consonance here is primarily a result of the abundant T_3/T_9, T_4/T_8, and T_5/T_7 relationships between the (013) sets; but, later in the improvisation, tension increases because of more frequent T_1/T_{11} and T_2/T_{10} relationships.

The first phrase of 'Iris' implies the harmonic progression F♯min (Maj7), F♯min (Maj7)/E, AMaj7(♯9, ♯11) as a result of the three instrument's interaction (Example 4.23). The duration of {G♯, A, B} – played by the saxophone for the entire phrase – establishes a temporary harmonic relevance while the piano uses {E♯, F♯, G♯} and {B♯, C♯, D♯} as accompaniment.

Common-tones are found between the three instruments: they initially appear with F♯ (piano, bass), G♯ (saxophone, piano), and A and B (bass, saxophone). Tension increases when the bass moves to the note E, conflicting with the F♯ minor major-seventh sonority sustained by the piano and saxophone. Similarly, in the second half of the phrase, tension increases from the conflict between B (saxophone, bass) and B♯, sustained by the piano, but is then released upon the arrival of the bass note A. The combination of piano: {B♯, C♯, D♯}, saxophone: A and G♯, and bass A: thus implying an A major-seventh chord with added tensions of ♯9 (B♯) and ♯11 (D♯). Alternatively, this sonority could be interpreted as a C♯ major-ninth chord with no third over A in the bass.

As the second phrase begins (Example 4.24), the bass and piano entries anticipate the first and third notes of the saxophone's melodic gesture, promoting stability from the harmonic rhythm and ic5 relationship between the saxophone and bass. The saxophone and piano each use three pc-sets which overlap and are sustained for different durations, their interaction with the bass implying the chord progression $C7^{(\sharp 9,\ \sharp 11,\ \flat 13)}$, Bsus ^{add3}, D♯min/A♯, DMaj7/C♯, C♯Maj9. Harmonic stability of the phrase is reinforced where notes with consonant interval relationships either rhythmically synchronise or occur in very close rhythmic proximity, as seen with D and A (bass and saxophone). The phrase ends with a virtual rhythmic synchrony (saxophone and piano), reinforcing the chord progression DMaj7/C♯ to C♯Maj7: F♯ and G♯ (saxophone) function as the third and sharp-eleventh of a D major-seventh chord, while E♯ functions as the third of a C♯ major-seventh chord.

Harmonic stability is also reinforced by the sustained pitches G, F♯, and E♯ (saxophone) and C, A♯, C♯, and A♯ (bass). Meanwhile, the piano trichord {D♯, E, F♯} is sustained for most of this phrase, allowing the melodic content of the other instruments to embellish its harmonic character. Additional stabilising elements comprise the sustained F♯ (saxophone shared with the piano), and the sustained C♯ (bass, also shared with the piano). In the final gesture of this phrase, the bass exerts a significant harmonic influence: while the saxophone and piano sustain their pitches, the bass notes B and A♯ shift the harmonic sonority from C♯ major-seventh to A♯ minor (Example 4.24). Additionally, this suggests a passing B dominant-seventh before the A♯ minor. As 'Iris' develops, this pattern of harmonic innuendo and chromatic tension-and-release continues.

Overall, the beginning of 'Iris' contains some of the most consonant, recognisable harmonies in the piece, reflecting the T_3/T_9, T_4/T_8, and T_5, T_7 relationships between the saxophone and piano pc-sets. The evidence presented demonstrates how the horizontal movement of each instrument, pc-set interactions, pitch and pc-set duration, common-tones between voices, rhythmic synchrony, and gestural anticipation all impact on harmonic perception. Furthermore, the harmonies resulting from the (013) set interactions are contained within six larger collections with distinct harmonic characteristics, revealing a harmonic structure in 'Iris' that is unique not only among Coltrane's rubato-ballads of 1967, but in his wider discography too. 'Iris' reveals a previously undocumented process in Coltrane's work, prompting a reassessment of his late-period music and the way that 'free jazz' is characterised. The continuous presence of (013) as a determinant of pitch structure (both piano and saxophone) establishes a precedent and methodology for interpreting pc-sets of various configurations right across *Stellar Regions* and *Interstellar Space*. Further evidence of this structural model is found in 'Jupiter Variation' and 'Jupiter' from *Interstellar Space.*

4.2 'JUPITER' AND 'JUPITER VARIATION': EXPLORATIONS OF A THEME

Although 'Jupiter' and 'Jupiter Variation' were recorded one week after 'Iris', unsurprisingly perhaps, they display similar patterns of determinacy. By contrasting these two takes, a process of experimentation and refinement is revealed whereby members of (023) and (024579) saturate both 'Jupiter Variation' (take one) and 'Jupiter' (take two). Significantly, the principal structures in 'Iris', 'Jupiter Variation', and 'Jupiter' – (013) and (023) – are inversionally related. While only 'Jupiter' appeared on the original release of *Interstellar Space*, 'Jupiter Variation' has been included on subsequent reissues, with its position as a first take generally misunderstood because of its title.

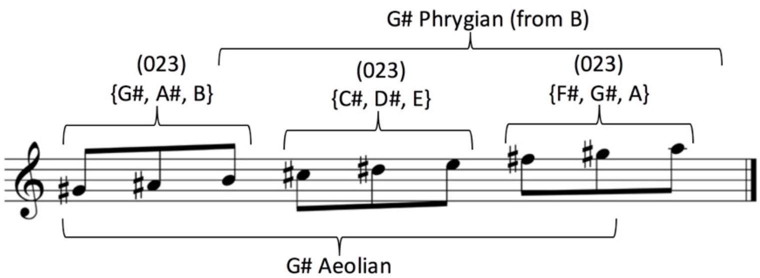
While bells and drums begin both versions, eliciting a ceremonial atmosphere, the large-scale form of 'Jupiter Variation' and 'Jupiter' contains variations within a similar framework (Examples 4.25; 4.26). In 'Jupiter Variation' (take one), the saxophone improvisation that precedes the theme is omitted from 'Jupiter' (take two), revealing Coltrane's experimental approach. The opening and closing themes across both takes display a pseudo ternary form (A^1-B-A^2) with dissimilar improvised 'B' sections (Example 4.27; 4.28). While the initial 'A^2' theme in 'Jupiter Variation' (01:14) remains true to the 'A^1' exposition, the corresponding 'A^2' in 'Jupiter' (00:47) contains alterations in the (023) structure. The most significant difference between these takes concerns the duration of the sections centred on (023) and (024579): the salience of (023) in 'Jupiter Variation' is sustained for far longer than in 'Jupiter'; similarly, (024579) has increased prominence in 'Jupiter' due to its appearance twice within the improvisation. Divergences from (023) and (024579) in ‘Jupiter Variation’ and ‘Jupiter’ typically occur during transitions between these T_n-types.

The main theme (‘A’) is constructed from three adjacent members of (023) at T_5 from set to set. Alternatively, its structure reflects Coltrane’s interest in interval-cycles, nesting three (023) sets within a segment of C5 (Example 4.29). In the forthcoming analyses it is common to find interval-cycles used as transpositional process for pc-sets, with different interval-cycles sometimes intertwined. This is exemplified by the emergence of (025) in ‘Saturn’ (see Chapter 6.1). As with numerous other Coltrane pieces, the theme’s statement is flexible, with slight rhythmic variations, fragmentation, and pitch alterations occurring in both takes (Examples 4.30; 4.31). Coltrane’s music uses {G♯, A♯, B}, {C♯, D♯, E}, and {F♯, G♯, A} as its referential set transpositions for the theme. Furthermore, the contour form of the trichords, the rhythm, and the multiple repetitions of the three trichord sequence are key features. Within ‘Jupiter’ the ‘A’ theme sometimes contains phrase extensions after the completion of the three trichord sequence. These are generally absent from ‘Jupiter Variation’ and indicate that Coltrane was experimenting with his approach from take one to take two. Additionally, the repeated {F♯, G♯, A} that functions as an ending coda in ‘Jupiter Variation’ is adapted as the final gesture for both the beginning and ending themes in ‘Jupiter’, evidencing the theme’s creative evolution.

A significant alteration to the ‘Jupiter’ theme occurs where Coltrane deviates from the C5 transpositional cycle. Instead, two $C4_1$-cycles appear before C5 is resumed, with {C♯, D♯, E} shared between $C4_1$ and C5 (Example 4.32). At first, $C4_1$ appears with one disruption to the ‘A’ theme’s (023) structure, with (034) member {F, G♯, A} substituting as the third trichord in the sequence. The appearance of {F, G♯, A} is an expansion of {F♯, G♯, A), with G♯ and A common-tones retained while F♯ maps onto F. This is immediately followed with a second $C4_1$ sequence – restoring the (023) set continuity with {A, B, C}, {C♯, D♯, E}, {F, G, A♭}. Coltrane then returns to the original 'A' theme using C5.

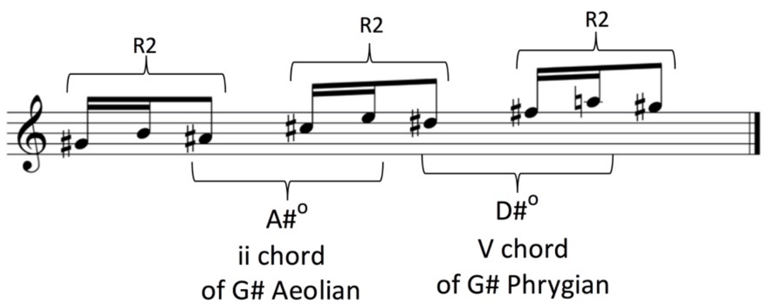
As seen in other late-period compositions by Coltrane, the pitch structure of the 'Jupiter Variation' and 'Jupiter' theme engages with tonal/modal harmony: the 'A' theme evokes a synthesis of the two minor modes G♯ Aeolian, and G♯ Phrygian. As the only pitches not shared between these two modes, A♯ and A imply opposing modal qualities. Figure 4.5 shows the (023) sets of the theme in normal form to better illustrate the two overlapping modes. The rhythmic emphasis of G♯, and its appearance as the theme's first and last pitch, helps to tonicise G♯ and reinforce this modal conflict.

Figure 4.5 Modal conflict in 'Jupiter Variation'/'Jupiter' theme



The contour shape R2 is another significant factor that influences the bi-modal character of the theme (Figure 4.6). The juxtaposition of these three trichords in an R2 rotation results in secondary structures that imply a ii° – V° – I minor pattern in G♯ minor, with A♯° functioning as ii° in G♯ Aeolian, and D♯° functioning as V° in G♯ Phrygian.

Figure 4.6 ‘Jupiter Variation’/‘Jupiter’ theme: Secondary tonal structures

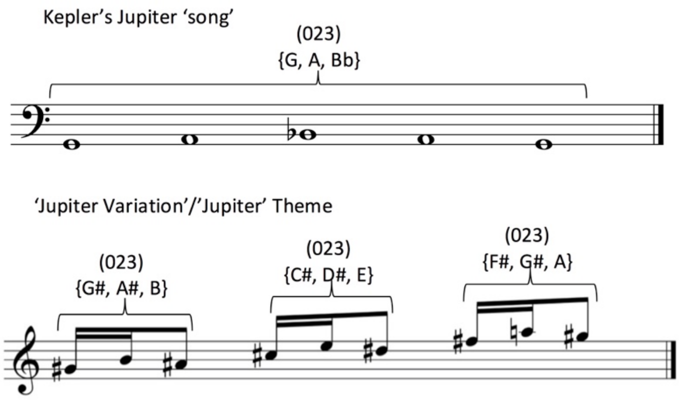


Comparable pitch structure that also embraces tonal/modal harmony is found within Coltrane’s earlier composition, ‘Giant Steps’, where the melody across bars 8–16 parallels the ‘Jupiter Variation’/‘Jupiter’ theme. ‘Giant Steps’ is constructed from three (025) sets nested within $C4_1$, while ‘Jupiter Variation’/‘Jupiter’ is constructed from three (023) sets nested within a segment of C5 (Example 4.33).[70] These analogous melodic structures establish a clear connection between two rather different stylistic phases, illustrating the importance of interval-cycles as transpositional processes and the lasting influence of Slonimsky’s *Thesaurus*.[71]

As previously discussed in Chapter 2.2, the ‘Jupiter Variation’/‘Jupiter’ theme exhibits significant correlations to musical structures as expressed by Johannes Kepler. Coltrane’s ‘Jupiter’ and ‘Jupiter Variation’ theme structure proves identical to Kepler’s planetary song for Jupiter, revealing (023) as the fundamental structure of each (Figure 4.7).

[70] In order to show the trichordal structure of ‘Giant Steps’, Example 4.31 (Vol. II) is a composite of multiple takes due to variations in Coltrane’s performance.
[71] Demsey (1991, p.14) observes that bars 8–16 of the ‘Giant Steps’ melody are identical to exercise #286 in Slonimsky’s *Thesaurus*.

Figure 4.7 'Jupiter Variation'/'Jupiter': (023) structure in Coltrane and Kepler



While this similarity could be coincidental, the shared titles and identical trichordal content strongly suggest Kepler's influence on Coltrane. As musical representations of cosmic principles, Kepler's planetary 'songs' are consistent with Coltrane's philosophical and spiritual views. Coltrane's statement: 'All a musician can do is to get closer to the sources of nature, and so feel that he is in communion with the natural laws' (Devito, 2010, p.118) evokes the synthesis of music and cosmic principles put forward by Kepler. Additionally, correlations exist between the 'Jupiter Variation'/'Jupiter' theme and constructions found in Slonimsky's *Thesaurus*, where three exercises contain members of (023) within the C5-cycle. Entitled 'Minor Polytetrachord', exercise #832 is constructed from four-note sets that share a common tone at the distance of a perfect fourth. However, this exercise also has an alternative interpretation: as (023) trichords which share no common tones within the C5 cycle (Example 4.34). In exercise #877, a clearer representation of (023) sets within the C5 cycle can be seen, with these (023) sets appearing as descending shapes in retrograde form (Example 4.35). A third example from Slonimsky, found embedded as a secondary structure within exercise #891 (Example 4.36), precisely foreshadows the structural shape of Coltrane's theme.

'B' SECTIONS ACROSS TWO TAKES

While the 'A' themes are generally consistent throughout both takes, the improvised 'B' sections contain a variety of structures. The opening 'B' section of 'Jupiter Variation' (01:02) contains {G♯, A♯, D♯} – a member of (027) – as the principal structure that gradually undergoes a series of transformations. Significantly, this trichord is related to the 'A' theme because its pitch-class members (A♯, D♯, and G♯) are embedded and rhythmically accented within the 'A' theme (Example 4.37). Additionally, in 'B', common-tones connect several pc-sets belonging to different T_n-types (this type of structural divergence is discussed later in Chapter 4). In the transition to 'B', two pc-sets of the 'A' theme are transformed – with {G♯, A♯, B} and {C♯, D♯, E} each undergoing one alteration in pitch: the resulting trichords, {G♯, B, D♯} and {C♯, D♯, G♯}, establish a pattern where two pitches-classes are sustained through several pc-sets. The changing pitch-classes from set-to-set produce the sequence D♯, F♯, E♯, D♯, E♯, B (Example 4.38), with this type of common-tone technique is frequently used by Coltrane across *Stellar Regions* and *Interstellar Space*.

In contrast to 'Jupiter Variation', the corresponding 'B' section in 'Jupiter' (00:47) contains (023) members in a descending semitonal pattern followed by a series of (03) dyads (Example 4.39). Within this set sequence {C, D, E♭}, {B, C♯, D}, {B♭, C, D♭}, {A, B, C} there occur two pitch-classes that interrupt the (023) continuity – A (preceding set {B, C♯, D}) and B (within {B♭, C, D♭}). As members of {A, B, C}, A and B signal the approach of {A, B, C} and indicate a conflation of (A, B, C} with {B, C♯, D} and {B♭, C, D♭}. Upon the arrival of {A, B, C}, a sequence of (03) dyads follows, projected as subsets of (023). The division of larger pc-sets into smaller subsets and conversely, autonomous dyads that become members of larger supersets, is a technique frequently employed by Coltrane. Before the re-emergence of the altered ‘A’ theme (using $C4_1$), a secondary (023) set is created by the consecutive pitches G♯, A, and G♭, so establishing a structural continuity between pc-sets during the transition from (03) to (023).

(023) SALIENCE

While (023) appears as a dominant structure throughout ‘Jupiter Variation’ and ‘Jupiter’, these (023) members appear for twice the length of time in ‘Jupiter Variation’ as compared to ‘Jupiter’. In ‘Jupiter Variation’ (01:24), an extensive series of transpositional patterns eventually fragment the (023) members into (02) and (03) dyad subsets (Example 4.40). The transition from the theme to the improvisation contains the tetrachord {G♯, B, C♯, D♯} from the synthesis of the theme’s first two trichords: G♯ and B from {G♯, A♯, B}, and C♯ and D♯ from {C♯, D♯, E}. Significantly, {G♯, B, C♯, D♯} expresses the blues as a subset of the pentatonic scale, while also connecting to the G♯ minor sonority of the theme. Coltrane briefly juxtaposes the (023) sets in the *altissimo* and bottom register of the saxophone, demonstrating great finesse in the common-tone transitions from set-to-set. At one point the two sets {G, A, B♭} and {B♭, C, D♭} are conflated, with their pitch-classes mixing before {C, D, E♭} emerges. In fact, there are several points at which recurring sequential sets become conflated. Individual pc-sets are emphasised as referential centres through their repetition and juxtaposition with other pc-sets. Frequently, referential sets are paired with other pc-sets, so creating two set patterns that are repeated multiple times. Furthermore, as the referential emphasis gradually shifts from one pc-set to another, the changing transposition patterns create a kind of harmonic progression. Although numerous transpositional relationships are found between the referential sets and the pc-sets with which they are contrasted, a significant structural pattern appears where trichordal pairs are repeated two or more times. In these instances, the transpositional relationship between the repeated pair of pc-sets is revealed as T_5/T_7, thus demonstrating a clear correspondence with the C5 structure of the theme.

Example 4.41 illustrates the transpositional patterns in 'Jupiter Variation' between 01:24 and 03:00, where all pc-sets are members of (023) unless otherwise noted. To better illustrate the set pattern, some set fragments are represented as complete trichords due to their context and the repeated manner in which they appear. The gradual emergence of referential set {F, G, A♭} begins at 01:24, being repeated first in combination with {C, D, E♭}, and then with {B♭, C, D♭}. At 01:35, the referential emphasis shifts to {B♭, C, D♭} where a descending semitone pattern occurs between the paired sets {B♭, C, D♭} – {G♯, A♯, B} and {A, B, C} – {G, A, B♭}, with these pairs being related at T_{11}. The referential set {B♭, C, D♭} is then contrasted and conflated with {G, A, B♭} before the other contrasting trichords, {C, D, E♭} and {A, B, C}, are introduced. This type of shifting referential emphasis continues through the entire section. Just two brief divergences from (023) occur during this set sequence: the first at 02:03 with {C, D, E} as an expansion of {C, D, E♭}, and the second at 02:32, appearing in the saxophone's *altissimo* register. An overview of the divergences from (023) in 'Jupiter Variation' and 'Jupiter' is detailed later in this chapter.

In contrast to 'Jupiter Variation', the corresponding section in 'Jupiter' (Example 4.42) is much shorter, lasting only fifty-four seconds. Example 4.43 represents these same pc-sets in 'Jupiter' vertically, with horizontal boxes showing the common-tone connections between the sets. Although the trichordal pairs {F, G, A♭} – {B♭, C, D♭} and {E♭, F, G♭} – {F♯, G♯, A} are repeated multiple times in a manner similar to that in 'Jupiter Variation', the referential use of one pc-set in juxtaposition to several set transpositions does not occur here. However, two significant transpositional patterns emerge between 01:16–01:25, related to the C5 and C2 cycles. Initially the groupings {F, G, A♭}, {B♭, C, D♭}, {C, D, E♭} display a transpositional relationship resembling the theme. But by re-ordering these three sets as {C, D, E♭} – {F, G, A♭} – {B♭, C, D♭}, a C5 segment is revealed that duplicates the structure of the theme at T_4. Additionally, {B♭, C, D♭} and {C, D, E♭} are used as part of the ascending $C2_0$ segment {B♭, C, D♭}, {C, D, E♭}, {D, E, F}, and {E, F♯, G} (the presence of this $C2_0$ is similar to the whole-tone cycles examined in 'Saturn' in Chapter 6.1). The contour shape of the trichords appear predominantly in the R2 formation, as found in the theme. Common-tones are frequently shared between sets, again displaying characteristics similar to those previously examined in 'Iris'.

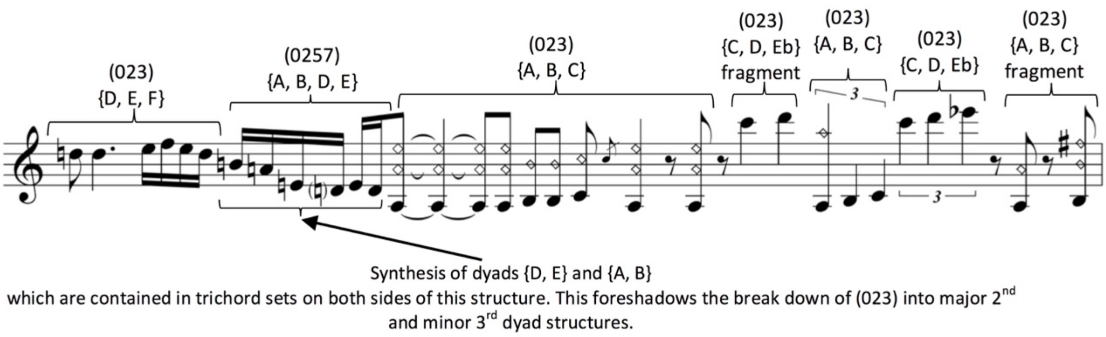
REGISTRAL PARTITIONING

A crucial technique found in both 'Jupiter' and 'Jupiter Variation' is the registral partitioning of trichords into their dyad subsets and pitch-classes. This is done in two ways: firstly, by fragmenting a single trichord into different registers, and, secondly, by fragmenting and juxtaposing multiple trichords in different registers. In 'Jupiter' at 01:56 Coltrane partitions {F♯, G♯, A} into motivic segments within two different registers (Example 4.44): the temporally disjunct dyad {G♯, A}, emerges in the lower register voice-leading as a contraction of the previously occurring low register (02) dyads {G♯, A♯}, {C, D}, {B♭, C} (see again Example 4.42). Prior to its appearance as a member of {G♯, A}, pitch A is periodically introduced as a low-register pedal-point during the series of sets {G, A, B♭}, {G, A, B}, {D, E, G, A}, {E, F♯, A, B}. Upon the arrival of {F♯, G♯, A}, however, A appears as a member of {G♯, A}, which is used referentially in the lower register. Contrasting with this, in the upper register {F♯, G♯, A} and {F♯, A} appear as motivic structures, nested between the lower G♯ and A.

A crucial feature of this section is where {F♯, A, B} is introduced as an (035) expansion of {F♯, G♯, A}. The set patterning {F♯, G♯, A}, {F♯, A, B}, {F♯, G♯, A}, {F♯, A, B} {F♯, G♯, A} appears within the continued registral development of the motives, and is nested between the repeated lower pitches G♯ and A (see again Example 4.44). Upon the second occurrence of {F♯, A, B}, the dyad {G♯, A} functions independently of {F♯, G♯, A}, continuing the lower register pattern. In this way, Coltrane uses this (01) fragment of (023) as an autonomous structure, one that is temporally disjunct and embedded below (035). After returning to {F♯, G♯, A}, the (05) subset of {F♯, A, B} generates the series of T_1/T_{11} related dyads {F♯, B}, {F, B♭}, {F♯, B}. A chromatic semitonal voice-leading motion occurs in the lower register with B♭, B, C, C♯ as members of the respective sets {F, B♭}, {F♯, B}, {C, C♯, D♯}, thus continuing the lower register (01) emphasis begun with {G♯, A}. Coltrane then transitions to (024579) by means of the grouping {G♯, B, C♯, D♯}

A more complex example of registral partitioning is found in 'Jupiter Variation' at 03:16: Coltrane signals the forthcoming pc-set fragmentation when {A, B, D, E} appears as a result of a conflation of the (023) sets that surround it, {D, E, F} and {A, B, C} (Figure 4.8 below). The two (02) dyad subsets contained in {A, B, D, E} serve to resonate a structural connection to the (02) fragments of {A, B, C} and {C, D, E♭} which follow soon after. Coltrane alternates between {A, B, C} and {C, D, E♭}, fragmenting them into their dyad subsets and individual pitch-classes and distributing them across different registers of the saxophone (Figure 4.8).

Figure 4.8 Registral partitioning in 'Jupiter Variation' (03:10)



This process begins a pattern where the (02) and (03) subsets of (023), and their pitch-class members, are used as independent referential structures, with Coltrane maximising timbral effects right across this entire section. In Example 4.45, {G♯, A♯, B} is repeated and fragmented in the lower register, while in the upper register {D, F} emerges as a T_2 development of {C, E♭}. Pitches C and C♯ are used as embellishments to approach {D, F} chromatically. This (03) dyad, and its chromatic approaches C, C♯, are rearranged at the end of the phrase forming {C, C♯, D, F}, so referring obliquely to their original appearance.

A new registral high-point is created with {G, A} as an extension of {D, F}, whereby the dyad {G, A} is subsumed within {G, A, B} before re-emerging as a referential (02) set contrasted by a series of low-register (03) dyads: {B♭, D♭}, {G♯, B}, {E♭, G♭}, {D, F}, {C♯, E}. Although {G, A, B} is a member of (024), its contour still suggests the preceding (023) salience. In Example 4.46, the referential emphasis shifts to {C, D, E♭} in the *altissimo* register. {C, D, E♭} is modified by the addition of pitch-class F creating the tetrachord {C, D, E♭, F}. Additionally, the subset fragment {C, E♭} is expanded to {B♭, E♭}, before a return to {C, D, E♭}. In the lower register a series of (03) dyads, {E♭, G♭}, {D, F}, {C♯, E}, {A, C}, gradually brings the process of registral partitioning to an end, with {A, B, C}, juxtaposed one octave above its dyad subset {A, C}.

To conclude this section (Example 4.46), the groupings {B, C♯, D, E} and {A, B, C, D} appear as tetrachordal expansions of (023), related at T_{10} from set-to-set, still expressing the same (0235) structure as the previously stated tetrachord {C, D, E♭, F}. The sequence of consecutive dyads that appears within {B, C♯, D, E} and {A, B, C, D} punctuates this section's recurring focus on (02) and (03), and acts to signal the beginning of a transition to (024579). The set sequence {E♭, F, G♭}, {C, D, E♭}, {E♭, F, G♭} imitates the juxtaposition of {C, D, E♭} and {E♭, G♭} presented at the beginning of this section; the initial statement of dyad {E♭, G♭} anticipates the later emergence of {E♭, F, G♭}. Meanwhile, a variant of the 'Jupiter Variation' theme occurs in the pc-set sequence {E♭, F, G♭}, {G♯, A♯}, {C♯, D♯, E}, with {G♯, A♯} appearing as a truncated {G♯, A♯, B}, with the transpositional relationship between these three trichords being a segment of C5. The (023), (024), (023) pattern that results from the expansion of {C♯, D♯, E} to {C♯, D♯, E♯}, marks the end of this section and a beginning of the extended focus upon (024579).

In short, the presence of an improvisational technique whereby trichordal motives are fragmented and partitioned in different registers demonstrates a method that extends far beyond the sequential motivic patterns commonly associated with Coltrane. Additionally, these examples provide a framework for understanding how trichordal salience is broken down and transformed, revealing a motivic surface that is centred on pitch and intervallic development.

(023) DIVERGENCES

During Coltrane's improvisations in 'Jupiter Variation' and 'Jupiter', brief disruptions to areas of T_n-type homogeneity engage in a dialogue with their musical context and exhibit distinct structural characteristics. A taxonomy of these divergences identifies events that similarly occur in regions of T_n-type salience right across *Stellar Regions* and *Interstellar Space*.

- The interjection of a pitch within an established set (Example 4.47). This pitch is often a member of a neighbouring pc-set, either a set that has been previously stated or one that is about to be introduced. Frequently, the interjected pitch occurs before a pause, then being redefined as the first pitch of a new pc-set. Additionally, these interjected pitches sometimes appear as a chromatic passing note or other ornamentation of the set structure. In other instances, interjected pitches expand on the trichordal structure, suggesting their membership as tetrachordal subsets of the diatonic and pentatonic collections.

- The conflation of two members of the same T_n-type (Example 4.48). These sets usually have been individually stated before the conflation, but sometimes a new set transposition will emerge from the conflation.

- Common-tone retention across different T_n-types (Example 4.38). Sometimes this appears as a repeating two-set pattern, as a sequence of sets, or as the expansion or contraction of a previously stated pc-set as a brief interruption to T_n-type hegemony.

- Trichordal fragmentation that functions to develop a subset's interval content (Example 4.49). Chain sequences of T_n related dyads sometimes occur.

- The emergence of the pentatonic scale as the result of melodic events which contain its interval content and subsets (Example 4.50).

- Pc-sets that are inversionally related to the T_n-type homogeneity (Example 4.51). These appear as a kind of inversional conflation between T_n-types, with common-tones frequently shared between these sets.

- Disruptions to T_n-type homogeneity due to issues related to the technical demands and idiosyncrasies of the saxophone's *altissimo* register and the use of timbral effects (Example 4.52).

Similar to the heterogeneous pitch structure that will be illustrated later in Chapter 6, a more extensive type of divergence occurs during the transition to the ending theme in 'Jupiter'. While these improvisational events display structural characteristics that contrast with the previous pc-set design, they highlight the flexibility of Coltrane's melodic conception and the existence of pc-set salience and a T_n-type determination as significant fixtures within Coltrane's improvisational method.

'JUPITER' TRANSITION TO THE THEME

As 'Jupiter' approaches its conclusion, in the transition from the phase of (024579) salience to the last theme, a variety of structures are present as the improvisation gradually refocuses on (023) (Example 4.53). The trichordal sequence {E♭, F, B♭}, {A♭, C♭, E♭}, {B♭, D♭, F}, {E♭, G, B♭} contains the tonal chords A♭ minor, B♭ minor, E♭ major and outlines the key of A♭ melodic minor. This shift from the major sonority contained in {A♭, B♭, C, D♭, E♭, F} demonstrates how Coltrane's tonal language and the pc-set development are integrated. The pitch structure then becomes divided into two registers, with (027) in the lower register as a projection of the initial trichord {E♭, F, B♭}, and with (02) in the *altissimo*, gradually modifying {G, A} until the appearance of {G, A, B♭}. Upon the emergence of the (023) members {G, A, B♭} and {B♭, C, D♭}, a series of (03) dyads are projected as subsets of (023). Segments of $C4_3$, C1, and $C2_0$ are evident as the transpositional processes for the (03) dyads, with Hex_{23} formed by the consecutive sets {G, B♭}, {E♭, G♭}, and {B, D}.

The final (03) dyad in the sequence – {G♯, B} – anticipates the re-emergence of the theme's trichord {G♯, A♯, B}, while the complex pitch structure that follows {G♯, B} develops upon its pitch and interval content, voice-leading, melodic contour, and intersecting melodic segments. In stave five of Example 4.53, D♯ is added to {G♯, B}, creating {G♯, B, D♯} which is then semitonally modified into {B, C♯, E, G}. The major-third relationship between these G♯ minor and E minor sonorities reflects Coltrane's larger-scale obsession with the major-third interval-cycle. The lower-register contour of these pc-sets projects {C♯, D♯, G♯} and the transitional salience of (027). Set {C♯, D♯, E♯} appears as a contraction of {C♯, D♯, G♯} while {B, C♯, E, F♯} is formed from overlapping sets {B, C♯, F♯} and {E, F♯, B}. Embellishments of (027) occur where chromatic approaches precede {C♯, D♯, G♯} and {B, C♯, F♯}.

While the ascending gesture beginning Example 4.54 continues the brief salience of (027) with {E♭, F, B♭} and {B, C♯, F♯}, the pitch structure develops in a unique manner as a projection of its contents. The initial ascending line is fragmented into four segments with each progressively modified upon restatement. From Segment A to Segment A1, chromatic voice-leading from B♭ to A appears. Additionally, the +2 ordered pitch interval motion from

B to C♯ in Segment A is reversed in Segment A1, becoming -2 from B to A. In the progression from Segment A1 to A2, Coltrane eliminates E♭ in the voice-leading from F to F♯. The *altissimo* dyad {G, A} projects (02) in the recurring {A, B} step that appears between Segments A1 and A2 and throughout this section; the emergence of {G, A, B} synthesises the dyads {G, A} and {A, B} into one single construct, embellished by A♭. Meanwhile, Segments B and B1, C and C1, D and D1 display similar modifications to their structure, leading to the recapitulation of the theme. Although the preceding structures described do not realise pc-set salience in the manner of the other sections of 'Jupiter', there is still a clear developmental focus on pitch and interval content that is evocative of Jost's 'motivic chain association' (see again Chapter 1.5 for Jost's analytical model). Similar formations occur in the 'B' section of the final theme in 'Jupiter Variation'.

After the re-hearing of the final 'Jupiter' 'A^1' theme in 'Jupiter', the following 'B' section briefly diverges from (023), projecting (04) through a sequence of pc-sets until {G, A, B♭} appears (Example 4.55). The construct {G, A, B♭} is employed as a referential set, juxtaposed with various other transpositions of (023) until the appearance of {G♯, A♯, B} and the 'A^2' theme. Similarly, in the introduction to 'Jupiter Variation', a similar variety of structures are found that function independently of (023).

'JUPITER VARIATION' INTRODUCTION

The improvised introduction before the main theme of 'Jupiter Variation' (Example 4.56) gives the impression that Coltrane is warming up, gradually adjusting his focus to (023) as the theme emerges. Similarly, the two false starts that precede this take contain a short saxophone flourish reflecting a similar sensibility.[72] The fact that Coltrane omits playing an introduction in the second take ('Jupiter') might indicate that he was dissatisfied by the results of the first take, preferring the directness of an immediate statement of the theme. As the improvisation unfolds, the whole-tone collection emerges as a referential background. Motives saturated with ic2 and ic4 are formed from the trichordal and tetrachordal subsets of WT_0 and WT_1. During this section, subset and superset relationships overlap at three temporal levels, with hexachords emerging across longer time-spans, while tetrachords and trichords appear within progressively shorter temporal segments. Predominantly the formations: (0248), (0268), (024), (026), (046) are revealed as subsets of the whole-tone collection. A structural relationship exists between the whole-tone collection (02468T) in the introduction, and (024579), which becomes the salient pc-set later in the piece. These sets divide into two pairs of (024) members, with (024) sets related at T_6 within the whole-tone collection and T_5/T_7 within (024579).

Coltrane's first phrase (00:18) is centred on WT_1, with only pitches B♭, C, and E disrupting its continuity. A type of broken symmetry emerges where B appears as the first and last note of the phrase, enclosing the T_n-type pattern (027), (037), (0248), (024), (0248), (027), (047). All of these sets surround (024) as the focal point. Both of the inversionally related (037) and (047) sets at the beginning and end of the phrase overlap with the (027) sets. Interestingly, reversing the ending (027) and (047) sets would result in a symmetrical T_n-type pattern (see again Example 4.56).

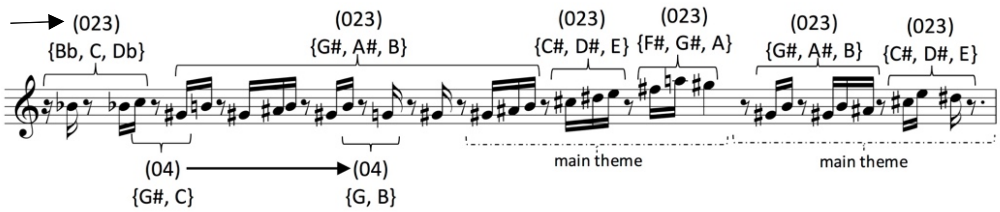
[72] The false starts are included as bonus tracks in the 2000 re-release of *Interstellar Space*.

The second phrase (stave two) begins with (A, B), which appeared at the end of phrase one. Notably, the T_n-type sequence (0248), (024), (0248), in the first phrase, is reorganised (0248), (0248), (024) in the second, with {D♭, E♭, F, A} present in both phrases; the consecutive tetrachords {D♭, E♭, F, A} and {A, B, D♭, F} are related at T_8. As a subset of {D♭, E♭, F, A}, trichord {D♭, E♭, F} begins a series of (024) sets that ends with {F, G, A} and a transition to WT_0.

While Coltrane often employs rhythm to delineate pc-sets, with {C, D, E} and (D♭, E♭, F}, he uses rhythm to combine their pitches into motives that obscure their (024) structure. As Coltrane moves back and forth between these two sets, motives C, E♭, D♭, and C, D, E, D♭ appear as a result of this rhythmic partitioning. Similarly, in stave three, Coltrane rhythmically fragments {F, G, A} and {C, D, F♯}, combining A and F♯ as a bridge between these two sets. Upon the arrival of WT_0, the melodic structures display three levels of pc-set relationships. In the background, WT_0 operates as the referential superset, while the tetrachordal subsets {C, D, F♯, A♭}, {A♭, B♭, C, E} appear as supersets for motives constructed from (026), (046), and (024). The presence of WT_0 as a background referential collection, from which trichordal and tetrachordal pc-sets motives are extracted, mirrors the structure of the earlier recording 'Suite: Prayer and Meditation (Day)', where (014679) functions as a referential collection (explored in Chapter 4.4).

Pitch-classes B♭, and C are sustained as common-tones through the series of sets {F♯, B♭, C}, {A♭, B♭, C, E}, {F♯, B♭, C}, {A, B♭, C}, {B♭, C, F}, {A, B♭, C}, {B♭, C, E♭}}, {B♭, C, D♭} with this common-tone connection between different T_n-types mirroring that examined in 'Iris'. Dyad {B♭, C} functions referentially as a recurring low-register anchor across this set sequence, while the arrival of {B♭, C, D♭} marks the beginning of the (023) salience; {G♯, A♯, B}, is first introduced in fragments, with G interjected before the theme fully emerges (Figure 4.9). In the transition from {B♭, C, D♭} to {G♯, A♯, B}, the disjunct (04) dyad {G♯, C} is echoed by the {G, B} interval that results from the interjected pitch G.

Figure 4.9 Emergence of the 'Jupiter Variation' theme (00:42)



Thus I argue that examination of the pitch structure of the introduction shows how hexachordal pc-sets can function as referential supersets for trichordal motives. Although (024), (026), and (046) appear here as subsets of the whole-tone collection, in other contexts within *Interstellar Space* they can operate independently. Further examples of hexachordal salience are presented next, focusing upon (024579) and (014679).

4.3 HEXACHORD (024579) AND ITS RECURRING EMPHASIS

A distinctive, ubiquitous feature of *Interstellar Space* (and to a lesser extent *Stellar Regions*) involves sections of repeated fast, descending figures of remarkable technical virtuosity. Hexachord (024579) emerges as the referential T_n-type for these figures, establishing a unique improvisational structure in Coltrane's music, unlike the fast melodic lines branded as 'sheets of sound' in his recordings of the late 1950s (Gitler, 1958). While the descending figures appear in every track of *Interstellar Space*, in *Stellar Regions* they only fully emerge in 'Offering', with brief allusions also in 'Configuration'. The relationship between the emergences of (024579) in *Stellar Regions* and *Interstellar Space* suggests two developmental scenarios: one where the fast descending figures were preconceived before the *Stellar Regions* session, with ‘Offering’ being the first documentation (Example 4.57); and secondly, a situation where the descending figures in ‘Offering’ were spontaneous, with the interceding week between recordings providing Coltrane with time to reflect on the content of ‘Offering’, inspiring further experimentation in *Interstellar Space*.[73] In either circumstance, *Interstellar Space* and *Stellar Regions* are the only Coltrane recordings that contain these descending (024579) figures.

The consistent presence of (024579) in the fast, descending figures suggests a conceptual framework focused on organising sections around its development. Furthermore, it indicates that Coltrane’s improvisational approach reaches beyond a trichordal focus, encompassing pc-sets of various cardinalities. A crucial aspect of (024579) is its relationship to the diatonic collection as a subset which strongly resonates with a major tonal sonority. Although the diatonic collection is sometimes evident during these fast, descending sections, the constant emphasis upon (024579) indicates its higher priority within the pitch structure.

Invariably within the fast, descending sections, the musical intensity builds to a high point where sound, timbre, gesture, texture, and contour then supersede the salience of (024579). Upon the conclusion of these sonically oriented sections, there often follows a brief return to (024579). A crucial element of these descending figures is the perceptible

[73] Coltrane had a habit of evaluating recording session tapes at home. As discussed in Chapter 2, the tapes for the *Stellar Regions* session were in Coltrane’s possession when he died, remaining lost until rediscovered by Alice Coltrane in the 1990s.

suspension of time, where a type of stasis is created through rapid movement: an impression of pitch simultaneity is produced that seemingly transcends the saxophone's monophonic limitations, evoking the sonority of a harp.[74] Paradoxically, the music takes on the quality of an object that both expands and contracts as a result of the combined changing pattern lengths and the shifting hexachord transpositions.

The tabular Example 4.58 lists the initial entrances of (024579) within *Stellar R*egions and *Interstellar Space* in chronological order, noting the time of their entrance, duration, and transposition. A percentage indicates the entry-point of (024579) as a proportion of the total length of the piece. Since 'Mars' ends with a lengthy drum solo, the percentage listed represents only the portion of 'Mars' where Coltrane plays. In the majority of these pieces (024579) appears most frequently in the final third of the improvisation, as the intensity and energy build. Only five members of (024579) are used to begin these sections, with Coltrane showing a preference for {F♯, G♯, A♯, B, C♯, D♯} (in 'Offering', 'Jupiter Variation', and 'Saturn'), and for {G, A, B, C, D, E} (in 'Configuration', 'Leo', and 'Venus'), as shown in Example 4.59. 'Configuration' is the least clearly formed of the eight pieces, with (024579) quickly enveloped within complex timbral and *altissimo* explorations. The ubiquitous presence of (024579) on these two recordings certainly indicates its special status as an idea that interested Coltrane.

[74] Coltrane's fascination with the harp is well documented. Notably, saxophonist Wayne Shorter suggests the harp as the inspiration for Coltrane's 'sheets of sound' (Porter, 1998, p.138). Alternatively, saxophonist Odean Pope (Devito, *et al.*, 2013) has suggested that an inspiration for Coltrane's 'sheets of sound' approach was Philadelphia pianist Hasaan Ibn Ali (1931–1980).

There is a compelling structural correspondence between (024579) as it appears in its fast descending form and the theme of 'Selflessness' (1969) which Coltrane recorded sixteen months earlier in October 1965. Performed at a breakneck tempo in *Interstellar Space* and *Stellar Regions*, the basic shapes of the (024579) figures are virtually identical to the 'Selflessness' theme which consists of two descending statements of (024579), followed by descending repetitions of its pentatonic subset (02479) (Example 4.60). Similarly, across *Interstellar Space* and *Stellar Regions*, (024579) is divided into descending pentatonic subsets. The tonality of 'Selflessness' is centred on E♭ major, with the melody utilising (024579) as a subset of the diatonic collection: this implies an E♭ major scale descending from the sixth degree. Coltrane uses (024579) in a similar manner in *Interstellar Space*, referencing the C major and C♯ minor tonalities of the 'Venus' and 'Saturn' themes by playing (G, A, B, C, D, E) and {F♯, G♯, A♯, B, C♯, D♯} in the prelude to their recapitulations. Importantly, the virtually identical structure of the 'Selflessness' theme and the rapid descending (024579) formations saturating *Interstellar Space* underscores Coltrane's use of one single theoretical structure for both composition and improvisation.

(024579) PATTERNS OF USE

The emergences of (024579) within *Interstellar Space* and *Stellar Regions* exhibit many of the characteristics found in regions of trichordal salience, appearing in varied transpositions, rotations, and often fragmented into subsets. Referential pc-sets occur frequently, and common-tone pivots are used to shift between consecutive pc-set transpositions, with pc-sets sometimes becoming conflated. Furthermore, as was noted in Chapter 2, striking similarities are found between Coltrane's fast, descending (024579) figures and the polytonal scale exercises taught by Dennis Sandole.

In terms of detail, when (024579) is introduced, it typically appears in retrograde form descending from integer 9, with the entire hexachord repeated as a descending motive. However, when the motive is extended to span two octaves, pitches are frequently omitted in the lower octave. The descending (024579) motive is often fragmented into subsets of varying length; in particular, pentatonic subsets may emerge from the hexachord as autonomous, repeated figures (Figure 4.10 below). Essential structural features of (024579) are the two discrete T_5/T_7 related (024) members it contains as subsets (T_5/T_7 related (024) members are examined further in Chapter 6.1). During a region of (024) salience in 'Leo', (024579) appears as a repeated ascending motive, formed from the trichords {E♭, F, G} and {A♭, B♭, C} (Example 4.61). Here, (024) members appear as subsets of WT_1, WT_0, {E♭, F, G, A♭, B♭, C}, and {A♭, B♭, C, D♭, E♭, F}. A transpositional expansion occurs between the referential pc-set {A♭, B♭, C} and transpositions {E♭, F, G}, {D, E, F♯}, and {D♭, E♭, F}, resulting in a descending semitonal voice-leading motion between the contrasting pc-sets. Example 4.61 clearly illustrates Coltrane's skill in manipulating what present analytically as subset and superset relationships, trichordal T_n-type homogeneity, and referential pc-set use.

While rapid descending (024579) constructs appear most frequently in retrograde form, they also appear in rotations. Figure 4.11 illustrates one such instance in 'Jupiter Variation' where G occurs as an upper-register common-tone pivot between two T_n-related members of (024579). Here, the pc-set {G, A, B, C, D, E} descends from the rotation starting on G (integer 0), while one segment of {B♭, C, D, E♭, F, G} descends from the rotation starting on F (integer 7). The {B♭, C, D, E♭, F, G} formation is fragmented into smaller subsets, omitting the pitches F and B♭, G and F, and F, before {G, A, B, C, D, E} appears for a second time in the rotation starting on G (integer 0).

Figure 4.10 Pentatonic subsets of (024579) in 'Mars' (04:08)

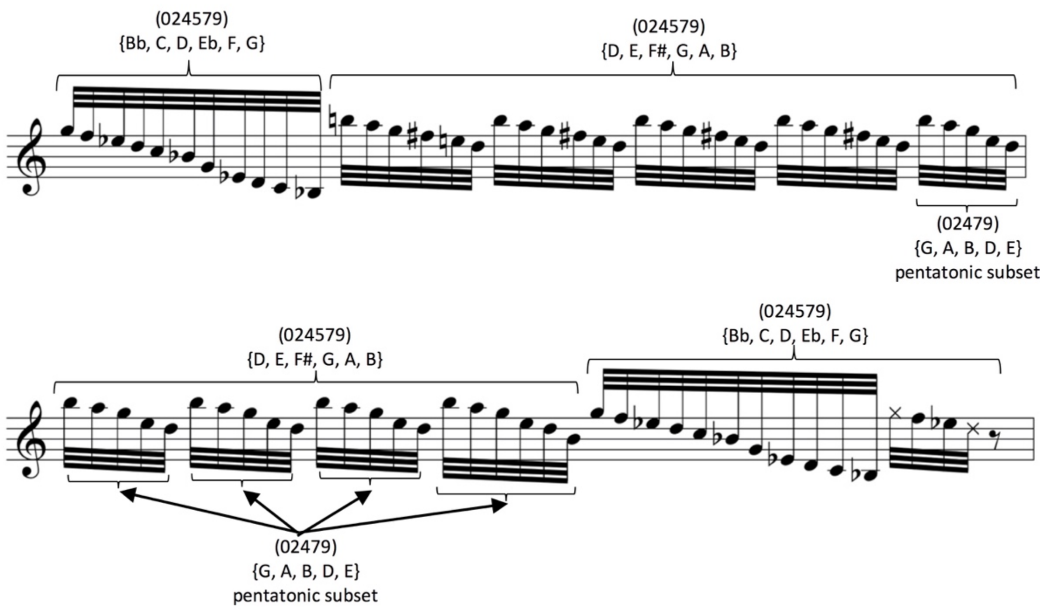
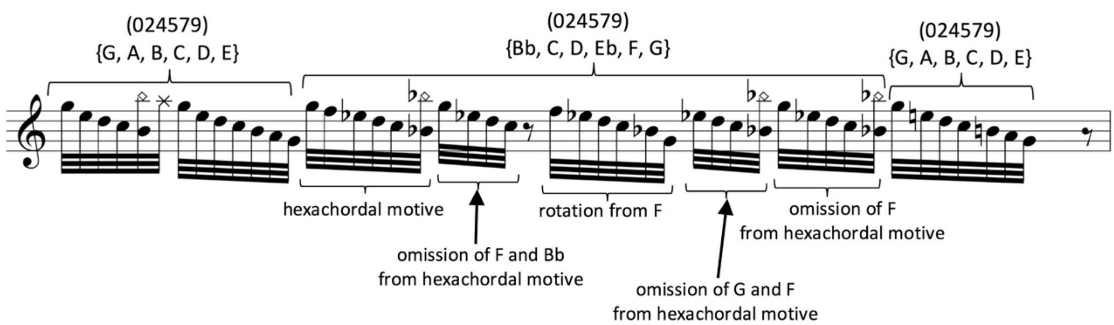


Figure 4.11 'Jupiter Variation' (024579): Rotations, fragments, and common-tone pivots (04:35)



A central factor influencing our analytical perception during these sections concerns the cardinality and contour of each figure. The attack of each descending figure's highest pitch creates either a regular or an irregular rhythmic pulse, depending on the number of pitches that each figure contains. The addition or subtraction of pitches to these consecutive descending motives thereby creates the impression of an increase or decrease in tempo. Individual members of (024579) are often emphasised as referential centres through their frequent repetition and juxtaposition with other T_n related sets, while harmonic progressions emerge as a result of the slowly shifting referential emphasis. At times, pairs of T_n-related sets are utilised as temporary referential centres. Although there are moments where the hexachordal pitch structure becomes looser and more chromatic (such as in ‘Mars’), it is predominantly (024579) that functions as the continually reappearing salient structure.

During virtually all the (024579) sections (with ‘Leo’ as the exception), the energy and intensity eventually build to a point where pitch structure is subsumed by sonic and textural inventions. In other instances, when disruptions to the (024579) salience occur, they are frequently conflations of consecutive pc sets. The alteration of an individual pitch-class within (024579) often signals a forthcoming change in transposition, where the altered pitch-class is a member of a new pc-set. While the diatonic collection sometimes appears as an expansion of (024579), Coltrane’s improvisation consistently emphasises (024579) as the salient structure, regularly omitting the two pitch-classes that would transform it into the diatonic collection.

(024579) SALIENCE IN ‘JUPITER’ AND ‘JUPITER VARIATION’

As exemplars of Coltrane’s hexachordal approach, ‘Jupiter’ and ‘Jupiter Variation’ provide extended examples of how (024579) is developed. During the first (024579) section in ‘Jupiter’, {B, C♯, D♯, E, F♯, G♯} is initially introduced as a descending motive which is repeated and fragmented into pentatonic subsets (Example 4.62). This hexachord emerges from the trichordal components of the theme, sharing the common-tones F♯ and G♯ with {F♯, G♯, A}: the trichord that precedes this section. Two occurrences of the pitch D during the exposition of {B, C♯, D♯, E, F♯, G♯} disrupt the salience of (024579) and signal the entrance of {D, E, F♯, G, A, B}, after which two subsets of {B, C♯, D♯, E, F♯, G♯} appear briefly before {D, E, F♯, G, A, B} returns. Similarly, pitches E♭ and F anticipate the entrance of {A♭, B♭, C, D♭, E♭, F} when they appear within the consecutive sets {D, E, F♯, G, A, B} and {A, B, C♯, D, E, F♯}. During the transition from {A♭, B♭, C, D♭, E♭, F} to {G, A, B, C, D, E}, a momentary conflation of these sets occurs before {G, A, B, C, D, E} clearly appears. As this section concludes, the diatonic collection arrives as the pitch F♯ is added to the previously stated pc set {G, A, B, C, D, E}: the contour of segment {F♯, G, A, C, D} mirrors {C, D, E, G, A} which precedes it, thereby completing the transformation of {G, A, B, C, D, E} into the diatonic collection. This single occurrence of the diatonic collection, in a context saturated with (024579), clearly confirms the hexachordal salience.

The second (024579) section in 'Jupiter' is much lengthier than the first, beginning again with {B, C♯, D♯, E, F♯, G♯} (Example 4.63a). Similar to the (023) transposition patterns previously described in 'Jupiter Variation', during this section, referential sets are repeated and juxtaposed with contrasting transpositions. The initial emergence of the diatonic collection (E♭ major) precedes the referential set {B♭, C, D, E♭, F, G}, with Coltrane omitting A♭ to form (024579). Two hexachords {G, A, B, C, D, E} and {D, E, F♯, G, A, B} are each juxtaposed with {B♭, C, D, E♭, F, G} multiple times, while one appearance of the diatonic collection (G major) results from adding F♯ to {G, A, B, C, D, E} as before (Example 4.63b). Across this section, pentatonic formations frequently occur as hexachordal subsets.

The pitch structure becomes increasingly complicated as adjoining and emerging sets become conflated (Example 4.63c). The emergence of the referential set {A♭, B♭, C, D♭, E♭, F} overlaps with {G♭, A♭, B♭, C♭, D♭, E♭}, a move which is anticipated by the interjection of C♭

within {A♭, B♭, C, D♭, E♭, F}. Where {G♭, A♭, B♭} appears within {A♭, B♭, C, D♭, E♭, F}, it references its previous appearance as an overlapping set, while the diatonic collection (A♭ major) emerges via the expansion of {A♭, B♭, C, D♭, E♭, F} with pitch-class G. Following the set sequence {G♭, A♭, B♭, C♭, D♭, E♭} – {G, A, B, C, D, E} – {A♭, B♭, C, D♭, E♭, F} – {E, F♯, G♯, A, B, C♯}, the referential emphasis shifts to {D, E, F♯, G, A, B}. Interestingly, the overlapping sets in this sequence do resemble the blended scales found in Dennis Sandole's pedagogy (Chapter 2.3.1), suggesting a possible source subsequently developed by Coltrane.

The emergence of {D, E, F♯, G, A, B} as a referential set is, however, brief, juxtaposed with {G, A, B, C, D, E} and fragments of the previously stated set {A♭, B♭, C, D♭, E♭, F}. The emphasis then shifts to {G, A, B, C, D, E}, which is contrasted by a subset given as: {F♯, G♯, A♯, B, C♯, D♯}, {D, E, F♯, G, A, B}, {A♭, B♭, C, E♭, F}, and {E, F♯, G♯, A, B, C♯} (Example 4.63d). Within this section the final referential set to emerge is {B♭, C, D, E♭, F, G}, which is juxtaposed by sets {E, F♯, G♯, A, B, C♯}, {F♯, G♯, A♯, B, C♯, D♯}, {G, A, B, C, D, E}, and {D, E, F♯, G, A, B}. Slight disruptions to the (024579) construct occur in places, such as where {F♯, G♯, A♯} appears overlapping with {E, F♯, G♯, A, B, C♯}. Here {F♯, G♯, A♯} references the preceding set {B♭, C, D, E♭, F, G} with A♯/B♭, while also anticipating the emergence of {F♯, G♯, A♯, B, C♯, D♯} (Example 4.63e). Other similar set conflations occur where {C, D} appears within {F♯, G♯, A♯, B, C♯, D♯}, and {E♭, D♭} appears within a subset of {G, A, B, C, D, E}. Coltrane's improvisation then becomes more abstract and intense, increasingly manipulating the saxophone's timbre and harmonics in the continuing exploration of previously stated patterns and gestures. As tension is released, there is a gradual transition back to the salience of (023).

In 'Jupiter Variation', the hexachord (024579) emerges after the brief expansion and contraction of (023) through the sequence of trichords {C♯, D♯, E}, {C♯, D♯, E♯}, {C♯, D♯, E} (Example 4.64). The common-tones shared between these sets, C♯ and D♯, are integrated as members of the initial (024579) set {F♯, G♯, A♯, B, C♯, D♯}. Between 04:06 and 04:52, only four members of (024579) appear – {F♯, G♯, A♯, B, C♯, D♯}, {G, A, B, C, D, E}, {E, F♯, G♯, A, B, C♯}, and {B♭, C, D, E♭, F, G}. This creates a more focused and concise harmonic palette as compared to 'Jupiter' which uses more numerous (024579) members across a longer duration.

Initially, the referential pc-sets {F♯, G♯, A♯, B, C♯, D♯} and {G, A, B, C, D, E} are repeatedly juxtaposed, with the pentatonic subsets of {F♯, G♯, A♯, B, C♯, D♯} occurring exclusively after its first entrance. The emergence and repeated pairing of sets {E, F♯, G♯, A, B, C♯} and {B♭, C, D, E♭, F, G} signals the first harmonic shift, whilst a second shift occurs when {G, A, B, C, D, E} replaces {E, F♯, G♯, A, B, C♯} as a contrasting set with {B♭, C, D, E♭, F, G}. Throughout this section, there are brief divergences from (024579) with conflations created between adjacent sets and brief appearances of the diatonic collection as modifications of recurring hexachords.

In both 'Jupiter' and 'Jupiter Variation', chromatic saturation occurs when sets {B♭, C, D, E♭, F, G} and {E, F♯, G♯, A, B, C♯} are paired in juxtaposition. Given that this only occurs with these two pc-sets, it seems to suggest a simple preference for these transpositions as opposed to an improvisational design that focuses on chromatic saturation and T_6-related hexachords. The focused repetition of (024579) and its division into various subsets across *Interstellar Space* and *Stellar Regions* indicates an improvisational approach where hexachordal pc-sets are transformed through processes of transposition and fragmentation. While the intensity and speed of the gestures, voice-leading, register placement, and timbre all have a significant musical bearing, the organicism of the descending figures arises from the freedom with which they are played, allowing spontaneous variances in pitch structure within a context fixed on (024579) salience. However, Coltrane's use of a hexachordal determinant is not limited to *Interstellar Space* and *Stellar Regions*, since in the earlier recording, 'Suite: Prayer and Meditation (Day)', he employs a single hexachord as the foundation for both theme and improvisation.

4.4 'SUITE: PRAYER AND MEDITATION (DAY)', A MODEL OF HEXACHORDAL SALIENCE

Having gone undocumented until now, the musical architecture of 'Suite: Prayer and Meditation (Day)' (hereafter abbreviated as 'Prayer and Meditation (Day)') stands as a structural precedent for the developments in pitch structure seen in 'Iris', 'Jupiter', 'Jupiter Variation' and across *Interstellar Space* and *Stellar Regions*. Recorded by Coltrane's 'classic' quartet in June 1965 (released posthumously in 1970), 'Suite' is an extended work lasting twenty-one minutes, comprising five segue movements with titles evocative of Indian *ragas*. The movement 'Prayer and Meditation' occurs at the beginning, middle, and end of the suite, with each appearance given the additional subtitles 'Day', 'Evening', and '4 A.M.' The forthcoming analysis focuses on 'Prayer and Meditation (Day)' as the longest (03:14) of these three movements.

Since the foundation of ‘Prayer and Meditation (Day)’ centres on the single hexachord pc-set {C♭, C, E♭, F, G♭, A♭}, there are many similarities to *Stellar Regions* and *Interstellar Space*: (1) the use of one T_n-type as a structural determinant for both the theme and improvisation; (2) the segmentation of a hexachord as a means for melodic variation; (3) the emphasis on trichordal motives that are repeated, fragmented, and combined in various ways; (4) the manipulation of chromatic pitch structure to engage with tonal harmony, and more specifically, the blues; (5) the use of common-tones in transformations between pc-sets of different T_n-types; (6) harmonic accompaniment which is derived from a salient pc-set; (7) the referential use of one pc-set within a series of pc-sets.

The manner in which these traits are expressed in ‘Prayer and Meditation (Day)’ suggests a broader, macro-level approach to pitch structure: one that focuses on the segmentation and breaking down of the superset to create a heterogeneous melodic surface. In ‘Prayer and Meditation (Day)’, pc-set homogeneity appears as part of the large-scale hexachordal design, in contrast to pieces such as ‘Iris’ which realise pc-set homogeneity from its small-scale (trichord) construction.

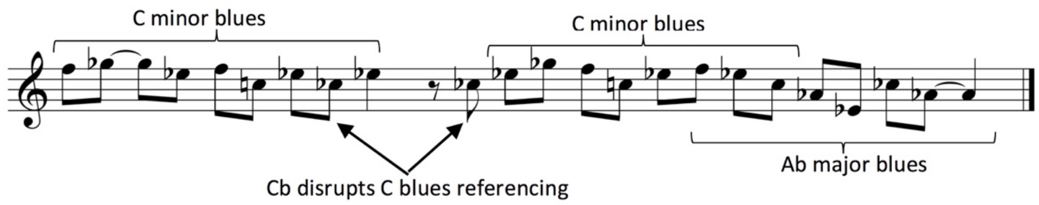
(014679) SALIENCE

As a thematic, harmonic, and improvisational construct, the (014679) set {C♭, C, E♭, F, G♭, A♭} saturates ‘Prayer and Meditation (Day)’. The pivotal structural qualities of {C♭, C, E♭, F, G♭, A♭} are that it occurs as a subset of Oct_{23}, and can be formed as a synthesis of triads B major and F minor, or alternatively of C diminished and F diminished. Coltrane’s use of this hexachord implies three different blues scales from rotations beginning on: F (F minor blues scale), A♭ (A♭ major blues scale), and C (C minor blues scale). Only one note (G♭)

differentiates pc-set {C♭, C, E♭, F, G♭, A♭} from the F minor and A♭ major blues scales (where B♭ is present instead of G♭) – with G♭ and B♭ mapping onto each other at T_4/T_8 (Example 4.65). Similarly, {C♭, C, E♭, F, G♭, A♭} and the C minor blues scale share all but two pitch-classes which map onto each other at T_1/T_{11}. A blending of the blues sonorities C and A♭ can be seen in Figure 4.12.

Predominantly in 'Prayer and Meditation (Day)', Coltrane emphasises A♭ minor, frequently changing between melodic figures that arpeggiate an A♭ minor-seventh chord and A♭ minor-sixth chord (both subsets of (014679)). However, in a few instances, A♭ major emerges as a subset of the salient hexachord and, within the context of the rhythm section (piano, bass, drums), F is emphasised centrically as a recurring pedal point. Significantly, harmonic instability results from a conflict between this F centricity of the rhythm section and the A♭ centricity of the melody and improvisation. The harmonic conflict created from the manipulation of {C♭, C, E♭, F, G♭, A♭} manifests itself similarly to how the (023) construct can imply both the Aeolian and Phrygian modes in the 'Jupiter Variation' and 'Jupiter' themes. The complex harmonic profile of {C♭, C, E♭, F, G♭, A♭} and the F centricity allude to the harmonic qualities of F minor, F half-diminished, and F Phrygian, with the rhythm section's accompaniment of the saxophone frequently reflecting this ambiguity. Thus 'Prayer and Meditation (Day)' provides another example of how Coltrane engages the blues within an advanced theoretical context, using pitch structure as the means for its reinvention.

Figure 4.12 ‘Suite: Prayer and Meditation (Day)’: Blending of blues sonorities (02:02)



‘PRAYER AND MEDITATION (DAY)’ THEME

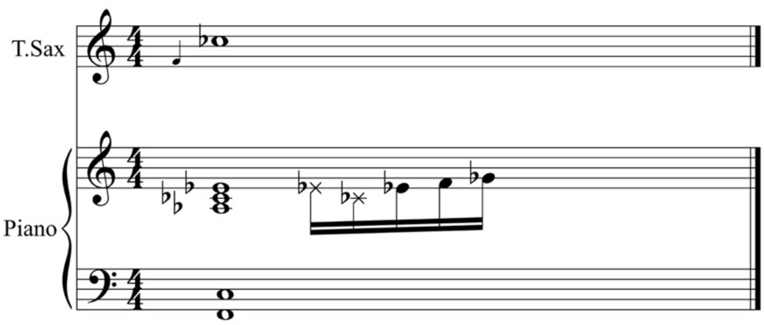
The theme of ‘Prayer and Meditation (Day)’, played by the tenor saxophone, uses a design that disguises the hexachord {C♭, C, E♭, F, G♭, A♭} within a series of ascending semitonal approaches to its pitch-classes. Example 4.66 represents these chromatic approaches as smaller notes, with the larger notes representing the members of {C♭, C, E♭, F, G♭, A♭}. All pitch-class members of {C♭, C, E♭, F, G♭, A♭} are targeted by chromatic approaches in the theme’s construction, except for F, which only appears as the first and last notes. The remaining pitch-classes, {G♭, A♭, C♭, C, E♭}, emphasise A♭ minor by using its subsets {E♭, G♭, A♭, C♭}, {A♭, C♭, E♭}, and {C♭, E♭, G♭}, in what is essentially a series of A♭ minor-seventh chord arpeggios and fragments. Towards the end of the theme, pitch C is interjected into the A♭ minor-seventh chord arpeggios, thereby introducing all pitch-classes in {C♭, C, E♭, F, G♭, A♭}. The importance of employing original transcriptions in musicology, discussed in Chapter 3.2, may be highlighted by issues relating to the commercially available transcription of the ‘Prayer and Meditation (Day)’ theme, published by Hal Leonard (Coltrane, 1991). Here, the transcription contains a consequential mistake in the opening statement of the theme which inhibits the analytical recognition of {C♭, C, E♭, F, G♭, A♭} as the core of its architecture. More significantly, the chord changes as wrongly notated distort the harmonic underpinning of the piece which should crucially resonate with the fundamental harmonic qualities of the melody and the hexachord {C♭, C, E♭, F, G♭, A♭}.

HARMONIC USE OF (014679)

At first glance, the F pedal-point would seem to indicate a modal underpinning to this piece re-sounding the F half-diminished seventh as its harmony, similar to Coltrane's earlier modal works. However, the harmonic content is far more complex, exhibiting the purposeful employment of the hexachord {C♭, C, E♭, F, G♭, A♭} to engage with the blues and tonal harmony. While the bass plays an F pedal, the first piano harmony of 'Prayer and Meditation (Day)' contains all the pitch-class members of {C♭, C, E♭, F, G♭, A♭}, except for G♭ (Figure 4.13). Pitch-class G♭ subsequently appears in the first linear gesture, thereby completing all the pitch-classes in {C♭, C, E♭, F, G♭, A♭}. The dissonance between C and C♭ is pivotal in creating the first chord's harmonic sonority, underscoring this chord's distinctive quality from that of an F half-diminished seventh chord where C is absent. Although the recording's mixed quality makes detailed analysis difficult, the pianist McCoy Tyner can often be heard constructing harmonies from the pitch-classes contained in {C♭, C, E♭, F, G♭, A♭}. Frequently the piano harmonies mirror the construction of the melody, emphasising the chordal quality A♭ minor-seventh, and the pitch-classes G♭, C♭, and F, both linearly and harmonically.

Additionally, blues figures appear as a linear accompaniment. While truncated A♭ minor blues scales occur, most notably at 00:03, 00:24, and 00:29, others are also apparent at 00:48 (F minor blues scale) and 00:06 (a truncated E♭ minor blues scale). The presence of {C♭, C, E♭, F, G♭, A♭} as both a melodic and harmonic structure anticipates the later, more rigorous use of (013) in 'Iris'. Whereas the piano in 'Iris' strictly adheres strictly to the construct (013), in 'Prayer and Meditation (Day)' there is a more liberal approach to incorporating the salient hexachord. It is Coltrane's improvisational rigour that brings into focus the central importance of {C♭, C, E♭, F, G♭, A♭} to the entirety of the piece.

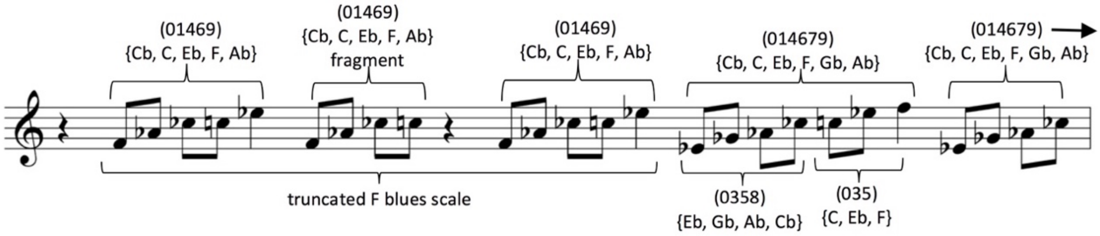
Figure 4.13 The first chord of 'Suite: Prayer and Meditation (Day)'



HEXACHORDAL SALIENCE AND SEGMENTATION

During the saxophone improvisation, Coltrane divides {C♭, C, E♭, F, G♭, A♭} into subsets of different cardinalities, emphasising various distinct melodic structures that blend and transform within the confines of the hexachordal superstructure. The improvisation only contains nine points where pitch-classes appear that are not members of {C♭, C, E♭, F, G♭, A♭}, thus demonstrating the intense focus on this single pc-set. The three pitch-classes that occur in these instances – G, B♭, and D♭ – form relationships with the salient hexachord, suggesting other blues and pentatonic sonorities. The first complete statement of {C♭, C, E♭, F, G♭, A♭} as a motive appears towards the beginning of the saxophone improvisation. This follows a repeated ascending (01469) motive (a truncated F minor blues scale), which is transformed into the {C♭, C, E♭, F, G♭, A♭} motive through the addition of G♭ (Figure 4.14).

Figure 4.14 'Suite: Prayer and Meditation (Day)': {C♭, C, E♭, F, G♭, A♭} motivic emergence (01:22)



Overall, Coltrane's improvisation exhibits a similar type of trichordal focus to that of 'Iris', 'Jupiter Variation', and 'Jupiter'. However, in 'Prayer and Meditation (Day)', the motives involve combinations of different segments from the hexachordal superset. In this way, the resulting melodic surface contains pc-sets of various T_n-types, contrasting with the homogeneous, transpositionally related sets that dominate 'Iris', 'Jupiter Variation', and 'Jupiter'. Coltrane begins his improvisation with motives constructed from (023), (025), (035), and (046) (Example 4.67a). Similarly, the common-tone retention in the motion from {C, E♭, F} to {C♭, E♭, F} and voice-leading from C to C♭ is similarly seen where heterogeneous trichords occur in *Stellar Regions* and *Interstellar Space*.

The first two sets introduced – {E♭, F, G♭} and {G♭, A♭, C♭} – are a trichordal pair that recur throughout Coltrane's improvisation, sometimes synthesised into one gesture through the common-tone G♭.[75] In Example 4.67b, the grouping {G♭, A♭, C♭} functions as a referential set, presented in an N1 contour in repeated juxtaposition with (024), (025), (035), (036), and (047), until {E♭, F, G♭} emerges in stave four. Effectively, this set sequence sounds like a kind of call and response, with {D♭, E♭, F}, {D♭, E♭, G♭}, {C, E♭, G♭}, and {C♭, E♭, G♭} mirroring the N1 contour of the referential set {G♭, A♭, C♭}.[76] Significantly, pitch-class D♭ occurs as a divergence from the {C♭, C, E♭, F, G♭, A♭} salience. Its appearance creates the superset A♭ minor pentatonic and resonates with the A♭ minor-seventh sonority contained as a subset in {C♭, C, E♭, F, G♭, A♭}. Coltrane modifies the repeated figure in stave three, changing pitches within the final two figures, while retaining E♭ and G♭ across sets {E♭, G♭, A♭}, {C, E♭, G♭}, and {C♭, E♭, G♭}. In the fourth stave of Example 4.67b, a five-note motive results from the

[75] Given Coltrane's focus on subsets of {C♭, C, E♭, F, G♭, A♭}, the vast majority of motives share pitches.
[76] An exception is the fragment of {D♭, E♭, G♭} that appears at the end of staff system two.

combination of the referential set {G♭, A♭, C♭} with {E♭, F, G♭}, using G♭ as a common-tone pivot. While this motive can be regarded as a penatchord, the context of the established trichordal salience, and the emergence of {E♭, F, G♭} in the following phrase, suggest the synthesis of {G♭, A♭, C♭} and {E♭, F, G♭} (the same type of structure is described in 'Iris', with a common-tone synthesis of (013) and (045), in Chapter 4.1). Similarly, the synthesis of {G♭, A♭, C♭} and {E♭, F, G♭} occurs later in the improvisation, with Coltrane adding a differing pitch to the end of each motive (Example 4.67c).

The referential juxtaposition of {G♭, A♭, C♭} and {C, E♭, F} (see again Example 4.67c) is a significant feature of the improvisation because of the inversional relationship between (025) and (035), and how they combine to form superset (014679). During the development of this section, the referential emphasis shifts onto {C, E♭, F}, while {G♭, A♭, C♭} is temporally fragmented and then altered. As the pitch structure begins to blend and become more fragmented, divergent pitches B♭ and D♭ appear as allusions to pentatonic subsets (035) and (025), with {A♭, C♭, C, E♭} emerging as a synthesis of the (03) subsets of {C, E♭, F} and {G♭, A♭, C♭}. Preceding the theme's recapitulation, Coltrane segments {C♭, C, E♭, F, G♭, A♭} into dyad subsets {G♭, C♭}, {A♭, C♭}, and {F, C♭} descending from the common-tone anchor C♭ (Example 4.67d). This dyad emphasis appears similarly in *Interstellar Space* and *Stellar Regions* when salient trichords are broken down into dyad subsets, so stringing together sequences of T_n-related sets.

Following an area of trichordal salience, an unusual figure exhibits structural characteristics not typically seen in improvised music. A symmetrical phrase is formed by I_{11} related pc-sets {F, G♭, A♭, C♭} and {C, E♭, F, G♭} (Example 4.68). The ordered pitch-interval sequence -3, -2,

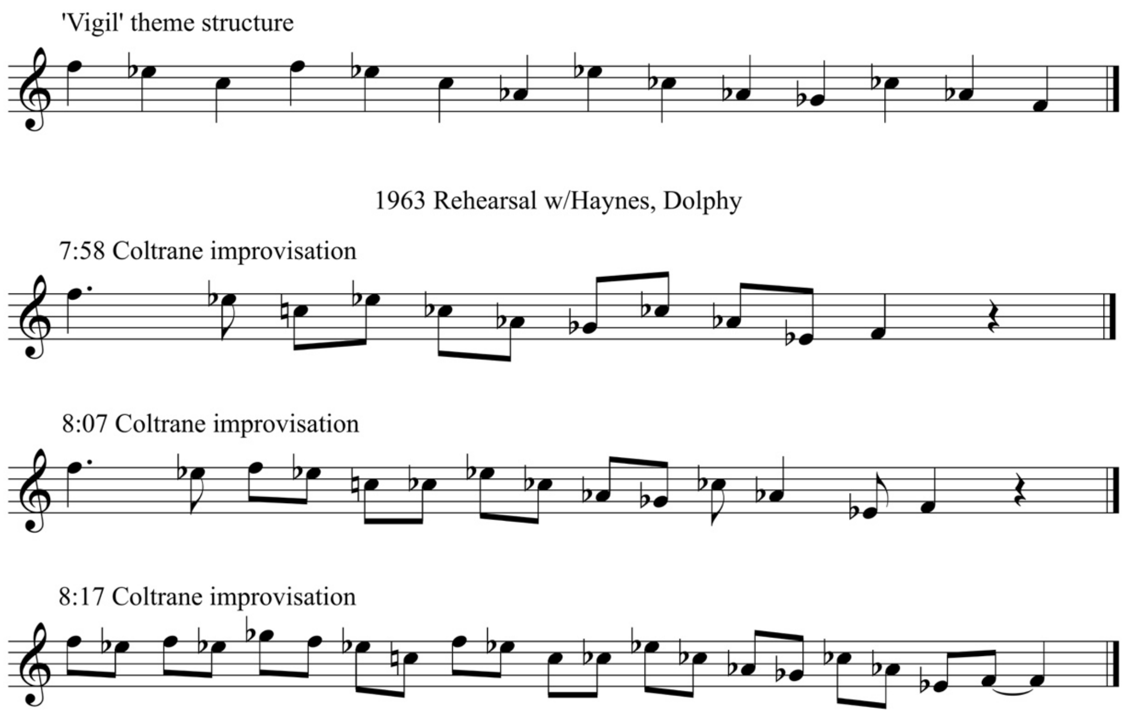
+5, -3, -3, +1, +2, +3 is mirrored around the C♭/C inversional axis as: +3, +2, -5, +3, +3, -1, -2, -3. Although the hexachord construct {C♭, C, E♭, F, G♭, A♭} inherently contains inversionally related subsets, the ordered pitch-interval construction of this figure, as identical semitonal movements in opposite directions, is an extraordinary structure.

'VIGIL'

Although a thorough examination of the pitch structures right across Coltrane's late period lies beyond the scope of this thesis, it is important to note that {C♭, C, E♭, F, G♭, A♭} is found in other recordings from this time-period. Most significantly, the theme to 'Vigil' (recorded one week after 'Suite' on 16 June 1965) is constructed from this identical hexachord, similarly emphasising an F centricity. 'Vigil' is often referenced in jazz literature as an early duo prototype for *Interstellar Space*, but its structural connection to 'Prayer and Meditation (Day)' has thus far gone undocumented in scholarship. Additionally, Coltrane is heard quoting the theme of 'Vigil' and improvising using {C♭, C, E♭, F, G♭, A♭} at 05:45 in 'Creation' (recorded at the Halfnote jazz club on 2 April 1965). While this performance reveals that Coltrane had been developing the use of {C♭, C, E♭, F, G♭, A♭} for at least two months before the 10 June 1965 recording session that produced 'Prayer and Meditation (Day)', an earlier unreleased recording of a 1963 rehearsal provides further evidence of Coltrane's experimentation with this exact hexachord, two years prior to 'Prayer and Meditation (Day)' (Figure 4.15). (This unreleased rehearsal recording is discussed in more detail in Chapter 1.4.)

The content of 'Prayer and Meditation (Day)', 'Iris', 'Jupiter Variation', and 'Jupiter' provide excellent examples of two basic approaches to pitch structure in Coltrane's late-period music: melodic surfaces built up from the combination of smaller pc-sets (trichords or dyads); and melodic surfaces resulting from the breaking down of larger pc-sets (as illustrated by hexachords) into smaller segments. Crucially in these pieces, structural unity is achieved through a deterministic approach whereby a single pc-set structural configuration is the means for realising the improvisational, thematic, and harmonic content of the music. However, this determinism is not dogmatic and allows for freedom and spontaneity within the musical process, drawing on Coltrane's lifetime of musical knowledge and melodic inclinations rooted in the blues. Further examples of emergent pc-set structures within *Stellar Regions* and *Interstellar Space* are examined next in Chapter 5.

Figure 4.15 Nascent 'Vigil' theme and {C♭, C, E♭, F, G♭, A♭} from 1963



CHAPTER 5: EMERGENT PC-SETS AND MAJOR-THIRD CYCLES

INTRODUCTION

This chapter examines an important phenomenon whereby referential pc-sets emerge within Coltrane's improvisations in *Stellar Regions* and *Interstellar Space*. The context from which the referential structures emerge typically contains the essential interval and pitch-class components of the emergent pc-set. Generally, there are three categories of pc-set emergence within Coltrane's improvisations: (1) the gradual development of a referential pc-set's identity in contexts where its structural components are initially hidden or embedded; (2) the sudden emergence of a referential pc-set with strong structural links to its context; (03) the emergence of referential pc-set as a subset of a salient local superset (as illustrated in Chapter 4.4). Additionally, supersets may emerge gradually as a product of the trichordal and dyad development of an improvisation. Across *Stellar Regions* and *Interstellar Space*, pc-sets of various T_n-types emerge as referential structures. While the duration of their salience may last from only a few seconds to several minutes, the transformative operations and manner in which they develop display common features that indicate a broad-based approach not limited to any individual T_n-type.

Furthermore, this chapter examines the referential emergence of the diatonic collection (as major scales and tonal centres), where the major-third cycle (C4) is the principal transpositional process. While these emergent instances in *Stellar Regions* and *Interstellar Space* can be traced back to major-third related tonal centres in earlier recordings such as 'Giant Steps', the manner of their appearance is more flexible and complex and indicates an evolution in Coltrane's approach. The chapter is necessarily long due to the need to place numerous pieces under examination to prove the widespread nature of the case. The overall progression of the analyses is first organised into two sections focused on emergent pc-sets: moving through 'Tranesonic', 'Tranesonic' (alt tk), 'Seraphic Light', 'Jimmy's Mode', 'Sun Star', 'Sun Star' (alt tk), and 'Configuration' from *Stellar Regions* in Chapter 5.1; and followed by 'Leo' and 'Mars' from *Interstellar Space* in Chapter 5.2. This sequence provides a means for contrasting the alternate takes within *Stellar Regions* and mirrors the pc-set development from *Stellar Regions* (where pc-set salience is concise) to *Interstellar Space* (where pc-set salience is lengthy and varied). Within this chapter, the analytical progression places similar pc-set formations in adjacent positions in order to better illustrate their frequency, properties, and status as improvisational tools.

In Chapter 5.3, the analytical focus changes to major-third (ic4) related members of the diatonic collection (major scales). As alternate versions of the same piece, the comparative analyses of 'Stellar Regions' and 'Stellar Regions' (alt tk) (and cursorily 'Venus') show how $C4_0$ and the diatonic collection comprise their entire theoretical foundation. In contrast, analyses of 'Mars' and 'Leo' examines the emergence of several C4 constructs and the diatonic collection within more varied contexts. Finally, Chapter 5.4 presents evidence of structural processes in 'Acknowledgment' (recorded twenty-six months earlier) that is analogous to the major-third related, diatonic collection formations that appear in *Stellar Regions* and *Interstellar Space*. This is presented in order to demonstrate that common theoretical threads run through Coltrane's constantly evolving music. Again, I direct the reader to Appendix C in Volume II where the cross-referenced Examples are found.

5.1 EMERGENT PC-SETS IN *STELLAR REGIONS*

While consideration is given to the harmonic influence of the piano and bass on *Stellar Regions,* the harmonic analysis of the entire ensemble is beyond the scope of this thesis, with the primary focus here being on the pitch structure of Coltrane's saxophone improvisations. In *Stellar Regions*, once the ensemble moves beyond the themes and their tonal references, the approach is essentially free, allowing each performer considerable musical autonomy. This approach may be justified by the fact that during an interview with Frank Kofsky in 1966 Coltrane himself says 'we don't follow what the piano does any more, because we all move in our own directions, see. I like it for a backdrop, you know—[because] of its sound' (Devito, p.293).

'TRANESONIC' AND 'TRANESONIC' (ALT TK)

'Tranesonic' and 'Tranesonic' (alt tk) have the distinction of being the final recordings of Coltrane on the alto saxophone.[77] It is likely that the raw and expressive nature of these pieces, with Coltrane's explosive intensity barely contained by the smaller saxophone, is a reason why these tracks were not recognised as the alto saxophone during the recording's mastering and production. These pieces contain some of Coltrane's most intense and abstract playing on *Stellar Regions*, and give the impression that the smaller, lighter horn is providing him with a gateway to new sonic possibilities of timbre and harmonics. As with 'Jupiter' and 'Jupiter Variation', the titles of 'Tranesonic' (alt tk) and 'Tranesonic' confuse the order in which they were recorded, with the first take billed as 'Tranesonic' (alt tk) and

[77] When *Stellar Regions* was released*,* the CD liner notes omitted listing Coltrane as playing alto saxophone on the two versions of 'Tranesonic'. Experts have since confirmed the presence of the alto saxophone. In order to avoid frequent clef changes, the alto saxophone analysis is presented one octave higher than it sounds (similar to the tenor saxophone analyses).

the second as ‘Tranesonic’. As a first take, ‘Tranesonic’ (alt tk) is the more unconventional of the two versions, consisting predominantly of timbral and sonic explorations. By contrast, the thematic material performed by the ensemble is more cohesive in ‘Tranesonic’, while Coltrane’s improvisation contains lengthy motivic areas constructed from conventional note sequences. Given that ‘Tranesonic’ (alt tk) predominantly entails complex sonic explorations of harmonics and timbre, it is excluded from examination in order to make room for other analyses more relevant to the focus of this thesis.

The ‘Tranesonic’/‘Transonic’ (alt tk) theme is primarily rhythmic, sharing a similar ethos to Coltrane’s ‘Leo’. Architecturally, the improvisations are framed by three sections comprising of contrasting rhythmic structures: an opening theme; a transitional theme; and an ending theme. The opening theme displays a ternary form, with an improvised bridge embedded between motives constructed from rhythmic note groupings 4 2; 4 2. It is loosely centred in E♭ minor and focuses on pitch-class E♭ – played rhythmically in groups of four notes that ascend over a span of three octaves. This motive is followed by a faster, D to D octave leap. Embedded within the theme is a recurrent emphasis on ic5 resulting from the periodic insertion of B♭ as the second pitch of the theme, and the manipulation of saxophone timbre producing ic5 harmonics above pitches E♭ and D. This thematic emphasis on ic5 resonates within ‘Tranesonic’ with the emergence of (027) during an extended section of Coltrane’s improvisation. In both versions, following the piano solo, there is a cued transitional theme that is similar to the opening theme, utilising E♭ octave leaps within the repeated rhythmic pattern: 2 2 2 3; 2 2 2 3; 2 2 2 3 3 3 3. Meanwhile, the ending theme modifies the thematic elements of the opening and transitional themes into a cued rhythmic pattern: 4 7 5 5 5; 4 7 5 5 5; 4 3 2 1. This is played by the drums and saxophone (overblowing E♭ to produce multiple harmonics within this pattern) while the bass and piano shadow these figures. The use of numbers as a compositional device in 'Tranesonic'/'Transonic' (alt tk) is unusual in Coltrane's music and invites speculation about its potential symbolic relationship to his interest in astrology and numerology (Chapter 2.2).

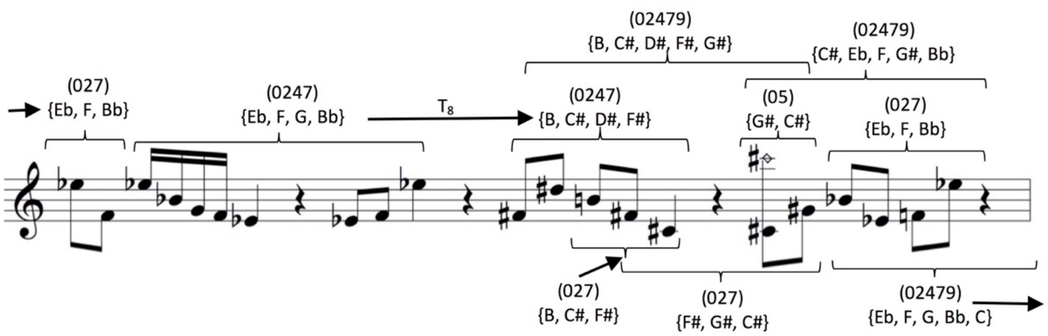
'TRANESONIC' AND (027)

In 'Tranesonic', the construct (027) is gradually revealed after the piano solo. It is first concealed within alto saxophone explorations of timbre, harmonics, and the *altissimo* register, until it becomes more clearly prominent at 03:04. While numerous consecutive set members of (027) eventually appear, initially the (027) structure is integrated with T_n-types (024), (0257), and (0357). Beneath the surface of this heterogeneous set structure, sequences of (02) and (05) subsets project the interval content (ic2 and ic5) of (027), promoting structural unity until the salience of (027) is firmly established in stave three of Example 5.1a. Crucially, during the emergence of (027), the voice-leading projects ic2 as a structural component of (027). The last pitch of stave one (D) begins a low register ic2 voice-leading sequence D, E, F♯, A♭, B♭ C that runs through several pc sets. This is followed by two ic2 voice-leading streams that result from the partitioning of the perfect-fifth (P5) sequence A, E, B, F♯, C♯, G♯, D♯ into ascending whole-step (05) dyads. Here, ic2 voice-leading appears in the lower-register with G, A, B, C♯, D♯/E♭, F, and in the upper-register with E, F♯, G♯, B♭. The emergence of (027) in this context exemplifies how T_n-type salience is often established in *Stellar Regions* and *Interstellar Space*. Additionally, the projection of ic2 and (02) dyads through heterogeneous trichord sequences, as a technique that establishes intervallic unity, is similarly found in other pieces (as exemplified by 'Saturn' in Chapter 6).

In the opening stave of Example 5.1b, (0257) appears as the transpositional combination of (027) members {D♭, E♭, A♭} and {A♭, B♭, E♭}, thus illustrating a different developmental strategy. A projection of ic2 voice-leading partitions {A♭, B♭, D♭, E♭} into two dyads (A♭, B♭} and {D♭, E♭} moving in contrary motion. Trichords {D♭, E♭, A♭} and {A♭, B♭, E♭} then emerge from {A♭, B♭, D♭, E♭} as individual pc-sets. Furthermore, a complete pentatonic superset {D♭, E♭, F, A♭, B♭} is formed upon the entrance of {E♭, F, B♭}. Interestingly, pentatonic supersets resulting from consecutive (027) members display a conceptual similarity to patterns in 'Acknowledgement' where consecutive members of (035) combine to form pentatonic supersets (see Chapter 5.4 for the analysis of 'Acknowledgement').

In another example of trichordal and tetrachordal interaction, which demonstrates the sophistication and diversity of Coltrane's approach, the (0247) member {E♭, F, G, B♭} appears as an embellishment of {E♭, F, B♭} (Figure 5.1). Tetrachord {B, C♯, D♯, F♯} then follows as a T_8 transformation of {E♭, F, G, B♭}, alluding to the major-third harmonic relationships that are a hallmark of Coltrane's approach. The emergence of {B, C♯, F♯} as a subset of {B, C♯, D♯, F♯} forms an incomplete chain of ic5-related pitch-classes, with a disruption caused by the reversal of E♭ and B♭ within the sequence. The appearance of (027) members {B, C♯, F♯}, {F♯, G♯, C♯}, {E♭, F, B♭} within the context of overlapping pentatonic supersets {B, C♯, D♯, F♯, G♯}, {C♯, E♭, F, G♯, B♭}, and {E♭, F, G, B♭, C} reveals that the pitch structure is dynamic and may have multiple layers comprising subset and superset relationships. Significantly, the emergence of pentatonics and the diatonic collection, as a result of consecutive (027) sets, can create new realms of tonal stability. This is seen in staves three and four of Example 5.1b where the diatonic collection is formed from the consecutive (027) sets {D, E, A}, {A, B, E}, {F, G, C}, {C, D, G}, and {F, G, C}. Thus, this pc-set structure reveals that Coltrane's music can contain both tonal and atonal qualities, which is why strictly atonal characterisations of his later music are problematic.

Figure 5.1 'Tranesonic': (027) embellishment, tetrachord development, and pentatonic emergence (03:43)



As Coltrane's solo builds to its ending, the structural layers become more complex, shifting focus back and forth from (027) to its related subsets and supersets (Example 5.1c). Consecutive (05) and (02) dyads, which express the interval content of (027), combine to form (035) which in turn is a subset of (02479). Using a similar technique to the previously illustrated emergence of {A♭, B♭, D♭, E♭}, the construct {C♯, D♯, F♯, G♯} appears as the transpositional combination of (027) members {F♯, G♯, C♯} and {C♯, D♯, G♯} in the fourth stave of Example 5.1c. At the end of Coltrane's improvisation, the appearance of {D♯, F♯, G♯}, as an (035) subset of the previous pc-set {C♯, D♯, F♯, G♯}, expresses the ic5 and ic2 interval content of (027) with the conjoined dyads {D♯, G♯} and {F♯, G♯}.

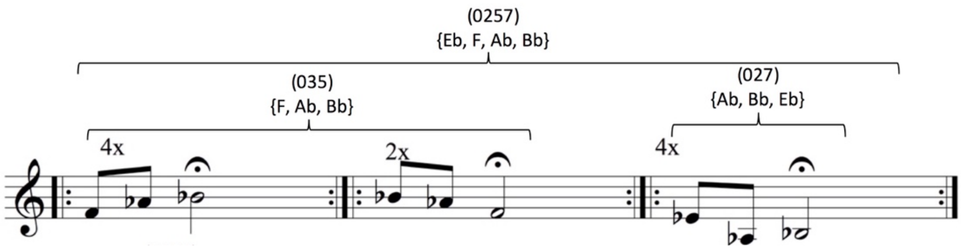
While the analysis of 'Tranesonic' illustrates (027) salience, equally, it demonstrates integration as a subset of the pentatonic scale. In the forthcoming analyses of 'Seraphic Light', 'Sun Star', 'Sun Star' (alt tk), 'Leo', 'Mars', and 'Saturn', other examples of (027) salience act to establish the importance of (027) as a crucial improvisational structure for Coltrane that is frequently in dialogue with pentatonic supersets. Although scholars, such as Whyton and Medwin, have remarked on the intertextual quality of (027) appearing in the fanfare of ‘Acknowledgement’, and in the opening of ‘Offering’, this chapter evidences (027) as a ubiquitous tool for coherence, establishing its significance as a fundamental structural device in Coltrane’s music.

‘SERAPHIC LIGHT’

In ‘Seraphic Light’ a broader menu of emergent elements is present, with the pentatonic scale exerting an influence on the constructs and the architecture of the theme mirrored by salient pc-sets in the saxophone improvisation. While (0257) and (0357) frequently appear as a synthesis of the theme’s trichordal components (035) and (027), T_n-types (027), (023), (035), and (03) all individually emerge as salient structures for varying durations. The theme comprises three repeated motivic statements that each contains three notes – forming the T_n-type pattern (035), (035), and (027) (Figure 5.2). This emphasis upon the number three (as a symbol of the Holy Trinity) and the ceremonial/liturgical manner in which the theme is performed, suggest an intersection of Coltrane’s musical and spiritual philosophies. The number of repetitions each motive undergoes forms a symmetrical pattern 4-2-4. The rhythm section is centred around B♭ minor, with the melody supporting this tonality using {F, A♭, B♭} and {E♭, A♭, B♭}. The manner in which (035) and (027) are used in the theme, and later in the improvisation, holds wider significance because these trichords are also the foundational structures of ‘Acknowledgement’, so providing further evidence of their status as fundamental tools in Coltrane’s compositional and improvisational vocabulary.

Additionally, (0257) has a recurring presence as a composite T_n-type formed by (035) and (027), thereby yielding another connection to the theme's structure.[78]

Figure 5.2 'Seraphic Light' theme



Coltrane's improvisation begins by utilising the trichordal structures of the theme, with pentatonic supersets appearing initially as referential background structures. Within the first motive of the improvisation, (027) and (035) overlap to form superset (0357). In fact, three structural layers are present during the opening section: B♭ minor and F minor pentatonic in the background; (0357) and (0257) in the middleground; and (025), (035), and (027) in the foreground as subsets of (0357) and (0257) (Example 5.2a). This formation resembles the type of layered complexity (featuring whole-tone collections) that appears in the introduction of 'Jupiter Variation' examined in Chapter 4.2. The structural continuity created by the interplay of these three layers is briefly interrupted by appearances of (0359) and B♭ Aeolian, indicating a brief shift between minor modal qualities that is a common harmonic technique used in tonal jazz improvisation. As Coltrane's improvisation progresses, he uses a call and response that juxtaposes repeated motives constructed from {B♭, D♭, E♭, F}, with leaps into the *altissimo* register consisting of subsets of B♭ and F minor

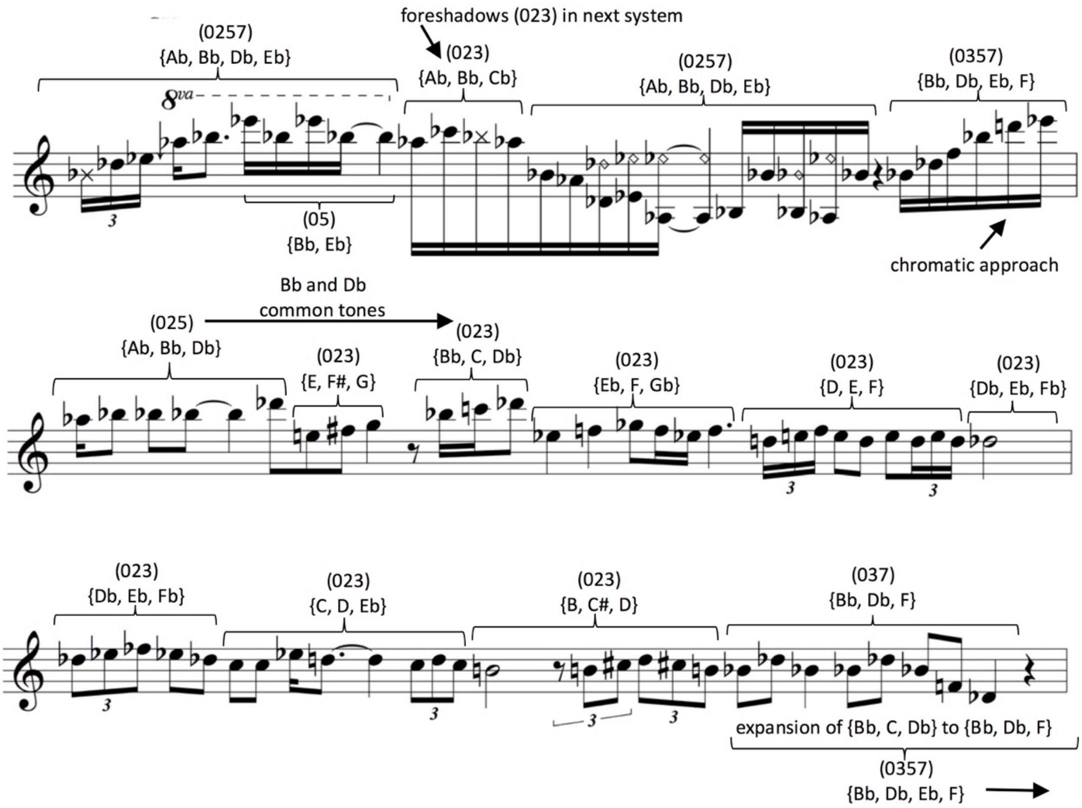
[78] The tonal plan of the four pieces comprising *A Love Supreme* (Porter, 1998, p.236) also reflects the structure of (0257). As previously mentioned, this tetrachordal structure is produced from the transpositional combination of two (027) members at T_5/T_7.

pentatonic (Example 5.2b). Thus, throughout this initial section, a synthesis of Coltrane's diatonic vocabulary and a pc-set congruent approach is seen.

(023) AND (027)

The brief salience of (023) is foreshadowed by {A♭, B♭, C♭}, which appears hidden within a rapid descending line that follows the final call and response *altissimo* leap (Figure 5.3). It is an emergent (023) sequence – {E, F♯, G}, {B♭, C, D♭}, {E♭, F, G♭}, {D, E, F}, {D♭, E♭, F♭}, {C, D, E♭}, {B, C♯, D} – that links the opening improvisation, focused on subsets of B♭ minor pentatonic, with the (027) constructs that precede the piano solo. During the (023) sequence, {B♭, C, D♭} interrupts what would otherwise be a transpositional movement of a descending semitone from set to set. This section ends when the (037) member {B♭, D♭, F} appears as an expansion of {B♭, C, D♭}: the next (023) member in the descending C1 sequence (Example 5.2b). The (02) dyad, {D♭, E♭} that follows, projects ic2 as a component of both (023) and (027) while also forming tetrachord {B♭, D♭, E♭, F} with the preceding trichord. A transition from (023) to (027) occurs when {E♭, F, B♭} emerges from superset {B♭, D♭, E♭, F}. In 'Seraphic Light', the limited use of (023) contrasts with its expansive appearance in 'Jupiter' and 'Jupiter Variations' (see Chapter 4.2) and exemplifies the way that salience sometimes shifts rapidly between trichordal T_n-types. The forthcoming analyses of 'Sun Star' and 'Sun Star' (alt tk) provide additional examples of (023) salience.

Figure 5.3 ‘Seraphic Light’: (023) emergence within a pentatonic subset context (03:01)



During the section focused on (027), there is a prevalence of T_2/T_{10} relationships between consecutive pc-sets. Significantly, pentatonic supersets are projected in the background as a result of the adjoining pc-sets {E♭, F, B♭} – {F, G, C}, {G♭, A♭, D♭} – {A♭, B♭, E♭}, {E, F♯, B} – {D, E, A}, {E♭, F, B♭} – {F, G, C}, {G, A, D} – {A, B, E}, {A, B, E} – {B, C♯, F♯}, and {B, C♯, F♯} – {D♭, E♭, A♭}. In several places Coltrane obscures the individuality of these (027) sets, rhythmically displacing one pitch class from a previously stated set, and inserting it before the entrance of a new T_n-related set. This technique of blending trichordal structures represents the kind of reconciliation of determinacy and indeterminacy that is pervasive within *Stellar Regions* and *Interstellar Space*. Example 5.2c illustrates five numbered instances where this occurs:

(1) Pitch-classes E and F♯ – from {E, F♯, B} – blend with {D, E, A} to begin the phrase.

(2) Following the statement of {F, G, C}, pitch-class G begins the next phrase, blending with {E, F♯, B}.

(3) Pitch-class A♭ ends a phrase as a member of {G♭, A♭, D♭}, and then begins the next phrase, blending with {A, B, E}.

(4) E and B, the final two pitch-classes of a motive employing {A, B, E}, begin the next phrase in retrograde – B and E – blending with the next pc-set {B, C♯, F♯} due to the repeated common-tone B and the contour.

(5) E♭ and A♭ appear as the final two pitch-classes of a phrase employing {D♭, E♭, A♭}, and as the first two pitch-classes of a motive that ends with {C, D, G}.

Similar to pitch structure in 'Tranesonic', the interval content of (027) is projected by the (05) sets {B, E} and {E♭, A♭} appearing shortly before the piano solo. While E and B are temporally displaced, A♭ and E♭ appear consecutively. The (027) set that precedes {E♭, A♭} combines with this dyad to form the (0257) superset {E♭, F, A♭, B♭}, revealing another instance where pitch structure duplicates the superset structure of the theme. Before the piano solo begins, the construct {A, B, D, E} emerges as a T_6-transformation of {E♭, F, A♭, B♭} and another synthesis of (027) and (025).

Following the piano solo, Coltrane re-enters with a repeated {E♭, F, A♭, B♭} motive (05:48), which re-establishes the exact pc-set structure that preceded the piano solo, furthering the structural continuity of the improvisation and the (0257) connection to the theme. The contour of this repeated motive divides {E♭, F, A♭, B♭} into two (02) dyads in contrary motion – {B♭, A♭} and {E♭, F}. The second pitches of these dyads generate a sequence of (03) motives. During this (03) sequence, several transpositional patterns appear, with consecutive pc-sets forming segments of C1, $C2_0$, Hex_{23}, and Hex_{34} (Example 5.2d). Subsequently, the final pc-set of this (03) sequence, {F, A♭}, is used to generate {F, A♭, B♭}, beginning a sequence of (035) members that transition back to the theme. As Coltrane alternates between {F, A♭, B♭} and {B♭, D♭, E♭}, the B♭ minor pentatonic again emerges as a background structure. Within the (035) pc-set sequence, {D♭, E♭, A♭} interrupts (035) as a projection of an incidental trichordal segment within the movement from {B♭, D♭, E♭} to {F, A♭, B♭}. The chromatic set sequence {G, B♭, C}, {E, G, A}, and {F♯, A, B} briefly wanders from B♭ minor pentatonic until {F, A♭, B♭} returns, again resonating the B♭ minor tonality of the theme as Coltrane begins the recapitulation. Throughout the (035) section, common-tones are used as pivots from set to set (Figure 5.4). Additionally, each of the (035) sets appear almost exclusively as motives in their first rotation, duplicating the N1b contour of the initial motive of 'Iris'. The presence of T_5/T7-related (035) members using this contour contrasts starkly with how (035) appears in 'Acknowledgement', and indicates an important development in Coltrane's handling of the (035) construct (see Chapter 6.2 for similar (035) structures in 'Saturn').

Figure 5.4 'Seraphic Light': (035) common-tone pivots (06:21)

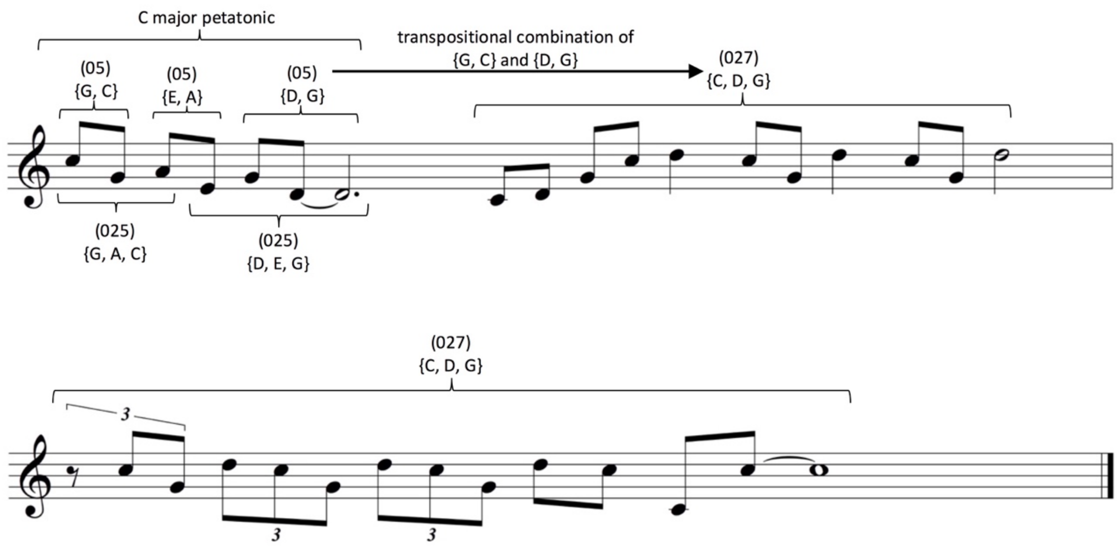
F	Eb	F	Eb	F	Eb	G	G	B	Ab
Bb	Bb	Bb	Db	Bb	Bb	Bb	A	A	Bb
Ab	Db	Ab	Ab	Ab	Db	C	E	F#	F
(035)	(035)	(035)	(027)	(035)	(035)	(035)	(035)	(035)	(035)

The structural content of Coltrane's improvisation in 'Seraphic Light' is predominantly informed and generated by the (035) and (027) pc-set structure of the theme, with the minor tonality and pentatonic backgrounds all related as constructs produced from the transpositional combination of two members of (027) at T_2/T_{10}, and two members of (035) at T_5/T_7, thus revealing its structural rigour. The emergent pitch structure of 'Seraphic Light' represents an intersection of Coltrane's tonal and post-tonal approaches, demonstrating that pentatonicism is not random, but rather a specific aspect of the pc-set development.

'JIMMY'S MODE'

'Jimmy's Mode' is unique within *Stellar Regions* as an improvisational feature for the bassist Jimmy Garrison, with a short theme flanking both ends of his solo. While other Coltrane recordings contain extended improvisations by Garrison, they are integrated within larger formats where other musicians improvise, making 'Jimmy's Mode' distinctive within Coltrane's works. The theme's construction provides another example of pc-sets engaged as subsets of the pentatonic scale. The consecutive (05) dyads {G, C}, {E, A}, and {D, G} appear as descending figures and subsets of C major pentatonic, resonating the C major tonal underpinning (Figure 5.5). Alternatively, these dyads may be seen to form {G, A, C} and {D, E, G} – two (025) members related at T_7. The motivic emergence of {C, D, G} is related to the initial pitch structure as the transpositional combination of (05) dyads {G, C} and {D, G}. While the manner in which (027) appears is reminiscent of the fanfare of 'Acknowledgment' and 'Offering', its distinctive use here provides additional evidence of the pervasiveness of (05) and (027) as fundamental structures in Coltrane's music.

Figure 5.5 ‘Jimmy’s Mode’ theme



‘SUN STAR’ AND ‘SUN STAR’ (ALT TK)

The two tracks ‘Sun Star’ and ‘Sun Star’ (alt tk), have a complex relationship and exemplify Coltrane’s experimentalism, revealing a musical work in the process of development. A critical issue surrounding them is the confusion caused by their titles, with the actual recording sequence producing ‘Sun Star’ (alt tk) as the first take, and ‘Sun Star’ as the second. While both versions are emblematic of Coltrane’s ‘rubato ballad’ style, using the same introduction and main theme centred in E minor, their large-scale form differs. The longer duration of ‘Sun Star’ (alt tk; 08:05), results from the extended individual drum and bass solos between the introduction and the main theme. By contrast, ‘Sun Star’ (06:05) contains a short saxophone improvisation between the introduction and main theme, with Coltrane as the only soloist.

The construction of the introductory theme in both versions of ‘Sun Star’ contains (027), (035), and their superset (0257) in virtually the same symmetrical formation as the ‘Seraphic Light’ theme, providing another instance of their pervasiveness in Coltrane’s music (Figure

5.6). The main theme (which Coltrane freely embellishes) is similarly constructed with (015) nested between two statements of (027) in a configuration that exemplifies how Coltrane integrates what are viewed analytically as pc-set motives within tonal harmonic contexts (here E minor) (Figure 5.7). Significantly, the composite pc-set formed from the three sets of the main theme – {E, F♯, A, B, C} – contains (023) as a subset, the improvisation's principal salient T_n-type in both takes. Although (023) is a hidden component of the theme, this pentachord establishes another link between Coltrane's compositional technique and his improvisations.

Figure 5.6 Introduction: 'Sun Star' and 'Sun Star' (alt tk)

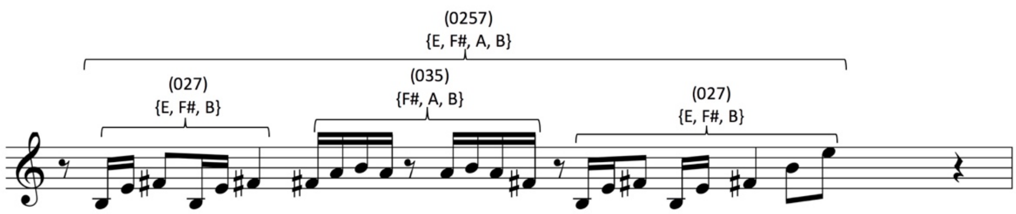
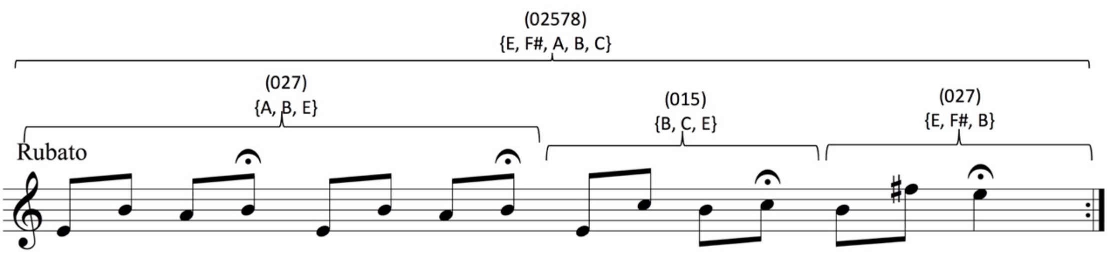


Figure 5.7 Main theme construction: 'Sun Star' and 'Sun Star' (alt tk)



Following the theme, both improvisations initially build on an E minor tonality, using the pentatonic scale, sound, and timbre expressively along with intermittent leaps into the *altissimo* register. The emergence of (023) in both takes begins with {E, F♯, G} at almost identical points after the main theme, with pitch-classes E–F♯–G evoking the E minor tonality of the theme.

'SUN STAR' (ALT TK)

A distinguishing feature of 'Sun Star' (alt tk) is that (023) emerges at two separate points in the improvisation: initially at 04:41 (lasting 1'29''); and for a second time, at 06:44 as a brief transition to the recapitulation (emerging from an improvisational section primarily consisting of timbral effects and harmonics). The development of these (023) sections reveals an improvisational approach that parallels the (023) formations in 'Jupiter' and 'Jupiter Variation' (Chapter 4.2):

- Segments of C1, $C2_0$ and $C3_1$ appear as transpositional cycles for members of (023).
- The repeated juxtaposition of {D, E, F}–{G, A, B♭}, and {C, D, E♭}–{E♭, F, G♭} creates two temporary areas of harmonic stability, in a manner similar to 'Jupiter'.
- The projection of the interval content of (023) sometimes appears as (01) and (02) dyads, suggesting incomplete (023) members. These dyads sometimes disrupt contiguous (023) sets.
- Contrasting with 'Jupiter' and 'Jupiter Variation', the melodic contours have fewer variations.
- When brief divergences from (023) occur, they exhibit an underlying structural connection to (023).

Upon the emergence of (023), pitch-class A is embedded between two statements of {E, F♯, G}, anticipating the entrance of {G, A, B♭} (Example 5.3a). Overlapping segments of $C3_1$ and

$C2_1$ appear as the transpositional operations for (023) in the set sequence {E, F♯, G}, {G, A, B♭}, {B♭, C, D♭}, {C, D, E♭}, {D, E, F}.[79] The repeated juxtaposition of {D, E, F} and {G, A, B♭}, establishes their referential importance until the entrance of the T_9-related pc-sets {C♯, D♯, E} and {B♭, C, D♭}. Next, the T_9-related pc-sets – {E♭, F, G♭} and {C, D, E♭} – are repeated, and then fragmented into their (02) and (03) subsets {E♭, F} and {C, E♭}, as Coltrane leaps into the *altissimo* register. Finally, this phrase ends with the manipulation of the saxophone's harmonics and a temporary divergence from the salience of (023), thus demonstrating an improvisational perspective that prioritises spontaneity.

The structural dialogue between a salient construct and divergent event is seen in the brief divergence from (023). Structural elements at the beginning and end of the rapid descending line appear as components of the (023) sets that emerge next (see again Example 5.3a, stave six). A return to (023) occurs with the movement from {B♭, C, F} to {B♭, C, D♭} – a contraction from (027) to (023) retaining pitch classes B♭ and C. Similarly, the next pc-set, {A, B, C}, shares common-tones {A, B} with the beginning of the rapid descending line. In this way, {B♭, C, D♭} and {A, B, C} represent a kind of truncation of the divergence, synthesising it into the salient dictates of (023). Additionally, the structural content of this divergence is suggestive of another type of improvisational approach utilising tonal elements. Three segments, from the keys of D major, G♭ major, B♭ major, are found to be intersecting at points where common-tones are shared: this major-third key relationship is evocative of the improvisational concept widely known as 'Coltrane changes', reflecting Coltrane's preoccupation with major-third cycles. While this formation is isolated within a

[79] As a reminder, the terminology used for interval cycles is explained in Chapter 3.4.

context saturated by (023), referencing major-third relationships in an oblique manner without the cadential features of 'Coltrane changes', it closely resembles the structures in 'Leo', 'Mars' and 'Stellar Regions' discussed in Chapter 5.3 below.

Following the return to (023), a segment of the C1-cycle functions as the transpositional operation for a sequence of nine sets (Example 5.3b). The chromatic movement of this C1-cycle is then continued by a series of pitch-classes that voice-lead chromatically downwards, while additionally projecting (01) and (02) as subsets of (023). In stave five of Example 5.3b, (023) is expanded to (027), with B♭ and C retained across {B♭, C, D♭} and {B♭, C, F}. As a synthesis of {B♭, C, D♭} and {B♭, C, F}, the construct {B♭, C, D♭, F} is nested between *altissimo* statements of {B, C♯, D}. The sequence of ic5-related pitch-classes that follow – D♭, A♭, E♭, B♭, F – produce B♭ minor pentatonic and are a projection of the (05) dyad {F, B♭} that is emphasised as a segment of {B♭, C, F} and {B, C, D♭, F}. Upon the return to (023) with {B♭, C, D♭}, {C, D, E♭}, and {E♭, F, G♭}, pentatonicism continues to resonate with the pentatonic subset {E♭, G♭, A♭, B♭} embedded between the (023) members {E♭, F, G♭} and {A♭, B♭, C♭}. Significantly, this tetrachord constitutes a synthesis of subsets {E♭, G♭} and {A♭, B♭} from the respective sets {E♭, F, G♭} and {A♭, B♭, C♭} (Example 5.3c). While (023) is clearly the salient structure throughout this section, these pentatonic allusions offer vivid examples of how Coltrane's improvisation integrates varied pc-sets within regions of T_n-type salience (pc-set integration is explored in more detail in Chapter 6).

Before the (023) section concludes, two segments of $C2_0$ appear as T_n operations for two pc-set sequences: {E, F♯, G}, {D, E, F}, {C, D, E♭}, {B♭, C, D♭}; and {E, F♯, G,}, {F♯, G♯, A}, {G♯, A♯, B}, {B♭, C, D♭}. The trichord {C♯, D♯, E} is centred between the $C2_0$ segments, sharing common-tones with the sets that surround it. While both C2 sequences begin with {E, F♯, G}, the first sequence of T_{10}-related sets is imperfect and contains alterations to the (023) salience: {E, F} as a truncation of {D, E, F}; and {B♭, D♭, F} as an (037) expansion of {B♭, C, D♭}. During the second C2 sequence of T_2-related sets, the initial trichord {E, F♯, G} is hidden within the grace notes connecting {C♯, D♯, E} and {F♯, G♯, A} (Example 5.3c): such is Coltrane's subtlety. Additionally, a segment of $C3_1$ appears as the transpositional operation for the sets {B♭, C, D♭}, {C♯, D♯, E}, and {E, F♯, G}, overlapping with the two $C2_0$ segments and sharing {B♭, C, D♭} and {E, F♯, G}. These interconnected cyclical patterns are mirrored in the (025) constructs in 'Saturn' (see Chapter 6.1), indicating that this transformational technique is a general characteristic of Coltrane's improvisational approach and is not limited to one T_n-type.

'SUN STAR'

While the construct (023) similarly constitutes a major focus in 'Sun Star', the pc-set structure displays a wider variety of elements than in 'Sun Star' (alt tk), with more diverse melodic contours, numerous large register leaps, and at several points, individual pc-sets emphasised referentially through repetition. Where the (023) salience appears, sets are sometimes modified with the addition of one pitch-class – creating supersets (0235) and (0237) as embellishments of (023). Divergences from (023) display a generative relationship between the pc-set structures involved and the re-emergence of (023). By contrast to the first take, 'Sun Star' contains these distinctive features:

- The brief emergence of (024) salience as an interlude between the ending statements of the theme, generated from (04) dyads and ic2 voice-leading motions.

- The emergence of Oct_{12} as a background superset for a sequence of inversionally related (013) and (023) pc-sets.
- A series of (03) dyads is generated from a sequence of T_{11}-related (023) sets, continuing for some time the T_{11}-relationship initiated by the trichordal movement.

Initially, (023) emerges after a short, expressive improvisation that follows the theme (Example 5.4a), remaining salient until the focus shifts to textural and timbral explorations in the *altissimo* register. Subsequently, (023) reappears at 03:42 and remains salient until 04:20, when a series of (03) pc-sets are generated as subsets of (023) (Example 5.4c; 5.4d). During the recapitulation, a second trichordal T_n-type comes into view. Here, (024) emerges in conjunction with a superset WT_1 as an interlude between two statements of the theme. This procedure contrasts with 'Sun Star' (alt tk) where no such interlude occurs and where (024) is absent (Example 5.4d). Thus, this variation between 'Sun Star' and 'Sun Star' (alt tk) exemplifies the spontaneous and experimental nature of Coltrane's music. Additionally, tonality intersects with the pc-set structure when the set sequence {E♭, F, A, B} to {B♭, C, D♭} produces an authentic cadence, implying the chord changes $F^{7\sharp11}$ to B♭ minor (Figure 5.8). In this brief divergence from (023), Coltrane emphasises {E♭, F, B} and {E♭, F, A} as subsets of {E♭, F, A, B} by utilising E♭ as the lowest pitch of two ascending gestures. While these divergent trichordal pc-sets only appear here briefly, the constructs (046), and (026) take on greater significance as salient structures in the introduction of 'Jupiter Variation' (Chapter 4.2) and, for extensive durations, in the forthcoming analyses of 'Configuration', 'Leo', and 'Mars'.

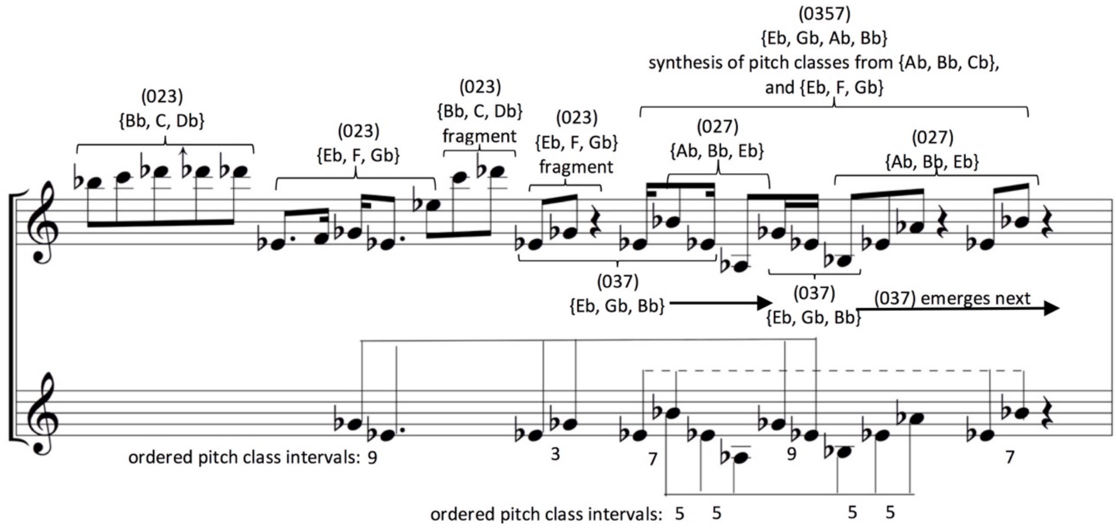
Figure 5.8 'Sun Star': Authentic cadence within (023) salience (02:21)

Although the octatonic collection is a construct commonly used by jazz musicians (and by Coltrane) in tonal contexts, its appearance as a superset within a setting focused on the referential use of (023) is unique within *Stellar Regions* and *Interstellar Space*. The events leading up to the emergence of Oct_{12} demonstrate a generative process within a pattern of divergences and reassertions of (023) salience, with the octatonic collection produced by the juxtaposition of (023) and its inversion (013). In many ways, this section is an exemplar of how Coltrane generates pitch structure progressively, displaying heterogeneous features similar to those in 'Saturn' (Chapter 6.4). In the sequence of events leading to the emergence of Oct_{12} (beginning in stave five of Example 5.4a), an expansion from (023) to (024) occurs with the pc-sets {A, B, C} and {G, A, B} sharing common-tones A and B. Here, the grouping {G, A, B} is partitioned into three octaves, with its final pitch-class A stated in the low register of the saxophone. The trichord {E, F♯, G} then reasserts (023) in the *altissimo* register with the embellishment of pitch-class B creating the tetrachord {E, F♯, G, B}. The embellishment of B takes on greater structural importance as a signal for the forthcoming entrance of {B, C♯, D}, and as a lower-register anchor that briefly evokes the tonality of B minor.

Initially, the trichord {B, C♯, D} is fragmented rhythmically, and then embellished by pitch-classes D and E until {B, C♯, D} is re-established (Example 5.4b). The appearance of the (013) member {C♯, D, E} within the embellished (023) structure suggests a common jazz improvisational technique; an approach-note pattern where C♯ and E target D. More significantly, the presence of {C♯, D, E} foreshadows its emergence as the first pc-set of Oct_{12} in the set sequence: {C♯, D, E}, {D, E, F}, {E, F, G}, {F, G, A♭}, and {A♭, B♭, C♭}. As members of (013), the presence of {C♯, D, E} and {E, F, G} within this sequence is notable because of their inversional relationship to (023), and because, within *Stellar Regions* and *Interstellar Space*, it is uncommon for (013) and (023) to alternate consecutively in regions where either T_n-type is salient. Ultimately, the presence of Oct_{12} represents a unique development in subset and superset relations, and furthermore, signifies an intersection between Coltrane's late-period melodic approach and his earlier tonal vocabulary.

Preceding the recapitulation, the tetrachord {E♭, G♭, A♭, B♭} emerges as a synthesis of pitch-classes belonging to the previously stated (023) sets {E♭, F, G♭}, {A♭, B♭, C♭}, and {B♭, C, D♭} (Examples 5.4c, 5.4d). The appearance of {A♭, B♭, E♭}, as a subset of {E♭, G♭, A♭, B♭}, is representative of the T_5/T_7 relationships between the preceding (023) sets {B♭, C, D♭}, {E♭, F, G♭}, and {A♭, B♭, C♭} and reflects their zero integers, establishing a link to the salient (023) structure (Example 5.4d). Additionally, a symmetrical melodic contour and interval structure is revealed in the pattern of ordered pitch-class intervals 9, 3, 9 created by the {E♭, G♭} dyads; and in the ordered pitch-class interval pattern 7, 5, 5, 9, 5, 5, 7 created by {A♭, B♭, E♭}, {E♭, G♭}, and {B♭, E♭} (Figure 5.9). Thus, a high degree of structural coherence is demonstrated in Coltrane's improvisation, even within apparently diverse formations.

Figure 5.9 ‘Sun Star’: Symmetrical interval formations (04:02)



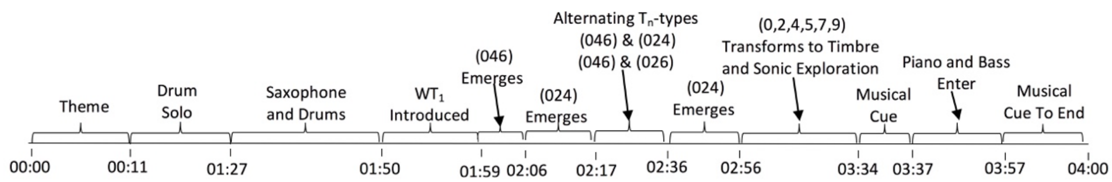
The final significance of {A♭, B♭, E♭} is that it signals the beginning of a sequence of divergent pc-set structures with generative relationships that eventually lead to the return of (023) (Example 5.4d). A crucial feature of this section are intersecting (037), (047), (027), and (026) constructs which proceed from, and to, (023) salience, with B Mixolydian emerging as a background superset. As the chord-scale for the dominant of E minor, the presence of B Mixolydian (and the harmonic sonority B^7) signals the forthcoming recapitulation and cadence to E minor, consequently providing another instance where pc-set formations intersect with tonal harmonic function. During the divergence from (023), structural coherence is created through the projection of the inversionally related members of (037) and (047), as seen in the T_5 relationship between {E♭, G♭, B♭} and {G♯, B, D♯}, and in the I_2 relationship between {G♯, B, D♯} and {B, D♯, F♯}. Additionally, coherence is promoted through the projection of (027) with the T_3-related sets {A♭, B♭, E♭} and {B, C♯, F♯}, and the repetition of the (026) member {A, B, D♯}. Initially, {A, B, D♯} overlaps with {G♯, B, D♯}, however, in its second occurrence, during the transition back to (023), the pitch-classes A and B function as common-tone pivots in a contraction from {A, B, D♯} to {A, B, C}. Following a series of T_n-related (03) sets (which are developed as subsets of (023)), the trichord {A, B, D♯} appears one final time, implying a tonal cadence of V7 to I minor as the theme returns. Embedded within the lower voice-leading is the descending motion: C–B–A, while E♭/D♯ is sustained as the highest pitch. In this way, {A, B, C} reappears in a more oblique relationship to {A, B, D♯}.

In contrast to 'Sun Star' (alt tk), two statements of the ending theme here are connected by a brief improvisation focused on (024). At this point, (024) projects its interval content in three ways: as the (04) subsets {D, F♯} and {C, E}; in the upper voice-leading with {F♯, E, D}; and in the lower voice-leading with {D, C} and {B, A} (Example 5.4e). The series of (04) dyads that follows – {D, F♯}, {G, B}, {E♭, G}, {D♭, F} – is subsumed within the emergence of WT_1, and within the entrance of (024) member {D♭, E♭, F} which develops from {D♭, F}. A segment of $C2_1$ then appears as the transpositional operation for the (023) sets {D♭, E♭, F}, {B, C♯, D♯}, {A, B, C♯}, {G, A, B}, with {A♭, B♭, C} interjected between {A, B, C♯} and {G, A, B} as a disruption to this cyclical transposition pattern. Upon the arrival of the construct {G, A, B}, its pitch-class members assume the tonal functions of scalic degrees 3, 4, and 5 in E minor, re-establishing the tonality of the theme. While (023) is the principal referential T_n-type in both 'Sun Star' (alt tk) and 'Sun Star', (024) and (026) are also important secondary structures in 'Sun Star'. The forthcoming analysis of 'Configuration' illustrates the more extensive use of (024), (026), and (046), and their interaction as subsets of the whole-tone collection.

'CONFIGURATION'

Lasting just 04:01, 'Configuration' is typical of the short length of many of the tracks comprising *Stellar Regions*. Its main theme is only stated at the beginning, while a short, trichordal cue is played twice by Coltrane to finish: firstly, as a signal for the piano and bass to enter; and secondly, as an indication to stop (Figure 5.10).

Figure 5.10 'Configuration': Overview of form

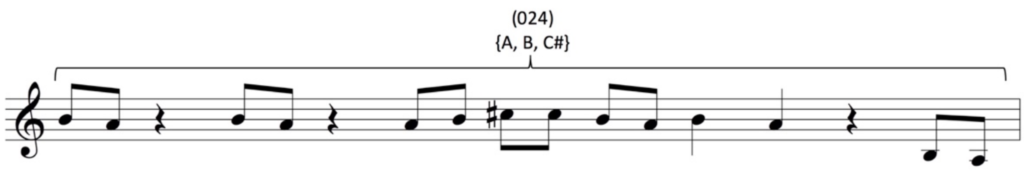


In fact, the opening theme is unusual for *Stellar Regions* and *Interstellar Space*, where themes are often constructed from short motives, or from a sequence of motives (both rhythmic and melodic) suggesting tonal qualities, pentatony, and the blues. Instead, it is constructed from an ascending chromatic scale that is played as a continuous stream of notes, beginning and ending on pitch-class A.[80] As the phrase concludes, the last two pitch-classes – G♯ and A – are repeated, with the final A leaping one octave. The entire ensemble plays this phrase four times, with a rhythmic and chromatic independence that produces a blurred effect. Unlike, 'Sun Star' or 'Seraphic Light', there is no clear connection between the structural content of Coltrane's improvisation and the opening theme. However, the musical cue that Coltrane plays at the end is constructed from (024), a T_n-type which is featured prominently during his improvisation (Figure 5.11). A lengthy drum solo follows the

[80] The use of the chromatic scale in 'Configuration' is evocative of the theme to 'Ascent' from *Sun Ship*.

opening theme, with Coltrane eventually joining the drums with intensity at 01:27. During this duo, there are only two instances where the piano interjects harmonies, playing in response to a repeated chromatic motive stated by Coltrane.

Figure 5.11 ‘Configuration’: Ending cue (03:57)



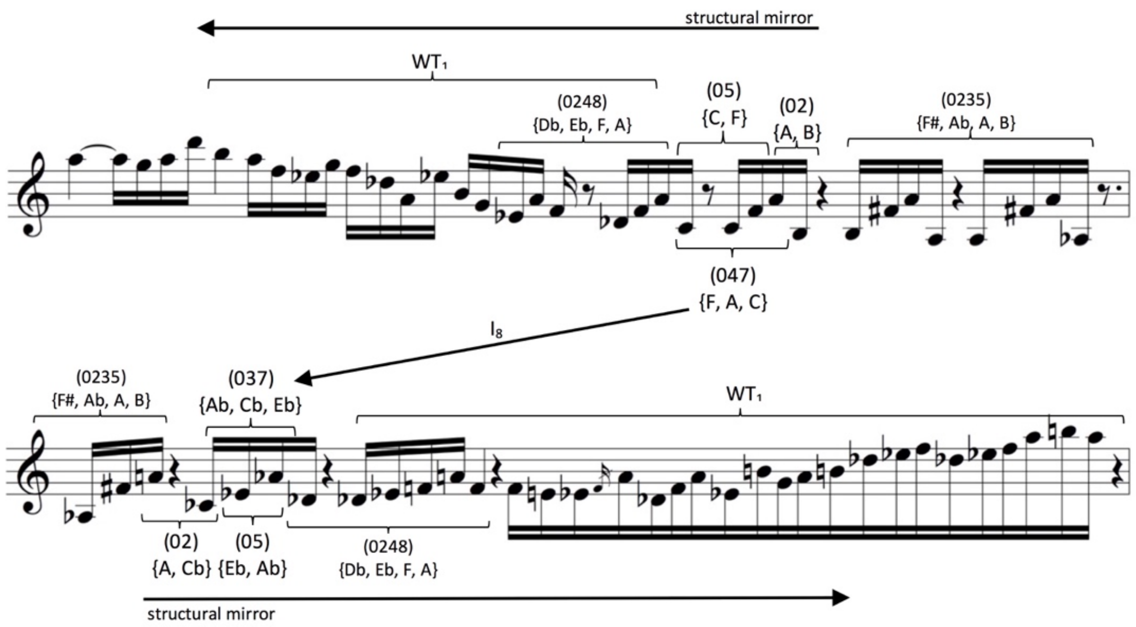
The principal salient T_n-types in ‘Configuration’ – (046), (024), and (026) – gradually emerge as subsets of the whole-tone collection and resonate its interval content: ic2, ic4, and ic6. Additionally, (02) is revealed as a crucial subset of these three trichordal T_n-types, frequently occurring as a pivot and low-register anchor. The musical events beginning at 01:50 are organised into a sequence of six sections: (1) the emergence of WT_1, with T_n-types (046), (026) and (024) embedded within its super-structure; (2) the emergence of (046); (3) the emergence of (024); (4) the re-emergence of (046), in juxtaposition with (024) and (026); (5) the re-emergence of (024); (6) the emergence of (024579) as a development of (024).

In ‘Configuration’, the evolution of the pitch structure exemplifies how interval content and pc-sets interact and become salient within Coltrane’s improvisations. Before trichordal salience is established, the pitch structure is varied and displays a gradual evolving focus developed from WT_1 and its interval content (ic2, ic4, ic6). The whole-tone collection emerges after the statement of {G, A, B, D}, with its (024) subset {G, A, B} appearing as a descending voice-leading motion (Example 5.5a). As an intervallic contraction of {G, A, B, D}, the construct {E♭, F, G, A} projects the ic2 and ic4 content of the preceding set and is followed by adjacent (048) sets {D♭, F, A}, {E♭, G, B}, {D♭, F, A}. An alternative segmentation of this WT_1 structure reveals <3102> as a recurring contour for the consecutive tetrachords {E♭, F, G, A}, {D♭, E♭, F, A}, and {G, A, B, E♭} (Figure 5.12).[81] Here, the layered complexity of WT_1 projects unity on two differing levels: where the pitch structure stresses (048), and where the contour stresses <3102>. Additionally, a binary structure is found in the voice-leading emerging from WT_1, beginning with {D♭, F, A}. Pitch-classes D♭, F, and A are partitioned into two registers as two voice-leading lines: in the lower-register with D♭, C, B, A, A♭, and in the upper-register with the contraction of dyad {F, A} to {F♯, A} producing the voice-leading motion: F to F♯. The pc-set sequence that follows forms a mirror structure that reflects around {F♯, A♭, A, B}, the composite pc-set formed by the lower voice-leading B, A, A♭, and the repeated {F♯, A} dyad in the upper-register (Figure 5.13). The remarkable complexity of the mirror formation is unique in *Interstellar Space* and *Stellar Regions*, displaying an I_8 relationship between {F, A, C} and {A♭, C♭, E♭}, (05) and (02) dyads, and the WT_1 subset {D♭, E♭, F, A} at both the beginning and ending.

Figure 5.12 'Configuration': Recurring contour <3102> within WT_1 (01:58)

[81] The analysis of contour relations uses a method outlined by Straus (2005, pp.99–102).

Figure 5.13 ‘Configuration’: Mirror pc-set structure reflected around {F♯, A♭, A, B} (01:58)



With the emergence of the (046) member {G♭, B♭, C} (see again Example 5.5a), a trichordal salience is established and pc-sets begin to alternate between (046), (024), and to lesser extent (026). Significantly, the dyad (02) frequently functions as a low-register anchor for these three, trichordal T_n-types. During the repeated juxtaposition of {G♭, B♭, C} and {A♭, C, D}, the inversionally related set {G♭, A♭, C} emerges as a conflation of these two (046) members. Upon the return of (046) with {B, E♭, F}, (024) emerges through the partitioning of {G, A, B} in the lower-register, and {A♭, B♭, C} in the *altissimo* register. The individual pitch-classes of {A♭, B♭, C} and {G, A, B} are temporally fragmented and juxtaposed until {A♭, B♭, C} is stated as a unifying motive. After the disjointed statement of {F, A, B}, and a chromatic contraction and expansion of (02) – seen in the dyad sequence {A, B}, {A, B♭}, {A, B}, {A♭, B} – the trichord (046) re-emerges with {A♭, C, D}. Significantly, this set shares two common-tones (A♭ and C) with the previous (024) set {A♭, B♭, C}.

The importance of (02) is asserted by a short, repeated motive {G, A} that precedes the sequence of pc-sets where {D♭, E♭} appears as a lower anchor and common-tone pivot (Example 5.5b). This move parallels the formations in 'Saturn' where (02) promotes unity between consecutive heterogeneous pc-sets (Chapter 6.4). In this sequence, (046) alternates at first with (024) in the set pattern {C♭, D♭, E♭}, {A, D♭, E♭}, {C♭, D♭, E♭}, {G♭, B♭, C}, and then with (026) in the set pattern: {A, D♭, E♭}, {C, D, G♭}, {A, B, E♭}, {E♭, G, A}. The appearance of pitch-class A♭, preceding the (024) member {G, A, B}, offers an exemplar as to how an isolated pitch-class becomes a member of the next pc-set introduced. In this instance A♭ becomes a member of {G♭, A♭, B♭}.

During the final section focused on (024), there is a brief divergence where {G, A, B♭} appears as a contraction of (024), and {E, G, A, B♭} as an embellishment of this trichord; {G, A, B} is used referentially for the remainder of this section until it is subsumed as a member of {G, A, B, C, D, E} (Example 5.5c). Here the improvisation shifts focus from (024) to the hexachord (024579), and then to less defined sonic-cum-timbral experimentation. While the structural content of 'Configuration' is remarkably varied and complex, the saturation and interaction of pc-set members of (046), (024), and (026) brings into focus the importance of the whole-tone collection as a source for their derivation.

5.2 EMERGENT PC-SETS IN *INTERSTELLAR SPACE*

'LEO'

Of the music comprising *Interstellar Space* and *Stellar Regions*, 'Leo' was the only piece regularly performed by Coltrane during the final eighteen months of his life. The first recorded documentation of 'Leo' occurred on 2 February 1966 (released posthumously on the LP *Infinity* (1972)) with subsequent versions included on *Live in Japan* (1991), *Offering: Live at Temple University* (2014), and *Last Performance at Newport* (2009) (an unofficial recording from the 1966 Newport Jazz Festival). The theme to 'Leo' is loosely centred in E minor and is constructed simply from pitch-class E, played in note groupings of 2, 2, 2, 2, 1 that alternate across two octaves. This feature occurs as a constant rhythmic pattern evoking the metre of 5/4. This motive is repeated three times consecutively, with the final three notes themselves reiterated three times as a phrase extension and ending. As a significant recurrent structural element, the number three may well hold a symbolic importance that relates to Coltrane's philosophical and spiritual views (this tripartite symbolism is examined in Chapter 2.2). The improvised bridge connecting the two statements of the theme mirrors the type of ternary form already observed in 'Jupiter', 'Jupiter Variation', and 'Tranesonic', so demonstrating Coltrane's proclivity for using standard song form, even when his improvisations are intricate, using far-ranging techniques. Although E minor is referenced briefly during the improvised bridge and as the improvisation begins, there is little evidence of a structural connection between the theme and remaining improvisation.

'Leo' is far longer than any track on *Stellar Regions*, with a total duration of 10:56. Two lengthy areas are saturated with T_n-types (046) (01:42–03:04) and (024) (04:13–07:01), with their combined duration exceeding the entire length of 'Configuration'. Additionally, the other prominent structural characteristics of 'Leo' include: (1) the emergence of (027) as a brief divergence from (024), and between closing statements of the theme; (2) the referential use of major-third related members of the diatonic collection; (3) the emergence of (024579) during the saxophone and drums trading. While the analysis in Chapter 4.3

examined (024579) for its significance as a recurrent structure within *Stellar Regions* and *Interstellar Space*, Coltrane's use of major-third cycles and the diatonic collection are foregrounded in Chapter 5.3.

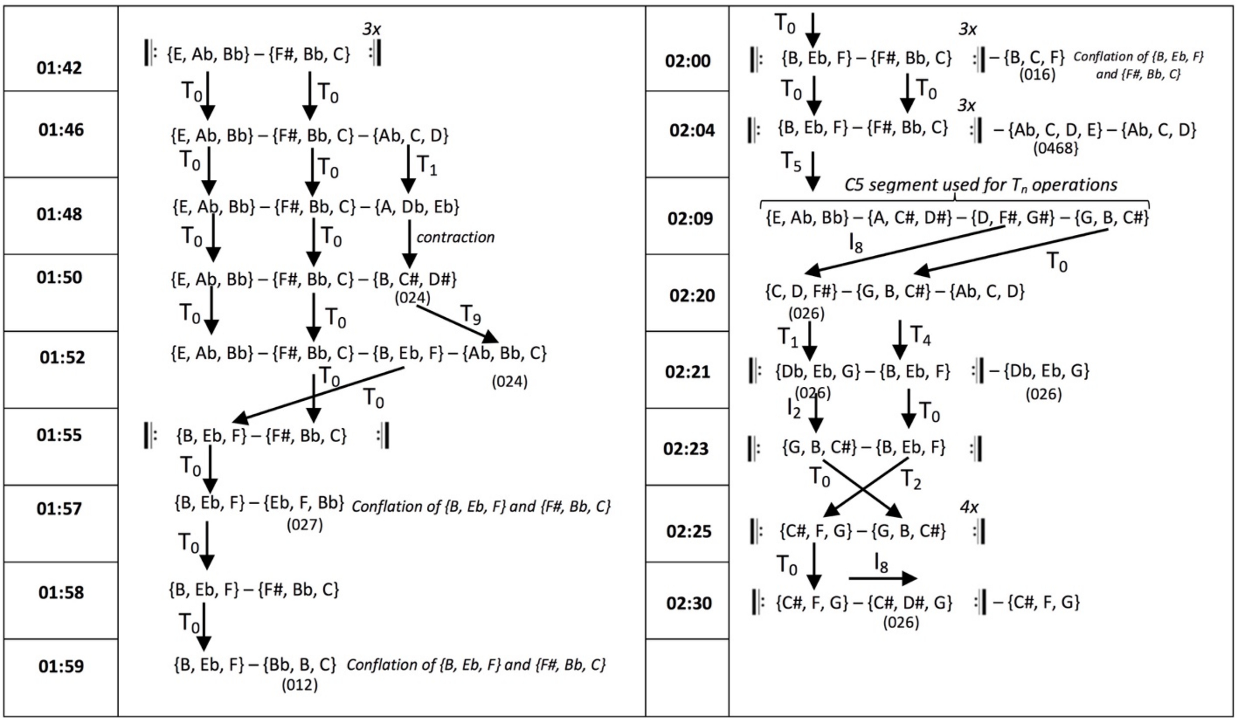
THE EMERGENCE OF (046)

Contrasting with the interaction of (046) and (026) in 'Configuration', the adherence to (046) in 'Leo' is more rigorous. Where (026) does emerge, it is primarily as a subset of the whole-tone collection, in juxtaposition with (046). Overall, the whole-tone collection is more prominent in 'Leo' than in 'Configuration', appearing six times as a product, either of consecutive, inversionally related (046) and (026) sets, or of when consecutive (046) members are related at T_2/T_{10}, T_4/T_8, and T_6. Frequently, Coltrane manipulates the timbre of notes to produce harmonics, heightening the intensity of his melodic constructs. Sometimes the harmonics sometimes sound louder than their fundamental pitches and create alternate melodic contours within established motivic patterns that continue to adhere to the salience of (046). Additionally, there are some fluctuations of intonation that occur as a result of the timbral changes, with these fluctuations representing one challenge that was encountered during the transcription process (see Chapter 3.2).

The context from which (046) emerges is initially focused on (027), with {E, A♭, B♭} resulting from a synthesis of pitch-class members belonging to {A, B, E} and {A♭, B♭, E♭} – two members of (027). In the sequence of pc-sets that precede {E, A♭, B♭}, the pitch-class A is interjected within {A♭, B♭, E♭} as a chromatic passing-tone and member of the previous set {A, B, E} (Example 5.6a). Subsequently, the 0 and 7 integers of {A, B, E} and {A♭, B♭, E♭} blend (with an added pitch-class F) to produce {E♭, E, F, A♭, A}. This pentachord is significant in two ways, since: (1) because pitch-classes E and A♭ emerge next as members of {E, A♭, B♭}; (2) because the interval construction of (046) (ic2, ic4 and ic6) is foreshadowed by the inversionally related (026) subset {E♭, F, A}. Upon the second appearance of {A♭, B♭, E♭}, this trichord is embellished by the pitch-class C, so creating {A♭, B♭, C, E♭}. This tetrachord is structured with {E♭, A♭} as its upper (05) dyad anchors, balanced by the (02) dyads {A♭, B♭} and {B♭, C} voice-leading in the lower register. These (02) dyads then become subsets of the first two (046) members to emerge: {E, A♭, B♭} and {F♯, B♭, C}, thus illustrating how the structural components of these (046) members were embedded in the preceding context (see again Example 5.6a).

The transpositional patterns in this section emphasise individual pc-sets referentially through repetition and by pairing sets in a manner that is similar to 'Jupiter Variation', where (023) appeared (Chapter 4.2). This correlation indicates that Coltrane uses this technique to develop a wide variety of T_n-types. Initially, {F♯, B♭, C} is the primary referential set (01:42–02:09), used in combination with {E, A♭, B♭} (01:42–01:55), and subsequently {B, E♭, F} (01:55–02:07) (Figure 5.14). The repeated juxtaposition of {E, A♭, B♭} and {F♯, B♭, C} is progressively expanded upon with the addition of a single pc-set: beginning with {A♭, C, D}, {A, D♭, E♭}, {B, C♯, D♯}, and ending with the two sets {B, E♭, F}, and {A♭, B♭, C}. Within this sequence, the appearance of the (024) member {B, C♯, D♯} functions as a contraction of the previous (046) set {A, D♭, E♭}, retaining pitch-classes C♯/D♭ and D♯/E♭ between sets. Additionally, the second appearance of {A♭, B♭, C} is as a T_9 development of {B, C♯, D♯} and as a contraction of the (046) referential set {F♯, B♭, C}, sharing pitch-classes B♭ and C. Similar to the emergence of WT_1 in 'Configuration', WT_0 appears as a superset for the initial (046) members in 'Leo'.

Figure 5.14 ‘Leo’: (046) sequence 01:42–02:30



At 01:55 {B, E♭, F} replaces {E, A♭, B♭} as the set juxtaposed with {F♯, B♭, C}. During the contrasting of these two sets, there are three places where (027), (012), and (016) occur as conflations of {B, E♭, F} and {F♯, B♭, C}, with pitch-class members of these two pc-sets blending. After the final repetition of {B, E♭, F} and {F♯, B♭, C}, {A♭, C, D, E} appears as an embellishment of (046) with pitch-class E until {A♭, C, D} emerges as a unified motive (Example 5.6b). A cyclical formation occurs when a segment of C5 appears as the transpositional operation for the sequence of (046) members {E, A♭, B♭}, {A, C♯, D♯}, {D, F♯, G♯}, {G, B, C♯}, with {C, D, F♯} used as an inversional substitution for the final (046) set in the sequence {C, E, F♯}. The presence of C5 as a transpositional operation parallels how various other interval-cycles are used in ‘Sun Star’, ‘Saturn’, ‘Mars’, ‘Seraphic Light’ and ‘Jupiter Variation’, providing further evidence that this technique is not limited to a specific pc-set cardinality or T_n-type.

The referential emphasis begins to shift between {G, B, C♯}, {B, E♭, F}, and {C♯, F, G} during an extended section where WT_1 emerges as a superset. Additionally, the (026) member {D♭, E♭, G} is used as an inversional substitution for {C♯, F, G}. This kind of inversional substitution also occurs at the end of this section when {C♯, D♯, G} is repeated in conjunction with {C♯, F, G} (Example 5.6b). After the final statement of {C♯, F, G}, there are brief disruptions to the salience of (046) with interjections of (025), (027), (026), and the projection of (04) as a subset of (046). A return to (046) follows a short exploration of timbre and harmonics in the *altissimo* register as the improvisation begins a transition into tonal structures and major-third cycles (Example 5.6c). During this transition, the sequence of tetrachords preseted: {B, C♯, D, F}, {E♭, F, A, B}, {A, B, D♭, F}, {A, B♭, B, E♭}, {F, A, B, C} all contain (046) or its inversion (026) as subsets, with the respective trichordal subset content as: {B, C♯, F}, {E♭, F, A}, {B, D♭, F}, {A, B, E♭}, and {F, A, B}. The saturation of (046) and its inversion (026) in this tetrachordal sequence shows how variations in pitch structure frequently continue to resonate with the salient local construct and its intervallic components (in this case with an underlying reference to WT_1).

THE EMERGENCE OF (024)

Although the salience of (024) in 'Leo' lasts twice as long as that of (046), it contains many of the same features: referential pc-sets; trichordal pairing; interval-cycles as a transpositional process; and whole-tone supersets. Additionally, its structure mirrors the type of pc-set fragmentation and registral partitioning that occurs in 'Jupiter' (Chapter 4.2). The salience of (024) is established by {B♭, C, D} and {C, D, E} following a section where members of the diatonic collection are used referentially in major-third relationships (Example 5.7a). Common-tone pivots connect the referential background keys of B♭, G♭/F♯, and D major in the transition to (024). A C4-cycle appears here in a descending movement, reflecting the same descending ic4 relationships found in earlier music such as 'Giant Steps' and 'Countdown' (Coltrane, 1960). The approaching salience of (024) is signalled by {A, B, C♯} and {C♯, D♯, E♯} which are embedded within melodic segments constructed from D and F♯/G♭ major. Subsequently, the construct {B♭, C, D} is generated from the low-register (02) anchors {C♯, D♯} and {C, D} within the sequence {C♯, D♯, E♯}, {C, D, G}, and {B♭, C, D}, featuring common-tone pivots C and D to connect (024) and (027).

One of the most remarkable features of 'Leo' is the extended formation of adjacent WT_1, WT_0, and (024579) supersets that is produced by consecutive (024) sets (Example 5.7b). This architecture offers an exemplar of subset and superset interaction and how referential trichords can appear as a members of multiple supersets. Here, the trichord {A♭, B♭, C} is used referentially in repeated juxtaposition with {E♭, F, G}, {D, E, F♯}, and {D♭, E♭, F}, creating the superset pattern (024579), WT_0, and (024579). Following superset {A♭, B♭, C, D♭, E♭, F}, the conflation of {A♭, B♭, C} and {A, B, C♯} produces the set {B♭, B, C} between {C, D, E} and {A♭, B♭, C}. The referential focus then quickly shifts to {A, B, C♯} which is juxtaposed in repeated patterns with {B, C♯, D♯}, {B♭, C, D}, and {A♭, B♭, C}. Significantly, the set pattern: {E♭, F, G}, {D, E, F♯}, {D♭, E♭, F}, {C, D, E}, {B, C♯, D♯}, {B♭, C, D}, {A, B, C♯}, {A♭, B♭, C} reveals another cyclical process in Coltrane's music, whereby the extended descending C1 transpositional segment encompasses the referential sets {A♭, B♭, C} and {A, B, C♯} and their contrasting sets (Example 5.7b). This descending chromatic pattern differs from the previously illustrated cyclical formations because it is hidden by the juxtaposition of the referential set with its changing set transpositions (Example 5.8).

Subsequently, {B♭, C, D} and {D♭, E♭, F} act as temporary referential centres until {A♭, B♭, C} is reintroduced in repeated juxtaposition with {D♭, E♭, F} and {C, D, E} (Example 5.7c). After the reappearance of {B♭, C, D}, harmonic equilibrium is achieved again when the superset (024579) is produced by the repeated juxtaposition of {A♭, B♭, C} and {D♭, E♭, F}. During this region, slight alterations to the (024) structure occur, with {C, D, E, G} appearing in two places as the embellishment of {C, D, E}, and with {A♭, B♭, C♭} appearing as an (034) contraction of {A♭, B♭, C} (Example 5.7c). Similarly, other embellishments to the underlying (024) structure occur where {C, D, E, G}, {E, F♯, G♯, A}, {C♭, D♭, E♭, F}, {E♭, F, G, A}, and {F, G, A, B, D} all reflect the underlying salience of (024) as a subset. These modifications of (024) mirror the expanded (046) and (026) constructs examined earlier in 'Leo' and reveal that T_n-type salience is often embedded within seemingly divergent pc-set structures.

INTERVAL-CYCLES AND SET FRAGMENTATION

Other developments in this section parallel the cyclical formations and set fragmentation observed in 'Jupiter' (Chapter 4.2) and 'Saturn' (Chapter 6.1). Contrasting with the previous hidden C1 segment, an entire descending C1-cycle appears as the transpositional operation for the (024) set sequence: {G♭, A♭, B♭}, {F, G, A}, {E, F♯, G♯}, {E♭, F, G}, {D, E, F♯}, {D♭, E♭, F}, {C, D, E}, {B, C♯, D♯}, {B♭, C, D}, {A, B C♯}, {A♭, B♭, C}, {G, A, B}, {G♭, A♭, B♭}, {F, G, A}. A sequence of four trichords follows – {D, E, F♯}, {C, D, E}, {B♭, C, D}, {A♭, B♭, C} – using a segment of $C2_0$ as a transpositional operation. Here, the {E♭, F} dyad occurs between {C, D, E} and {B♭, C, D} as a projection of the subset {D, E} at T_1. Additionally, D♭ appears as a chromatic embellishment within {B♭, C, D} and [A♭, B♭, C} (Example 5.7d). Subsequently, a sequence of events epitomises the kind of intervallic cohesion often found when Coltrane deviates from an established salient structure. A brief divergence from (024) occurs with the emergence of (027) and its (05) and (02) subsets at 05:55. Initially the (05) dyads pattern {F, B♭}, {C, F}, {F, B♭} forms a background (027) superset {B♭, C, F}. Pitch-class G is introduced into this harmonic texture; firstly as an (02) dyad with pitch-class F, then as an added pitch-class to the previously stated (05) dyads {C, F} and {F, B♭} – creating the trichordal sets {F, G, C} and {F, G, B♭}. The (027) sequence {F, G, C}, {C, D, G}, and {D, E, A} is then followed by the projection of its (02) subset, with {B, C♯} and {B♭, C} appearing before the return of (024). Dyad {B, C♯} is then integrated as a member of the next (024) trichord (Example 5.7d).

Upon the restoration of (024) with {C♭, D♭, E♭}, a WT_1 superset (with the omission of G) is formed from its repeated juxtaposition with {D♭, E♭, F} (Example 5.7e). The emergence of {A, B, C♯} signals the beginning of a section where {A, B, C♯} and {A♭, B♭, C} are fragmented and partitioned in different registers, with {G, A} appearing as a (02) subset projection of (024). A second divergence emerges from this fragmentation and registral partitioning as a complex mixture of autonomous (02) and (05) members amid (027) and (0257) supersets. These are intermingled with oblique references to (024) contained within the superset (0247), and an F minor-line cliché voice-leading pattern that evokes Coltrane's tonal language (Example 5.7f). This cliché, as a common voice-leading pattern used by jazz musicians in tonal settings, is often associated with Coltrane's earlier music. Figure 5.15 illustrates correspondences between the improvised bridge of the 'Leo' theme recapitulation (where a minor-line cliché occurs) and two earlier recordings. This correlation establishes another connection between Coltrane's early and late music, demonstrating the evolution of earlier techniques.

Finally, before the drum solo begins, there is a return to (024) within a projection of (02) dyad anchors. WT_1 appears here as the superset for a sequence of pc-sets: {E♭, F, G}, {E♭, F, G, A}, {E♭, F, G}, {F, G, A, B, D}, {E♭, F, G}, {F, G, A}, {E♭, G, A}, {E♭, F, G, A}, {E♭, G, A}, {D♭, E♭, F}, with only pitch-class D employed as a disruption within {F, G, A, B, D}. The trichord {E♭, F, G} is used referentially during this sequence, with its embellishment by pitch-class A signaling a synthesis of {E♭, F, G} and {F, G, A}. Additionally, the (046) member {E♭, G, A} is produced as a conflation of {E♭, F, G} and {F, G, A}, which precede it (Example 5.7f). While (027) emerges briefly as a divergence during the section focused on (024), a more substantial occurrence of (027) is found nested between closing statements of the theme. The (027) section begins as a sequence that is generated from common-tone pivots between pc-sets. The dyad {B, E}, which ends a previous voice-leading pattern, projects the coming salience of (027), with the pitch-class B used as common-tone pivot for the (024) member {B, C♯, D♯}. Pitch-classes C♯ and D♯ then function as common-tone anchors for three pc-sets during the expansion from (024) to (027). Upon the establishment of (027) salience, {C♯, D♯, G♯} appears briefly in referential combination with {C, D, G} and {E, F♯, B} before a roaming transpositional pattern containing seven members of (027) develops. Within this sequence, {D, E, G} appears as combination of the (05) dyad {D, G} from set {C, D, G} with pitch-class E, the first pitch-class of the next set {E, F♯, B}. This section ends with a transition back to (024), using common-tone pivots, with an expansion from (01) to (02) then generating (024) (Figure 5.16).

As compared with the concise tracks of *Stellar Regions*, the greater duration of 'Leo' provides an abundance of structural detail with numerous parallels to the other music examined in Chapters 4, 5, and 6. The extended trichordal salience focused on (046) and (024) reveals the whole-tone collection as a crucial superset created by consecutive members of these T_n-types. Significantly, Coltrane's improvisation demonstrates that the whole-tone collection is not used randomly, but rather is realised as specific (046) and (024) segments. Although there is an implicit connection between (046) and (024) in 'Leo' due to their similar interval content, proximity, and membership within the whole-tone collection, the emergence of (024) in 'Saturn' and (046) in 'Mars' establishes instances where these T_n-types are structurally independent of each other.

Figure 5.15 The minor-line cliché in 'Leo', 'Little Melonae', and 'Russian Lullaby'

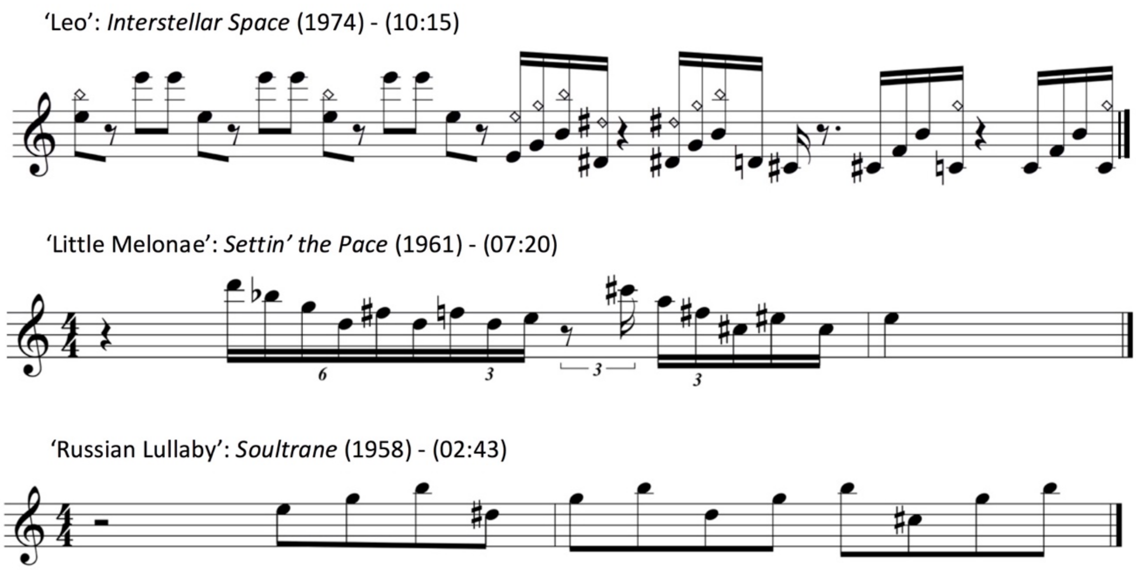
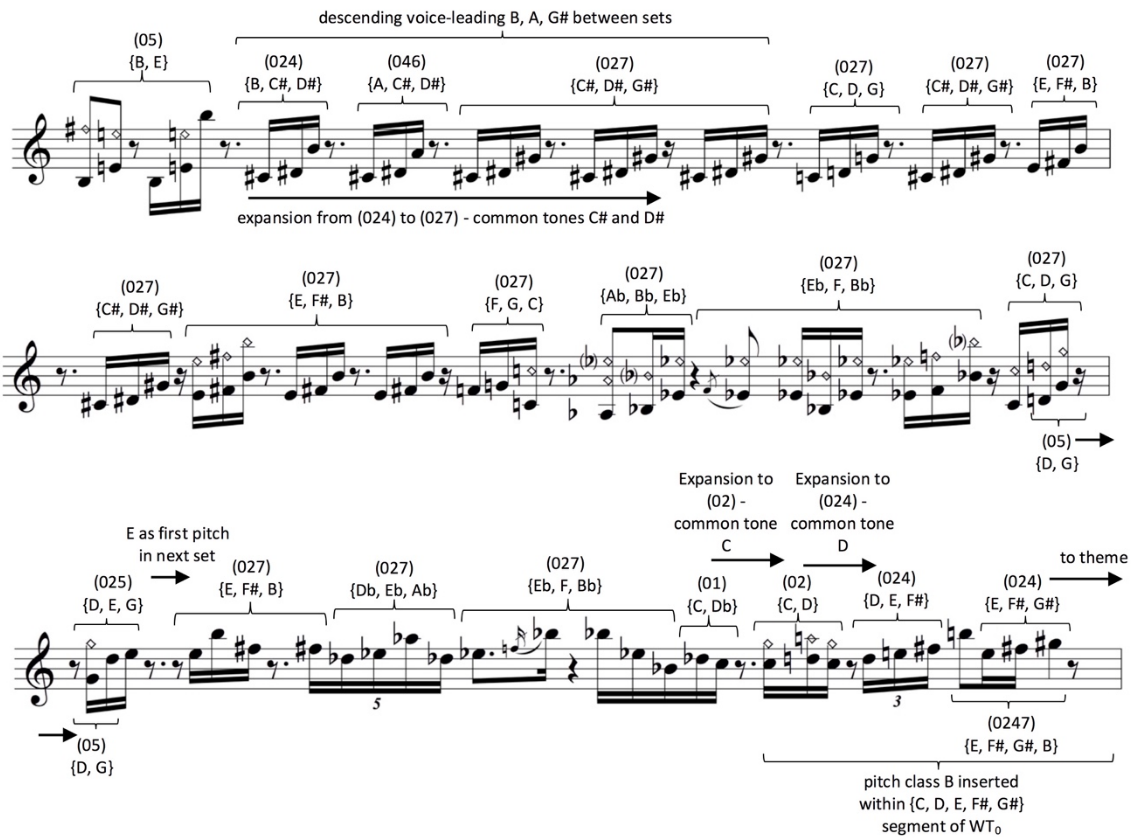


Figure 5.16 (027) emergence between concluding 'Leo' themes (10:17)



'MARS'

As the first track recorded at the *Interstellar Space* session, 'Mars' is a *tour de force* of saxophone virtuosity. The coherence of its pitch structure is especially remarkable in light of the extreme tempo and emotional intensity of the music. The piece begins with pitch collections that suggest an approach informed by tonal harmony and major-third cycles (C4) (Chapter 5.3); and is followed by extended sections focused on (027), (013), and (024579) (Chapter 4.3). Finally, Rashied Ali ends 'Mars' by playing an extended drum solo (2'39'').

Within the extant sources on Coltrane, problematic analytical characterisations appear regarding quotation and self-reference in 'Mars'. The Wikipedia page for *Interstellar Space* states that Coltrane 'quotes the melody of what became known as "Iris", and many note choices and runs are similar' (*Interstellar Space*, 2018). On the matter of quoting 'Iris', this entry thereby suggests that audible constructs in 'Mars' (which I identify as (013)) effectively result in perceptions of coherence and similarity. However, to equate these appearances of (013) in 'Mars' with a direct quotation of 'Iris' (where (013) is also a determinant) oversimplifies the issues involved, advancing a problematic narrative beyond the apparent intertextuality by supposing a hierarchy of importance in their relationship. Indeed, the overwhelming evidence presented in this thesis undermines the notion of quotation and strongly points toward Coltrane's employment of an improvisational technique (i.e. specific pc-sets and T_n-types as referential structures) as a means for structural coherence across his late music, with both 'Iris' and 'Mars' being examples of where (013) occurs. (Analysis of 'Saturn' in Chapter 6 will reveal another instance where (013) appears at length.) Additional characterisations of 'Mars' reference the presence of an E♭ tonal centre (Medwin, 2008, p.79) and theme (Porter, 1998, p.277).[82] However, once more, the following analyses find no evidence to support these claims; rather, it is highly likely that 'Mars' is one of the rare instances when Coltrane recorded a spontaneously improvised piece without any compositional or recurring thematic component. More broadly, I would posit that what Porter and Medwin express is the perception of a type of structural stability that resonates with the coherence of a theme: an impression produced by the trichordal development of the (013) construct that demonstrates this technique's effectiveness at establishing coherence.

[82] Medwin's comments regarding a key and theme are made within the larger subject of inconclusive endings of which he argues 'Mars' is an example. In his statement: 'Coltrane's final gestures are entirely unrelated to the head's tonal centre, E-flat' (2008, p.79) he implies that 'Mars' has both a theme and key. The context of Porter's comment is found in regard to the arch form of each of the pieces comprising *Interstellar Space*. The statement that 'some ideas leading up to the climax occur in reverse after the climax, on the way back to the theme' (1998, p.277) again introduces the idea that 'Mars' has a theme which I argue is not the case.

THE EMERGENCE OF (027)

In 'Mars', the development of (027) follows an extended section focused on members of the diatonic collection operating in major-third relationships. Initially, the (027) members present resonate the tonalities A♭ and E major, which appear as referents in the previous C4-cycle: C, A♭, and E major. This practice represents a significant intersection of approaches: one focused on pc-set design, and the other using techniques drawn from tonal referential structures. The brief sequence of (05) dyads that emerge as subsets of (027) display transpositional relationships as segments of C5, C1, and $C2_0$. Following the re-establishment and subsequent conclusion of (027), the construct (046) emerges briefly as a transitional structure before rapid descending (024579) figures begin.

As the first (027) member to appear, {A♭, B♭, E♭} is produced as a synthesis of the temporally separated (05) dyads {B♭, E♭} and {E♭, A♭} that end the previous phrase (Example 5.9a). When pitch-class G is inserted within {A♭, B♭, E♭}, it is combined with pitch-classes A♭ and E♭ to form the (045) member {E♭, G, A♭}. Subsequently, pc-set {E♭, G, A♭} appears again in the same formation, with overlapping (027) sets resulting from the temporal displacement of the pitch-class members of {F, G, C} and {A♭, B♭, E♭} within the sequence: {A♭, B♭, E♭}, {B♭, C, F}, {F, G, C}, {A♭, B♭, E♭}, {E, F♯, B}, {A♭, B♭, E♭}, {B, C♯, F♯}. This provides a striking example of how divergent T_n-types sometimes are enveloped within a salient structure. At the end of this sequence, when pitch-class D♯ is added to {B, C♯, F♯}, the tetrachord {B, C♯, D♯, F♯} appears as a T_7 projection of {E, F♯, A♭, B} – the product of adjoining sets {E, F♯, B} and {A♭, B♭, E♭}. Next, a series of (05) dyads are generated from trichord {B, C♯, F♯}, beginning with subset {F♯, B}. Segments of C5, C1, and $C2_0$ are present as transpositional operations for the (05) dyads, with {D, G} employed as a pivot between C1 and $C2_0$. A slight disruption to (05) salience occurs when pitch-class F♯ appears within {F, B♭} as a conflation with the preceding dyad {F♯, B}. Upon the return to (027), the final three pitch-classes of the (05) sequence – members of {F♯, B} and {E, A} – combine to form {A, B, E}. The appearance of F as a chromatic embellishment within the grouping {A, B, E} anticipates its membership in the next pc-set {F, G, C}.

The sequence of (027) sets that begins in stave five of Example 5.9a displays a variety of transpositional relationships, with five pentatonic supersets produced by continuous T_5/T_7 and T_2/T_{10} related (027) members. A divergence from (027) precedes the brief transition in salience to (046) (Example 5.9b). Meanwhile, the (047) member {G, B, D} appears as a transformation of {G, A, D}, with G and D used as common-tone pivots. Upon the return to (027) with {B♭, C, F}, pitch-classes B♭ and C are used as members of {F♯, B♭, C} in a semitonal contraction from (027) to (046). The T_6-related (046) members {F♯, B♭, C} and {C, E, F♯} are then juxtaposed multiple times before (024579) emerges and Coltrane begins a freer exploration of timbre and harmonics. While the structural features of (027) in 'Mars' do parallel the (027) formations in 'Jupiter Variation', 'Seraphic Light', 'Tranesonic', and 'Saturn', the brevity of (046) (which does not involve whole-tone saturation or interaction with (026) or (024)) contrasts with its longer appearances in 'Configuration' and 'Leo', thus demonstrating the greater autonomy of the construct (046) in 'Mars'.

THE EMERGENCE OF (013)

The final phase of Coltrane's improvisation (2'22'') does focus on the salience of (013), exhibiting a variety of structural characteristics that both resemble and contrast with the (013) formations in 'Iris' and 'Saturn'. The significant features of this section include:

- The temporal and registral fragmentation of (013).
- The development of (02) and (03) as subset components of (013). These dyads can appear as disruptions within the context of contiguous (013) sets.
- Descending segments of C1 are used as transpositional operations for (013) and (03).
- The appearance of the constructs (023), (035), and (045) as temporary transformations of (013) sharing common-tones.
- A brief divergence from (013) using harmonics and the *altissimo* register of the saxophone.
- Common-tone pivots between consecutive pc-sets.

In the transition to (013), the (02) dyad {B♭, C} functions as a lower-register common-tone anchor for the consecutive sets {B♭, C, F}, {A♭, B♭, C}, {G♭, B♭, C}, and {A, B♭, C}, with (013) emerging as the last set of the sequence (Example 5.10a). As Coltrane plays through these four T_n-types – (027), (024), (046), (013) – there is the sense that he is searching for an idea through which to launch the improvisation into a new direction. This searching phenomenon similarly occurs twice in 'Saturn' (Chapter 6.1) when a common-tone dyad is used to connect varied trichordal T_n-types at transitional junctures to, and from (013) salience.

SET FRAGMENTATION

The temporal displacement and fragmentation of (013) begins after the entrance of {A, B♭, C} and {G♯, A, B} (stave two, Example 5.10a). Dyad {A♭, B♭} continues the low register voice-leading that was initiated by the preceding pc-sets and foreshadows its membership as a subset of {G, A♭, B♭}. By contrast, the dyads {A, B} and {G, A} function as subsets of the respective trichords {G♯, A, B} and {F♯, G, A}. Pitch-class A♭ is embedded between {F♯, G, A} and {G, A} as a low-register anchor, projecting its connection as a temporally fragmented member of the previously stated unit {A♭, B♭} and the forthcoming {G, A♭, B♭}. Shortly before Coltrane's improvisation ends, (013) is fragmented for a second time, with a gradual emphasis upon (02) as a subset of (013) (Example 5.10e). The pentachord {B, C, D, E♭, F} appears as a transpositional combination of {B, C, D} and {D, E♭, F} in the set sequence: {C, D}, {B, C, D, E♭, F}, {D, E♭, F}. Within this pattern, {C, D} occurs as a subset of the previously stated pc-set {B, C, D}. Enveloped within {D, E♭, F} and {G, A♭, B♭} is a projection of (02), with the consecutive dyads {E♭, F}, {F, G}, and {A♭, B♭}. Pitch-class D♭ appears between {F, G} and {A♭, B♭} as a brief divergence from (013), and suggests a possible improvisational route not actually taken up by Coltrane. The improvisation ends with juxtaposed (02) statements {A♭, B♭} – a subset of {G, A♭, B♭} – and {F, G}.

TRANSPOSITIONAL PATTERNS

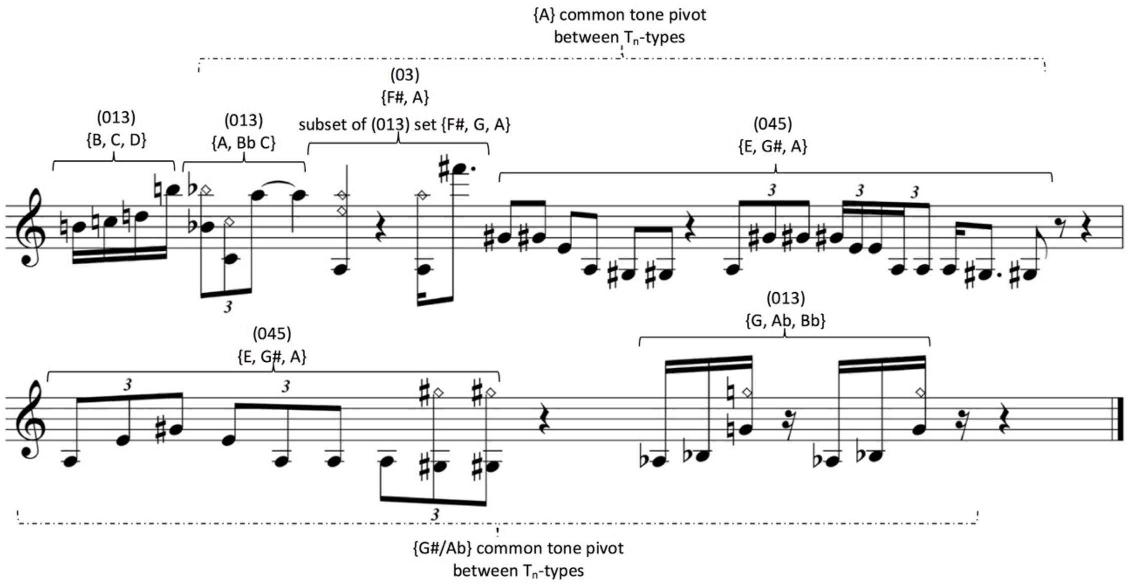
In 'Mars', the transpositional relationships between (013) members frequently utilise common-tones while generally exhibiting a more random pattern, with fewer individual pc-sets, or pairs of sets appearing as referential structures. However, there are a few occasions where significant patterns do emerge. The first pattern occurs with the two consecutive set sequences {B, C, D}–{C, D♭, E♭}–{B, C, D} and {F, G♭, A♭}–{E, F, G}–{F, G♭, A♭} (Example 5.10b).

The constructions of these two patterns mirror each other, with (C, D♭, E♭} found between two statements of {B, C, D}, and {E, F, G} between two statements of {F, G♭, A♭}. By considering the consecutive transpositional relationships across all six pc-sets, we can reveal a larger symmetric pattern: T_1, T_{11}, T_6, T_{11}, T_1. In the second pattern, pairs of pc-sets are used referentially in two areas, with {E, F, G}–{E♭, E, F♯} juxtaposed four times, and {D, E♭, F}–{C, D♭, E♭} repeated twice (Example 5.10d). A third pattern occurs when segments of C1 appear as descending transpositional operations for members of (013) (Example 5.10a), and for members of (03) (Example 5.10d). Within the (03) sequence, there is a minor disruption when the (04) dyad {D♭, F} is substituted for {D, F} – the correct pc-set within the C1 sequence.

DIVERGENCES FROM (013)

While Coltrane demonstrates a commitment to the salience of the construct (013) throughout this section, brief divergences from (013) and its subsets do sometimes occur. In Figure 5.17, the set sequence {A, B♭, C}, {F♯, A}, {E, G♯, A}, {G, A, B♭} contains a divergence and return to (013) using pitch-classes A and G♯/A♭ as a common-tone between the members of (013), (03), (045), and (013). The dyad {F#, A} implies the truncated (013) set {F#, G, A}. Additionally, in this sequence, we see the last pitch-class of one pc-set becoming the first pitch-class of a new pc-set. This occurs in the transformation from {A, B♭, C} to {F♯, A}, and in {E, G♯, A} to {G, A♭, B♭}.

Figure 5.17 'Mars': Common-tone pivots between T_n-types (06:10)



A longer divergence utilising the *altissimo* register and harmonics occurs between 06:41 and 07:02. In stave six of Example 5.10b, the (03) dyad {G, B♭} appears in the *altissimo* as a subset projection of (013), but is followed by unstable intonation and sound that settles upon pitch-class E♭. The chromatic dyad {D, E♭} can be heard as resulting from this instability. T_n-type (013) then emerges briefly with {E♭, E, F♯}; its (02) subset {E, F♯}, which occurs as a lower-anchor, reappears over the length of this divergence as a reminder of the (013) salience (Example 5.10c). There is an expansion to (026), and a recurrence of {D, E♭} before Coltrane abandons conventional approaches and uses the harmonics of the saxophone to create two phrases of astonishing chromatic and timbral complexity. Upon a return to the saxophone's normal register, a gradual refocusing of the pitch structure leads back to (013). During the pc-sets sequence: {B, C♯, D♯, F♯, G♯}, {F, G}, {G, A♭, A}, {A, B}, {G, A♭, A}, {G, B♭, C} there is found a continuous presence of (01), (02), and (03), as subsets of (013). The overlapping emergence of {D, E♭, F} and {B, C, D} within this sequence of pc-sets signals the imminent return of (013). The transition back to (013) is made when {A, B♭, C} appears as a conflation of pitch-class members B♭ and C from {G, B♭, C}, and A from {A, B, E}. From this point forwards, (013) remains salient until the saxophone improvisation ends.

5.3 MAJOR-THIRD CYCLES: ‘STELLAR REGIONS’, ‘MARS’, ‘LEO’, AND ‘VENUS’

While trichordal constructs saturate *Interstellar Space* and *Stellar Regions,* equally, the major-third cycle (C4) and the diatonic collection (specifically as major-scale referential centres) are important recurring theoretical structures. The manner in which Coltrane uses major-third (ic4) related members of the diatonic collection in these recordings is far more oblique and freer than the well-known major-third harmonic sequences known as ‘Coltrane changes’ which they resemble. This correlation between major-third constructs in Coltrane’s earlier and later music indicates an evolution in his approach, disproving the notion that his late music breaks completely from past techniques.

These analyses begin by examining the structural characteristics and correlations between ‘Stellar Regions’ and ‘Stellar Regions’ (alt tk), with brief comparisons to structures in ‘Venus’; there follow analyses that demonstrate parallel developments in ‘Leo’ and ‘Mars’. While ‘Stellar Regions’, ‘Stellar Regions’ (alt tk), and ‘Venus’ are primarily centred on $C4_0$ for their entire length, the C4-cycles in ‘Mars’ and ‘Leo’ are more varied and intersect with lengthy regions focused on trichordal salience. A detailed analysis of ‘Venus’ is excluded from this thesis, partly as a concession to the practical limitations of its length and structure, but also because the extant analyses of ‘Venus’ by Voss (2015) and Porter (1998, pp.279–288) already offer important observations with which I concur.

INTERPRETATIVE CHALLENGES

Coltrane's late-period music poses interpretative challenges because of layered complexities that evoke major and minor tonalities, pentatonicism, symmetric scales, T_n-type salience, and cyclical constructs that remain connected to the blues. Therefore, the analyses focus on identifying the pitch structure as segments of specific major-scale transpositions (diatonic collections) that reflect corresponding major-key centres. They result from considering features such as the uniform adherence of pitch structure to one key, contextual orientation, chord formations suggesting diatonic functions within local tonal centres, references to dominant and tonic relationships, voice-leading, global patterns of use across 'Stellar Regions', 'Stellar Regions' (alt tk), 'Venus', 'Leo', and 'Mars', and common jazz improvisational practices. These analyses are offered as evidence of structural unity, but are only one possible interpretation of the pitch structure.[83]

'Stellar Regions' and 'Stellar Regions' (alt tk) (from *Stellar Regions*) are the first recorded versions of a piece more widely known as 'Venus' from *Interstellar Space*. All three versions adhere to the same conceptual formula. While the theme is centred in C major, the harmonic approach throughout the improvisations utilises the major-third related keys C, A♭, and E major and their corresponding major scales as referential background structures. Additionally, in each piece, a larger developmental arch is formed when the intensity gradually builds as the saxophone climbs into the upper register, and is released as the instrument descends through its range.[84] The short length of 'Stellar Regions' (03:34) and

[83] The methodology used is similar to that employed by Porter (1998) and Voss (2015) for 'Venus'. Dmitri Tymoczko also illustrates quartal use and the pentatonic scale in this way (2011, p.359).
[84] Porter's analysis of 'Venus' describes the same type of large-form structure.

'Stellar Regions' (alt tk) (04:40) contrast with the much longer 'Venus' (08:28) and provide an opportunity to observe the evolving concept of this piece.

Although the theme evokes the tonality of C major, the melody reveals {G, A, B, C, D, E} as the principal background superset. The conspicuous absence of pitch-class F from the theme in 'Stellar Regions' (alt tk) (Example 5.11), and the single appearance of F as a grace note in 'Stellar Regions' (Examples 5.12, 5.13), are clear indications of the salience of (024579). This presence of (024579) in the theme is notable because it emerges later (07:08) as rapid descending lines in 'Venus' (see Chapter 4.3). While, this descending line is absent from the earlier versions of 'Stellar Regions', it represents an important development in 'Venus' that structurally relates to the theme. Throughout the statement of the theme in 'Stellar Regions' and 'Stellar Regions' (alt tk), the harmonic accompaniment reinforces the tonality of C major. As the saxophone improvisation ensues, there is a gradual increasing dissonance between it and the piano. It is worth considering that the recording of 'Venus' one week later – without harmonic accompaniment – might constituted an effort by Coltrane to achieve more harmonic clarity, in response to the harmonic dissonance of the earlier attempts with piano.

'STELLAR REGIONS'

The repeated descending major-third relationships begin after the theme and continue until the recapitulation. Within the $C4_0$ cycle, there is a gradually ascending voice-leading pattern that spans from G4 to G6 in the saxophone's *altissimo* register. Example 5.14a indicates this voice-leading with arrows. While the voice-leading moves predominantly by ic1, there are five occurrences of ic2, and one occurrence of ic3. The common-tones shared between C, A♭, and E major scales are frequently used as pivots, as illustrated in Figure 5.18 below. One such instance occurs in the second stave of Example 5.15a, where pitches A♭/G♯ and E♭/D♯ are used to pivot between the keys of A♭ and E major.

Figure 5.18 ‘Stellar Regions’: Common-tone connections between major-third related keys

Ab major:	C	Db		Eb		F		G	Ab		Bb	
C major:	C		D		E	F		G		A		B
E major:		C#		D#	E		F#		G#	A		B

How scale segments are used within the localised tonal regions of C, A♭, and E major varies. While the pitch structure within each region adheres to the content of the referential superset, it may or may not serve to reinforce the tonality of the key. This can be seen in the third stave of Example 5.14a, where segments from C, A♭, and E major appear in scalar movements of seconds and thirds, but without referencing the tonic sound of these keys. Only F♯ and D♯ are used to reference E major as the melodic line voice-leads from A♭ to C major. A survey of the cumulative pitch content of three referential centre’s reveals a pattern that adheres strictly, without exception, to the pitch members of each tonal region.

Within each local referential centre, there are signs of dominant to tonic relationships. This again mirrors the type of cadential patterns found in Coltrane’s earlier pieces such as ‘Giant Steps’ and ‘Countdown’. In Example 5.14a, the dominant to tonic movements are indicated within each localised key. Tonic regions are typically articulated by complete tonic triads (or its dyad subsets), III- and VI- substituting as tonic function chords, or leading-tone movement to the tonic. The length of each referential centre constantly fluctuates causing a corresponding variance in the harmonic rhythm from one tonal centre to another. This fluctuation is also seen within the localised referential areas where movements from dominant to tonic appear. The C4-cycles present in ‘Stellar Regions’, ‘Stellar Regions’ (alt tk), ‘Venus’, ‘Leo’ and ‘Mars’ move generally in a descending direction, however, there are instances where short ascending segments occur. Voss (2013) notes that within the ascending major-third cycle there is an inherent building of tension, while a relaxing of tension occurs with the descending major-third cycle. Additionally, these characteristics are influenced by the contour of the melody. While there are segments of melody that imply the tonality of each of these three keys, equally there are phrases that do not. Within the context of C, A♭, and E major, two interpretations are offered for these instances: either that they function as unresolved prolongation of the dominant; or as a type of harmonic approach typical in jazz improvisation that emphases a chord’s upper structure (shown in the second stave of Example 5.14b). Within the tonal centres of E and C major, we see the emergence of their respective dominants: B and G major. The pitch structure mirrors a common practice in jazz where upper-structure chord tones 7, 9, and 13 are emphasised upon tonic function chords. Here the pitches of B and G major function as 5, 7 and 9 of their respective tonic chords. It is through the larger context of the entire improvisation that these major triads are interpreted as affirmations of the salience of C, A♭, and E major and $C4_0$.

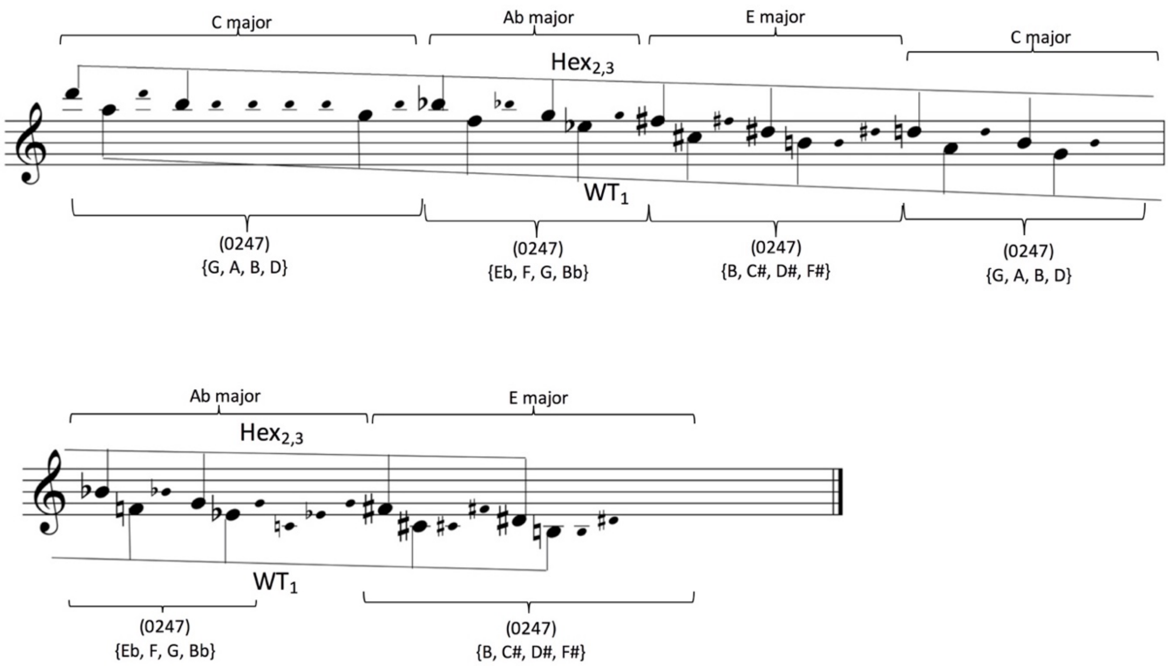
'STELLAR REGIONS' (ALT TK)

Coltrane's approach on 'Stellar Regions' (alt tk) is less measured and utilises the same range of techniques and overall structural formula in a more spontaneous manner. While the ascending voice-leading pattern mirrors the first take by beginning on G4 and ending on G6, the pattern progresses at a much slower pace (Example 5.15a). Lengthy improvisational flourishes frequently appear between each prolonged voice-leading movement. Additionally, the voice-leading only moves by ic1 in contrast to 'Stellar Regions' where ic2 and ic3 also appear. Initially, the $C4_0$ movement appears in the repeated descending pattern C, A♭, E major. However, at 01:49 the direction of this pattern begins to vary with the sequence of major-scale centres A♭, C, E, C, E, A♭, E, C, A♭, C, E, C, A♭, C, E, C, E. This is followed by a brief exploration of harmonics and timbre (02:24–02:41) and a return to the descending $C4_0$ movement. Although the first take of 'Stellar Regions' contains a brief variation in the directional movement of $C4_0$, the second take contains a far lengthier and more substantial alteration. One additional variation appears briefly before the recapitulation in the pattern A♭, E, C, A♭, C.

Another structural characteristic that distinguishes 'Stellar Regions' (alt tk) from 'Stellar Regions' is the appearance of divergent scale segments within local major regions. This is similar to the type of conflation between consecutive pc-sets identified in the previous analyses. The divergent segments are almost exclusively dyads belonging to one of the other referential centres, briefly superimposed on another, with common-tones functioning as pivots between two keys. This phenomenon is found in staves two, three, four, and six of Examples 5.15a and 5.15b, and stave six of Example 5.15c. Additionally, a significant pattern containing three structural layers emerges at 02:52. Beginning in stave six of

Example 5.15c and continuing through stave two of Example 5.15d, the major-third related tetrachords {G, A, B, D}, {E♭, F, G, B♭}, and {B, C♯, D♯, F♯} appear as descending segments of the respective keys C, A♭, and E major. Two voice-leading patterns emerge with $Hex_{2,3}$ formed in the upper voice, and WT_1 formed in the lower voice (Figure 5.19). The tetrachords here articulate the scale tones 5, 6, 7, 2 of each key and the upper structure of each tonic harmony. This multi-layered intersection of pc-set structure, major scale and key centres, major-third cycles, and $Hex_{2,3}$ and WT_1 voice-leading provides crucial evidence of the highly structured nature of Coltrane's improvisations.

Figure 5.19 $Hex_{2,3}$ and WT_1 voice-leading in 'Stellar Regions' (alt tk) (02:52)



'MARS'

Coltrane's approach to using major-third cycles in 'Stellar Regions' and 'Stellar Regions' (alt tk) is similarly found as a prominent feature in 'Mars' (2'30''). The patterns that emerge in 'Mars' are far more varied than those found in 'Stellar Regions', 'Stellar Regions' (alt tk), or

'Venus', with the transpositional relationships between the major-scale referential centres utilising segments of $C4_0$, $C4_1$, $C4_2$, and $C4_3$. The local major-key centres exhibit the same types of structural characteristics and dominant to tonic relationships as previously identified in 'Stellar Regions'.

Initially, the opening line of 'Mars' is centred in E♭ minor Aeolian – a superset of overlapping E♭ and B♭ minor pentatonic segments (Example 5.16a). Within E♭ minor pentatonic, the appearance of the passing note C♭ between D♭ and B♭ establishes the E♭ Aeolian modal quality. At the end of the first phrase, the (024) members {D♭, E♭, F} and {E, F♯, G♯} emerge, projecting two structural characteristics: a tonal cadence with {E, F♯, G♯} implying an E7 substitution for B♭7 in the cadence E7 to E♭ minor; and a correlation with Coltrane's method for using (024) as a salient structure in 'Leo', 'Configuration', 'Sun Star', and 'Saturn'. Upon the entrance of B♭ major in the second phrase, an oblique major-third relationship is revealed between E♭ minor's relative major G♭ in the first phrase and B♭ major in the second. In the second stave of Example 5.16a, a series of eight C4-cycles begins with the emergence of $C4_3$ and E♭ major as the first referential centre. Figure 5.20 below shows the order in which these C4-cycles appear, and the pattern of referential major scales they contain.

Figure 5.20 'Mars': C4 sequence and major tonal centres

00:40	$C4_3$	Eb, G, Eb, B, G, Eb
00:48	$C4_0$	C, Ab, E, C, Ab
00:53	$C4_1$	F, Db, A, F
00:56	$C4_2$	Bb, Gb, D, Bb, Gb
01:00	$C4_3$	G, Eb, B, G
01:03	$C4_0$	E, C, Ab
01:07	$C4_1$	Db, A, F
01:10	$C4_2$	Gb, D, Bb

Except for the initial movement from E♭ to G major, all of the C4-cycles illustrated in Figure 5.20 exhibit a descending major-third relationship. Whereas complete cycles appear between 00:40 and 01:03, smaller segments are observed at 01:03, 01:07, and 01:10. A significant pattern emerges with repetition of the sequence $C4_3$, $C4_0$, $C4_1$, $C4_2$ at both 00:40 and 01:00. This sequence forms $HEX_{3,4}$ from the referential keys centres of the consecutive cycles $C4_3$ (E♭, G, and B major) and $C4_0$ (C, E, and A♭ major), and $HEX_{1,2}$ from the referential key centres of consecutive cycles $C4_1$ (D♭, F, and A major) and $C4_2$ (D, G♭, and B♭ major). Additionally, a theoretical twelve-tone aggregate is produced from the structural relationships between the referential regions in this sequence, evidencing the deeper structural traits of Coltrane's improvisation.

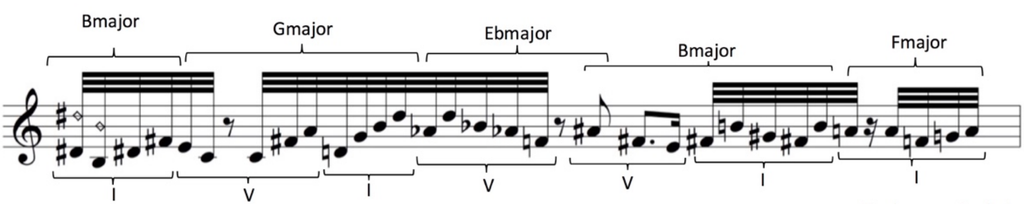
At 01:13, the transpositional relationship between referential centres becomes more random, with consecutive major-third relationships appearing amid other transpositional movements (Example 5.16b). The brief appearance of $C4_0$ – with the major referential centres E, C, A♭, E, C, A♭, E – is followed soon after by a sequence of fragmented major-third relationships: E♭–B, and D–B♭ major (Example 5.16c). Similarly, the pitch structure between

01:49 and 02:05 becomes more ambiguous, containing the often-noted timbral and harmonic effects (Example 5.16d). At times, the melodic content evokes the sense that Coltrane is improvising through a set of chord changes. This can be seen in Example 5.16d where blues references and pitch content appear in the type of formations typically seen in tonal improvisations over dominant-seventh chords. The major-third relationship – E and A♭ major – is referenced during this section until major-third related referential centres re-emerge briefly with G♭ and D major. Timbral and harmonic effects soon follow as the pitch structure again becomes more complex, until $C4_1$, $C4_2$, $C4_0$, and $C4_3$ return and salience shifts to (027) (Example 5.16e). These occasional structural variances from the C4-related major referential centres mirror the type of divergences that occur within regions of trichordal T_n-type salience. This divergence from and subsequent return of salient constructs within Coltrane's improvisations serves as further evidence of his commitment to theoretical models for creating coherence.

Occasionally within the local major referential centres, chromatic figures suggest chord substitutions or alterations to dominant harmony as typically used in jazz. This can be seen back in the fourth stave of Example 5.16a, where a C diminished triad appears as a dominant substitution for B. A subset of Oct_{12} follows and is used as a harmonic substitution for the dominant of C major. The alterations ♭9, and ♯9 to the dominant chord G7 result from this substitution. The sixth stave also contains an alteration to the dominant within the region of D major, where the chord sonorities A7 ♭9 and A7 ♭13 are implied by the chromatic pitches which resolve to an arpeggiated B minor triad substitution for the tonic D major.

In ‘Mars’, referential centres are sometimes temporally displaced, resembling the pc-set fragmentation illustrated in the previous analyses. In stave two of Example 5.16e, the phrase ends on the dominant of F major, which then begins the next phrase on the tonic (stave three). After a complete $C4_1$ cycle, this phrase ends again on the dominant of F major. A reversal of these dominant and tonic positions is found in the next phrase, where the referential region of B♭ is articulated in a way to suggest a tonic to dominant movement. Another type of temporal displacement occurs in ‘Mars’ when phrases end with pitches outside of the locally emphasised referential key, and the phrases that follow synthesise those pitches within the new referential centre. Figure 5.21 below demonstrates this with a sequence of referential centres B, G, E♭, B, and F major. Pitches E and C (within the first B major segment), and A (within the second B major segment) are temporally displaced members of the respective referential centres G and F major. Additionally, within the E♭ major segment, we see another instance where the dominant is emphasised, with B♭/A♯ is used as a common-tone pivot to B major. This type of temporal displacement and blending of referential structures is virtually identical in concept to features described in the previous analyses of trichordal pc-sets.

Figure 5.21 ‘Mars’: Temporal displacement of referential centres (02:07)

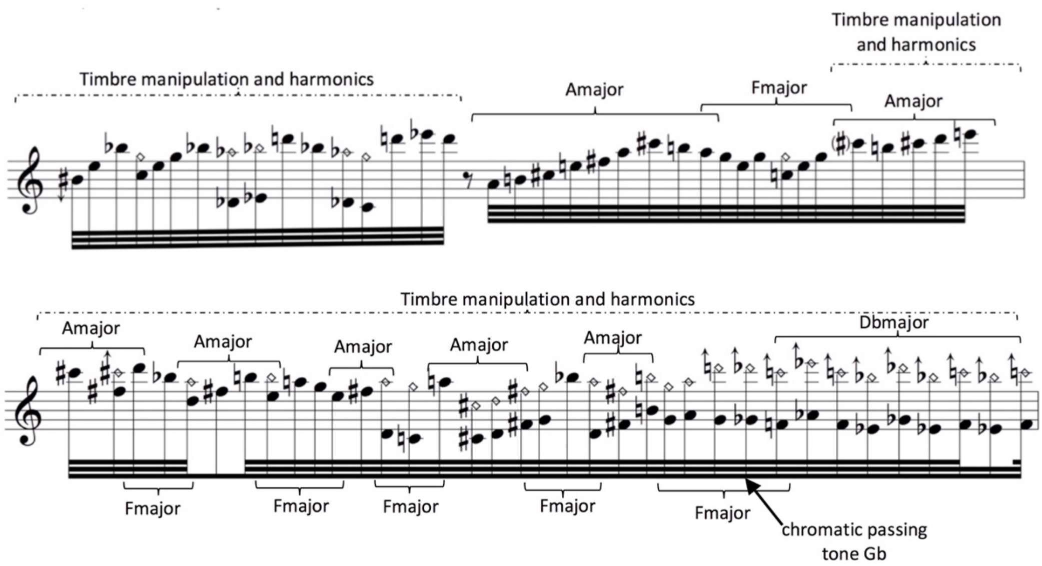


TIMBRAL AND HARMONIC EFFECTS

The manipulation of sound and tonal colour is an important feature through the opening section of 'Mars'. Harmonic effects appear at various points within phrases and create an atmosphere of heightened intensity. Since the saxophone has numerous ways that fingerings, embouchure, and air can be used to create harmonics and alterations in timbre, there is an inherent difficulty in interpreting those figures. Melodic contours constructed from harmonics may be achieved by using fingerings that are associated with producing other pitches. Intonation fluctuations sometimes result from these alternative fingerings, which are also subject to the idiosyncrasies of the particular instrument being played. Despite these complications, and the potential for greater variations in pitch content, these sections in 'Mars' do show a general correspondence to the overall structural focus on major-third cycles and major-scale key centres as referential structures.

Figure 5.22 below gives one example where pitch structure closely resembles the previous trichordal analyses. During one instance of timbral and harmonic manipulation, the major-third cycle undergoes a 'fracturing', with A and F major alternating in repeated short segments. The $C4_1$ cycle ends with a shift to D♭ major. Although the pitches E♭, F, G♭, and A♭ do not in themselves support the tonality of D♭ major, similar structures within the clear harmonic rigour of 'Stellar Regions' do support this as a reasonable analytical interpretation. The fracturing of $C4_1$ resembles the type of pc-set fragmentation and conflation seen during improvisations focused on one trichordal T_n-type. A tally of each segment's corresponding pitch-class content reveals {A, B, C♯, D, E, F♯} as the composite set for segments marked A major, and {F, G, A, B♭, C, D, E} as the composite set for segments marked F major. The entry of G♭ at the end of the phrase is interpreted as a chromatic passing note between G and F, although an alternative interpretation could include it as a member of D♭ major. The conformity of the overall pitch structure to the regions A and F major, the similarity to short diatonic segments in 'Stellar Regions', and the correlation with pc-set fragmentation and juxtaposition in other analyses, constitute compelling evidence that this complex melodic line is engaging with the major-third cycle.

Figure 5.22 'Mars': The fracturing and juxtaposition of A, and F major within $C4_1$ (02:10)



The evidence in 'Mars' reveals that, although the initial phrase outlines E♭ minor (Aeolian), the constant shifting between C4-related members of the diatonic collection clearly eschews the standard definition of key. Furthermore, the pitch structure at the beginning and ending of 'Mars' is realised through entirely different means and conceptual formulae, displaying none of the characteristics of a theme or recapitulation as has been suggested by scholars, such as Medwin and Porter. The analytical challenges posed by this music perfectly illustrate why tonal analytical tools alone are insufficient for conveying the structural complexities of 'Mars', and why a hybrid approach borrowing from tonal and post-tonal methods is better suited to probing its varied structural layers.

'LEO'

The structural heterogeneity of 'Mars', with its trichordal development and varied C4-cycles, is similarly found in 'Leo', but contrasts with the uniform $C4_0$ constructs found in 'Stellar Regions', 'Stellar Regions' (alt tk), and 'Venus'. Within 'Leo', C4-related members of the diatonic collection emerge only briefly between lengthy sections focused on the salience of (046) and (024) (Examples 5.17a, 5.17b, 5.17c). Although the transpositional patterns in 'Leo' are varied and include $C4_0$, $C4_2$, and $C4_3$, there is, however, an absence of $C4_1$. The referential major-scale structures frequently overlap and share common-tones, displaying formations more like those in 'Mars', 'Stellar Regions', 'Stellar Regions' (alt tk), and 'Venus'. Additionally, chromatic embellishments sometimes occur within local referential centres.

Beginning in stave two of Example 5.17b, the constituent referential centres C, E, A♭, D, F♯, and B♭ major (within the consecutive $C4_0$ and $C4_2$ cycles) form a theoretical whole-tone construct. This is similar to the appearance of $HEX_{1,2}$ in 'Mars' and represents a deeper hidden theoretical structure within this section. As the musical intensity builds, Coltrane begins ascending into the upper register in a similar pattern to 'Stellar Regions', 'Stellar Regions' (alt tk), and 'Venus'. As Coltrane shifts between $C4_2$-related referential centres, he fragments and juxtaposes segments of D, B♭, and F♯ major in the *altissimo* and lower register of the saxophone. The low-register D♯ that appears in stave six of Example 5.17b anticipates the entrance of E major and a shift to $C4_0$. Although the fragmented approach in this section is centred on major-third related members of the diatonic collection, the pitch structure is remarkably similar to the fragmentation of (023) in 'Jupiter' (Chapter 4.2), thus evidencing common developmental processes for seemingly disparate improvisational approaches. While across the analyses of this chapter, the conceptual framework of the referential structure creates a common thread, be it trichords, hexachords, major scales, or C4 as a transpositional process, this approach is not limited to *Stellar Regions* and *Interstellar Space*. Evidence from Coltrane's earlier recording 'Acknowledgement' indicates a parallel conceptual approach to referential pitch structure at a nascent stage of development.

5.4 PARALLEL STRATEGIES IN 'ACKNOWLEDGEMENT'

As the first track of *A Love Supreme*, 'Acknowledgement' (1965) embodies almost all the structural principles found in *Stellar Regions* and *Interstellar Space* in its usage of: trichordal T_n-types as salient structures; transposition as a transformative operation; interval-cycles as transpositional operations, common-tone pivots between pc-sets; rigorous adherence to one salient structure; fragmentation/segmentation of a salient construct into its subsets; manipulation of superset and subset relationships; a theoretical concept for providing improvisational structure; an engagement with the pentatonic scale and its subsets as a means to express the blues. Composed as a musical suite in four movements, and comprising the tracks 'Acknowledgement', 'Resolution', Pursuance', and 'Psalm', *A Love Supreme* represents a pivotal phase in Coltrane's music, encompassing two main elements: the intertwining of musical expression with spiritual themes; and improvisational strategies focused on the structural integrity of the melodic line, autonomous over the constraints of modality and harmony.

As Coltrane's most celebrated work, *A Love Supreme* has been the subject of exhaustive research. Porter's investigation (1985) provided the first insights into its structural content, identifying major features of 'Acknowledgement' such as its foundation in the pentatonic scale; the importance of its two subsets designated 'cell a'; the opening fanfare 'built of fourths'; and the chromatic transposition of 'cell a' that precedes the ending chant. By using the tenets of post-tonal theory, we can however gain a clearer understanding of his observations, so recognising 'cell a' as (035), the fanfare 'built of fourths' as (027), and the pentatonic scale configured as the transpositional combination of (035) members at T_5. The design of 'Acknowledgement' establishes an approach to pitch structure that becomes one of the defining features of Coltrane's late-period music.

The key to understanding the architecture of 'Acknowledgement' is found in the theoretical structure that results from the rotation of the F minor pentatonic scale. By configuring F minor pentatonic to begin on C, its T_5 related (035) members {C, E♭, F} and {F, A♭, B♭} form the first two segments of a C5 cyclical chain that encompasses all twelve transpositions of the pentatonic (pent) scale (Figure 5.23 below). The overlapping pentatonic scales share all but one pitch with neighbouring transpositions, creating an environment where modulations at T_5/T_7 are potentially obscured and only signalled by a single change in pitch. This theoretical structure emerges as a crucial feature of Coltrane's improvisation in the forthcoming analyses. Furthermore, it is remarkable that this exact cyclical pattern appears in Slonimsky's *Thesaurus* as Exercise #828, providing yet another example of where Coltrane's pitch structure and Slonimsky's monograph intersect (Figure 5.24; Coltrane's interest in Slonimsky's *Thesaurus* is examined in Chapter 2.3). As the analysis will illustrate, the journey from, and return to F minor pentatonic is a crucial feature in Coltrane's improvisation.

In the forthcoming analysis of 'Acknowledgement', the overlapping cyclical formation of pentatonic scales in Figure 5.23 below establishes the framework for interpreting the transpositional relationships. Although F minor functions as the tonal centre, Coltrane employs the pentatonic scale and its subsets exclusively through his improvisation, eschewing modal scales and functional harmonic patterns. The alternating salience of the pentatonic scale, and its (035) subset, parallels the interaction between (024), the whole-tone collection, and (024579) in 'Leo' and 'Saturn'. However, in 'Acknowledgment' Coltrane's approach to (035) is far more restricted than the flexible trichord formations in *Interstellar Space* and *Stellar Regions*, utilising just two principal motivic contours.

Figure 5.23 Circle of conjunct (035) members and overlapping pentatonic scales

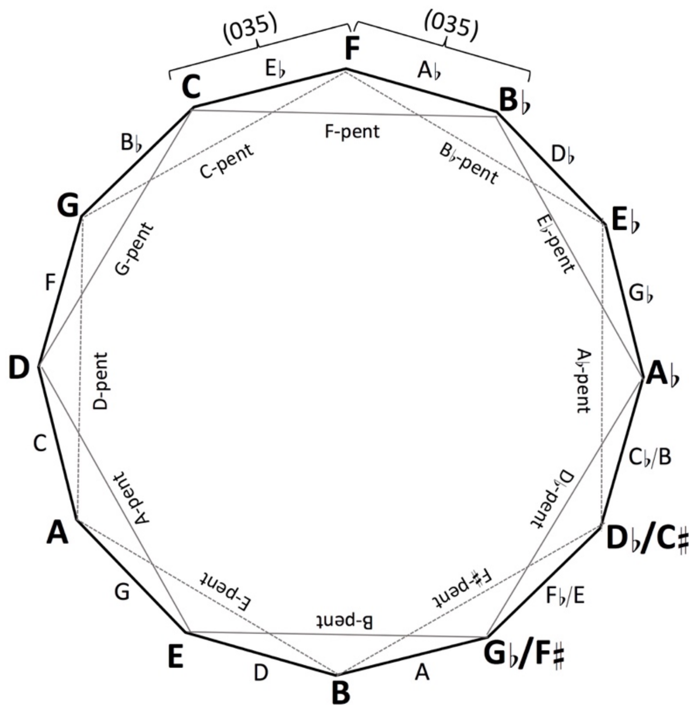


Figure 5.24 Slonimsky, *Thesaurus* (p.109): Exercise #828

After the opening fanfare, Coltrane's improvisation begins with consecutive (027) motives formed by (F, G, C} and {B♭, C, F}. The contour of these motives is identical to the first five pitches of Slonimsky's Exercise #839, demonstrating not only the potential influence of the *Thesaurus* on the pc-set structure, but also upon its contour (Figure 5.25). While at the same time, these two trichords resonate the (027) structure of the fanfare's {E, F♯, B}, more importantly, they provide the framework for the melodic content of the first two phrases. Coltrane slowly reveals these two motives as subset members of the supersets C minor and F minor pentatonic through their progressive development (Example 5.18a). In phrase one, F minor pentatonic is the first superset to be revealed, while in phrase two E♭ is added to {F, G, C} before a complete C minor pentatonic scale emerges. This developmental approach foreshadows the pitch structure in 'Stellar Regions', where the melodic content gradually reveals a background structure of major-third related members of the diatonic collection.

Across 'Acknowledgement', common-tone pivots allow the seamless movement between pentatonic scale transpositions, mirroring the common-tone structures in 'Iris', 'Mars', 'Saturn', and other pieces in this thesis. The analysis reveals only six instances where pentatonic modulations occur without common-tones pivots (Examples 5.18a, 5.18b, 5.18c, 5.18d, 5.18e). Significantly, the transpositional mapping between the pentatonic regions contains a pattern where Coltrane uses F minor pentatonic as a referential axis, initially slipping back and forth from C minor pentatonic (the dominant side) and B♭ minor pentatonic (the subdominant side) (Example 5.19). A gradual transpositional expansion occurs symmetrically around F minor pentatonic, with transpositional movements alternating between the dominant and subdominant sides. Finally, Coltrane finally breaks free of this symmetrical movement, and its tether to F minor, by using common-tone pivots to move through all twelve transpositions of the pentatonic scale until the C5-cycle returns to F minor.

Figure 5.25 Slonimsky, *Thesaurus* (p.113): Exercise #839

As the piece nears its end, C1 appears as a transpositional cycle for motives constructed from members of (035) (Example 5.18e). Only {C♯, E, F♯} is missing from this cyclic pattern. After Coltrane returns briefly to F minor pentatonic, members of (035) then appear chromatically in the motive form of the bass ostinato (known as the *A Love Supreme* motive) before the ending vocal chant. Researchers such as Porter have suggested that the (035) motive's chromatic movement through twelve transpositions may be symbolically important. However, as this analysis shows, the chromatic saturation of (035) and their pentatonic supersets through all twelve transpositions precedes the more famous (035) bass ostinato motivic sequence, a fact that any symbolic reading must also consider.

Porter's examination of 'Acknowledgement' emphasises the importance of the spiritual message of the music and proposes that, with the ending (035) motive's chromatic shifting, Coltrane is 'telling us that God is everywhere – in every register, in every key' (1998, p.242). With Porter's hermeneutic interpretation as a starting point, additional links between Coltrane's spirituality and the musical elements of the piece may emerge. The handwritten note – 'All Paths Lead To God' – appearing in the margins of Coltrane's sketch for *A Love Supreme* (Example 5.20) is certainly evocative when considered within the context of the structural patterns in 'Acknowledgement'. Pitch F is centrally located within the rotated formation of the F minor pentatonic scale (with the pitches C and E♭ on its left and A♭ and B♭ on its right), and within the C5 pattern of overlapping pentatonic scales (illustrated in Figure 5.23). In this way the pitch F, and F minor pentatonic would denote the source of creation, positioned at the centre of the musical (and spiritual) universe of 'Acknowledgement'. As Coltrane plays pentatonic transpositions that gradually move further and further away from its generating source, the C5 transpositional path inevitably leads back to F minor pentatonic, symbolically mirroring the sentiment in Coltrane's note that 'All Paths Lead To God'.

Beyond its spiritual aspects and within the musical realm, the structural and conceptual breakthrough of 'Acknowledgement' establishes a foundation for the evolved pitch organisation of *Stellar Regions* and *Interstellar Space*. We see in 'Acknowledgement', a design that most closely foreshadows ‘Iris’, ‘Stellar Regions’, ‘Stellar Regions’ (alt tk), and ‘Venus’ because of their shared focus on the transpositional modification of one referential pc-set construct, as represented by these parallel structures:

- The rotated pentatonic scale where conjunct (035) members are embedded within a C5-cycle in ‘Acknowledgement’.
- The (013) construct in varied T_n relations as both melody and harmony in ‘Iris’.
- The ic4-related members of the diatonic collection in ‘Stellar Regions’, ‘Stellar Regions’ (alt tk), and ‘Venus’.

Although the emerging, salient pc-set constructs in this chapter are diverse, encompassing varied interval structures and cardinalities, collectively they reflect an overarching approach where pc-sets are used as referential centres. While Chapter 5 has established wide-ranging relationships between the emergent pc-sets and their contexts, it falls to Chapter 6 to examine in greater detail the generation, integration, and emergence of diverse pc-set structures across the entirety of ‘Saturn’ in order to contextualise relationships on a broader scale.

CHAPTER 6: PC-SET GENERATION, INTEGRATION, AND DIVERSITY IN 'SATURN'

INTRODUCTION

In the same way that 'Iris' exemplifies T_n-type determinacy (Chapter 4), 'Saturn' offers a model of T_n-type generation, integration, and diversity. Of all the music comprising *Interstellar Space* and *Stellar Regions,* 'Saturn' displays the most cogent and wide-ranging pc-set design, distinguishing it as an exemplar of Coltrane's late-period style. Numerous varieties of trichordal T_n-types are developed as both homogeneous referential structures for prolonged durations, and as consecutive heterogeneous pc-sets integrated into a melodic surface encompassing common-tone pivots, dyad anchors, chromatic voice-leading, and the projection of shared interval content. Within Chapter 6, 'Saturn' is examined in its entirety to highlight the rigour and evolution of its pitch structure. Distinctive regional characteristics emerge within its large-scale architecture (Figure 6.1). Investigation of these regions and their relationships illustrates how pc-sets are generated and assimilated across the full improvisatory span of 'Saturn'. As a final reminder, the Examples, cross-referenced in the text, are found within Appendix D in Volume II.

Following an extended drum solo by Rashied Ali, Coltrane states the actual theme to 'Saturn' (02:27), structured as a thirty-two bar C♯ minor blues with an AABA form in 3/4-metre. Tonality and metre gradually dissolve after the statement of this theme and are not referenced again until the recapitulation.

Figure 6.1 Large-scale structural design of 'Saturn'

00:00–02:27	Introductory drum solo
02:27–03:20	'Saturn' theme and structurally related improvisation
03:20–5:00	(024) salience
05:00–06:43	(013) salience
06:43–07:14	(025) salience
07:14–07:58	(027) salience
07:58–08:07	Ic4 salience and tonal references
08:07–09:09	Shifting trichord salience and integration of heterogeneous pc-sets
09:09–09:32	(02), (035), and (027) emergence as subsets of (0257)
09:32–10:15	Integration of heterogeneous T_n-types and pentatonic supersets
10:15–11:00	(024579) emergence and its dissolution into harmonics and timbral exploration
11:00–11:37	'Saturn' theme recapitulation

In 'Saturn', the pentatonic subsets (027), (025), (035), and (0257) all appear within the theme's construction, so paralleling the 'Seraphic Light' and 'Sun Star' themes examined in Chapter 5. Each 'A' section consists of one repeated, four-bar phrase constructed from the (0257) member {F♯, G♯, B, C♯}, segmented into overlapping subsets {B, C♯, F♯} and {F♯, G♯, B} (bb. 1 and 2), and {F♯, G♯, B} and {F♯, G♯, C♯} (bb. 3 and 4). While (035) appears as a contraction of {F♯, G♯, C♯} (bb. 15 and 16) and in the 'A' theme upper contour, the overlapping pc-sets in each four-bar phrase form the symmetrical pattern (027), (025), (025), (027) (Example 6.1a; 6.1b). In bars 9 and 29, A♯ appears as an embellishment of the 'A' theme, forming an auxiliary (025) set {G♯, A♯, C♯} with the preceding pitch-class G♯.

Similarly, the eight-bar 'B' section is constructed from (0257), with {B, C♯, E, F♯} divided into two primary motives. During this phrase, the first motive constructed from {B, C♯} is repeated three times before it is finally answered by {C♯, E, F♯}, with C♯ functioning centrically as the last pitch-class of each motive. Moreover, the pitch structure of the overall theme forms C♯ minor pentatonic from the transpositional combination of the 'A' and 'B' tetrachords {F♯, G♯, B, C♯} and {B, C♯, E, F♯}. This architectural precision provides a likely strong indicator that planning went into the theme's design. In Chapter 6.3 the emergence of (0257) provides a wider perspective on its structural utility independent from the pentatonic scale.

Following the theme, the improvisation briefly continues using C♯ minor pentatonic subsets, with {F♯, G♯, B, C♯} (from the 'A' theme') and {C♯, E, F♯, G♯} employed as embellishments of the principal motive {F♯, G♯, C♯} (Example 6.1b). Upon the entrance of D♯ in stave six, a shift to G♯ minor pentatonic occurs, synthesising the {F♯, G♯, B, C♯} unit from the theme within this new superset and paralleling the pentatonic common-tone modulations in 'Acknowledgement' (Chapter 5.4). Gradually, Coltrane begins to move away from the implied C♯ minor tonality of the theme upon the emergence of (024) with pc-sets {F♯, G♯, A♯} and {B, C♯, D♯}.

6.1 PC-SET GENERATION: (024; 013; 025; 027)

Between 03:20 and 07:58, Coltrane's improvisation comprises four consecutive sections focused respectively on the salience of (024), (013), (025), and (027). Chapter 6.1 examines the entire spans across which these T_n-types appear, the generative processes that produce them, and the pc-set formations that result from their individual structural properties.

(024) 03:20–05:00

The first appearance of (024) occurs at 03:20, remaining salient for 1' 40'' with only one brief interruption. A distinguishing feature of this section is the referential use of two primary pc-sets – {F♯, G♯, A♯} and {E♭, F, G} – through their frequent emphasis and juxtaposition with other T_n-related sets. The employment of repeated pairs of T_n-related (024) sets, in patterns resembling (024) and (046) sets in 'Leo' (Chapter 5.2), and (023) sets in 'Jupiter Variation' (Chapter 4.2), creates movement through a variety of harmonic areas, in what may be considered as analogous to harmonic progressions in tonal jazz repertoire. Supersets (024579), WT_0, WT_1, and Messiaen's sixth mode of limited transposition all appear as a result of the referential pairing of two trichords. Figure 6.2 below tabulates where multiple repetitions of two trichords occur, while Example 6.2 gives a complete account of the pc-set transpositional patterns and (024) saturation occurring between 03:20 and 05:00.

Figure 6.2 'Saturn': (024) referential pc-set pairs

Time	PC Sets	T_n Relationship
03:20	{F#, G#, A#} — {B, C#, D#}	T_5/T_7
03:40	{F#, G#, A#} — {C, D, E}	T_6
04:02	{F#, G#, A#} — {Eb, F, G}	T_3/T_9
04:12	{F#, G#, A#} — {F, G, A}	T_1/T_{11}
04:29	{A, B, C#} — {Eb, F, G}	T_6
04:44	{Db, Eb, F} — {Eb, F, G}	T_2
04:49	{B, C#, D#} — {D, E, F#}	T_3/T_9

The introduction and repetition of the trichord {F♯, G♯, A♯} at 03:20 emerges from the melodic development of the G♯ minor pentatonic scale which precedes it and the C♯ minor tonality established by the 'Saturn' theme. The entrance of {B, C♯, D♯} is anticipated by the interjection of a single B pitch-class within the motivic development of {F♯, G♯, A♯}. This type of anticipation was previously explored in Chapters 4 and 5 and can be found at several other points in 'Saturn'. While the T_5/T_7-related pc-sets {F♯, G♯, A♯} and {B, C♯, D♯} maintain a tonal connection to the 'Saturn' theme as subsets of C♯ minor (Dorian), Coltrane also mimics the theme's melodic architecture by ending his phrases on G♯ and C♯. (Pc-sets that work in combination with referencing diatonic modes, and major and minor tonalities are also illustrated in Chapters 4.1, 4.2, and 4.3.) At first, Coltrane repeats {F♯, G♯, A♯} and {B, C♯, D♯} twice, preserving their distinctiveness, before blending them into one seamless (024579) hexachordal structure (Example 6.3a). This (024579) emergence contrasts with its appearance at 10:15 as a rapid descending figure (see Chapter 6.4), and with its treatment in 'Leo' (Chapter 5.2), indicating the variety of ways in which this structure features as a superset of (024).

Upon the entry of {C, D, E} and its paring with the referential set {F♯, G♯, A♯}, an unusual structural formation appears that subsumes these two trichords (a WT_0 collection) within a larger superset (Example 6.3b). The addition of pitch-classes F and B to {F♯, G♯, A♯} and {C, D, E} creates the symmetric T_n-type (0124678T); otherwise known as Olivier Messiaen's sixth mode of limited transposition and Scale #21 in Slonimsky's *Thesaurus* (Figure 6.3 below).[85] Although the whole-tone collection appears intermittently in *Stellar Regions* and *Interstellar Space* in areas of (024) salience (produced by T_6 related pc-sets), the emergence of Messiaen's sixth mode (Scale #21) as a related structure to (024) and the whole-tone scale, constitues a unique occurrence within these recordings and a persuasive indication of Coltrane's theoretical knowledge of their interconnection.

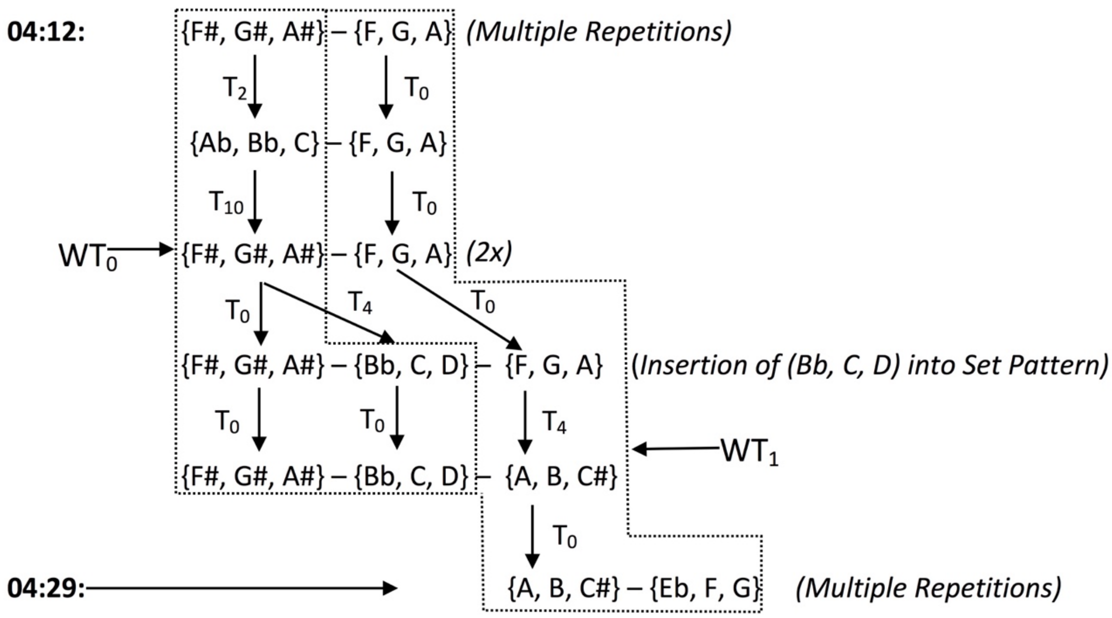
[85] During an interview with J. C. Dargenpierre in 1961 (DeVito 2012, p.127), Coltrane mentions reading the book *Since Debussy* (Hodeir, 1961). This book contains a chapter on Olivier Messiaen that describes his compositional techniques and the 'modal power' of the modes of limited transposition, suggesting their potential relationship to Greek, Chinese and Hindu modes (p.112). Hodeir also refers to Messiaen's book, *The Technique of My Musical Language* (repr. 2007) where the modes of limited transposition first appear.

Figure 6.3 The theoretical model for Slonimsky's Scale #21 and Messiaen Mode 6

During the development of this section, there is a brief interruption in the structural continuity of (024) and the superset (0124678T). This temporary divergence from (024) underscores an essential point about trichordal salience in Coltrane's improvisations: that divergences engage in a dialogue with the salient construct and are rarely unrelated to the contexts in which they appear. The emergence of a sweeping ascending line that reaches into the *altissimo* register and then descends cues the divergence from (024) and (0124678T). The registral limits of this line are developed by contrasting the extreme *altissimo* with the low register of the saxophone, followed by a brief transition containing subsets of WT_0 in return to (024). Through this divergent phase the WT_0 subsets {F♯, A♯, C}, {A♯, C, D, F♯}, and {F♯, G♯, A♯, D} interact with the more chromatic pitch content, so providing continuity for the whole-tone sonority, while framing the sweeping ascending line and the entire section (Example 6.3c). Pitch-classes F♯ and A♯, as members of {F♯, A♯, C}, {A♯, C, D, F♯}, and {F♯, G♯, A♯, D}, maintain a connection to the referential set {F♯, G♯, A♯} that re-emerges after this divergence in combination with (0124678T).

A gradual transpositional compression occurs between the referential pc-set {F♯, G♯, A♯} and the contrasting transpositions: {E♭, F, G}, {E, F♯, G♯} and {F, G, A} (Example 6.3d), which results in an ascending semitonal voice-leading motion between the contrasting pc-sets. Figure 6.4 below groups the trichords into subdivisions of two and three sets in order to illustrate the transpositional mapping that occurs between 04:12 and 04:29. Although this section begins with the repeated, referential pairing of {F♯, G♯, A♯} and {F, G, A}, during the development {A♭, B♭, C} and {A, B, C♯} appear as discrete substitutions for the respective sets {F♯, G♯, A♯} and {F, G, A}. Shortly before the arrival of WT_1, the two-set referential pattern is expanded to three sets with the inclusion of {B♭, C, D}.

Figure 6.4 'Saturn': Transition from 04:12 to 04:29

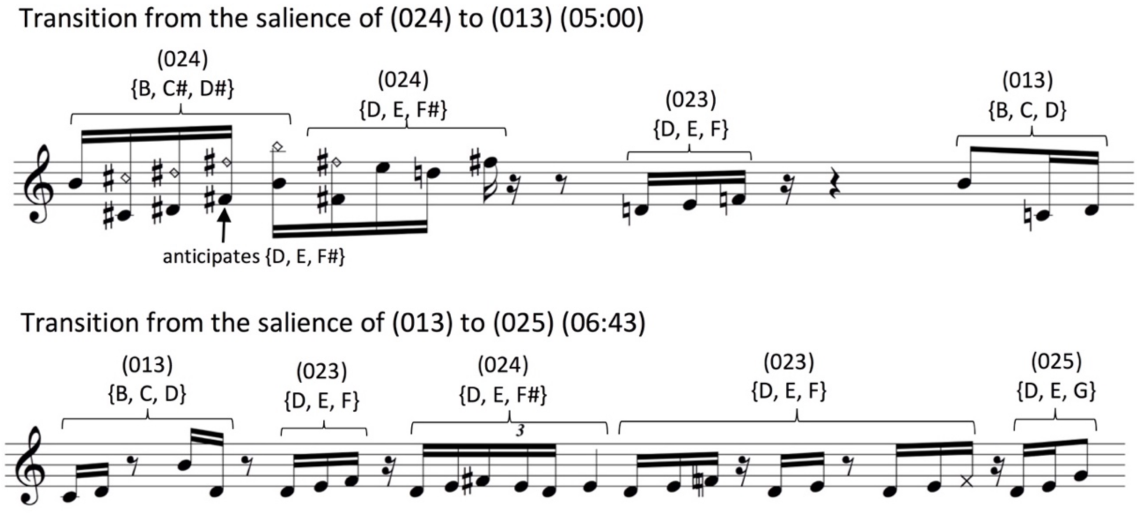


During the transition to the construct {A, B, C♯}–{E♭, F, G}, the emergence of a WT_0 stream (Figure 6.4 again) results from the common-tone transpositions which occur, with whole-tone saturation then fully realised upon the emergence of {A, B, C♯} and {E♭, F, G} (forming WT_1). From 04:29 to 04:49, WT_1 is the primary superset for the trichords that appear (Example 6.3e): {E♭, F, G} is occasionally fragmented and eventually emerges as a referential set during the transition to {D♭, E♭, F}–{E♭, F, G}, where it is contrasted with five other T_n-related members of (024). At 04:41, Coltrane alternates between the trichords {E♭, F, G} and {D♭, E♭, F} in different octaves, sometimes blending them to form {D♭, E♭, F, G} (Example 6.3f). The final pair of repeated trichords – {B, C♯, D♯} and {D, E, F♯} – are preceded chromatically by another pair of T_3-related sets {C, D, E} and {E♭, F, G}. Moreover, the trichord {B, C♯, D♯} is embellished twice, with F♯ anticipating the initial entry of {D, E, F♯} (a ubiquitous technique), and pitch-classes B♭ and A in a gesture that implies a truncated Messiaen mode six. This use of (024) as a structural determinant is ended with the trichords {B, C♯, D♯} and {D, E, F♯} (Example 6.3g).

A transition in salience from (024) to (013) begins with the set sequence {D, E, F♯}, {D, E, F}, {B, C, D}, using common-tone pivots to connect three T_n-types. Initially, pitch-classes D and E are retained in the intervallic compression from {D, E, F♯} to {D, E, F}, with pitch-class D is subsequently used as a pivot between the inversionally related sets {D, E, F} and {B, C, D}. While this manner of utilising common-tone pivots to generate pc-sets and new regions of salience has already been examined in other pieces, remarkably in 'Saturn' Coltrane employs these same pc-sets again at 06:40 in reversed order to generate (025) (Figure 6.5).

This section of 'Saturn' demonstrates Coltrane's extraordinary skill in using, what we identify as, the members of (024) in a variety of ways. These trichordal explorations engage with the functional harmony of the theme and symmetrical supersets, while also establishing regions of harmonic stability through the pairing of referential trichords. Significant correspondences occur between the content of Coltrane's improvisations and the theoretical concepts of Messiaen and Slonimsky. The structural content here parallels not only the other emergences of (024) elsewhere in *Stellar Regions* and *Interstellar Space*, but other T_n-types as well.

Figure 6.5 ‘Saturn’: Correspondences between two transitions in salience



(013) 05:00–06:43

The shift in salience from (024) to (013) is notably sudden and is signalled by the fleeting appearance of {D, E, F}, inversionally related to, and containing the same interval content as (013). Common-tone pivots and T_1/T_{11} movements from set to set are frequent structural features, mirroring the descending and ascending C1 segments found in ‘Iris’ and ‘Mars’ where (013) also appears at length (Example 6.4).

During this section the constructs (023), (047), (045), (015), (024), and (027) are all integrated into a context focused on the salience of (013). This phenomenon is initially seen in the transition to (013) with the set sequence {D, E, F}, {B, C, D}, {B♭, B, D♭}, {A♭, B♭, B}, {G♯, A, B}, {G, A♭, B♭}, {F♯, G, A}, {F, G♭, A♭}. The members of (023) that appear in this sequence – {D, E, F} and {A♭, B♭, B} – are inversionally related to (013) and share common-tones with the neighbouring pc-sets (Example 6.5a). Occasionally in Coltrane’s improvisations, we see salient trichordal T_n-types juxtaposed briefly with their inversions, suggesting a conflation of their shared structural properties. This type of conflation occurs periodically in 'Saturn', both within this section and at 08:19 with (035) and (025). A continuous, descending semitonal transpositional movement between (013) trichords begins with {B, C, D} and ends with {D, E♭, F}. Here, the descending sequence contains two main disruptions: {G♭, B♭} and {G♭, B♭, D♭} between {F, G♭, A♭} and {E, F, G}; and {D, E, F} between {E, F, G} and {D, E♭, F}. Pitch-class B♭ is interjected within {D, E♭, F} as a lower-register anchor, so anticipating its membership in the next pc-set {A, B♭, C}. Upon the entrance of the (045) member {E, G♯, A}, a sequence of pc-sets begins that, while diverging from the salience of (013), is fully integrated within the melodic development, utilising common-tone pivots and voice-leading to return eventually to (013) with {G, A♭, B♭} (Example 6.5b).

While the intensity builds and Coltrane ascends higher into the *altissimo* register, the set sequence: {G, A♭, B♭}, {F♯, G, A}, {A♭, A, B}, {G, A♭, B♭}, {B, C, D} reaffirms the salience of (013). After a brief interjection of the (023) member {B, C♯, D} between two statements of {B, C, D} – mapped at I_1 – an ascending semitone transpositional movement across the (013) sets {B, C, D}, {C, D♭, E♭}, {C♯, D, E}, {D, E♭, F} heightens the intensity, accompanied by cascading *glissandi* descending from C, C♯, and D (Example 6.5c). During this section, there are intermittent squeaks and unresponsive notes that contribute to the overall effect and intensity being generated.

After the final descending *glissando* from *altissimo* D to the low-register dyad {A, B♭}, the heterogeneous T_n-type sequence (023), (024), (013), (027), (013) gradually refocuses on the salience of (013). Additionally, these consecutive pc-sets – {C, D, E♭}, {A♭, B♭, C}, {F, G♭, A♭}, {E♭, F, B♭}, {D, E♭, F} – are all connected by common-tone pivots (Example 6.5c). The arrival of {D, E♭, F} cues the descending semitonal transpositional movement {D, E♭, F}, {C♯, D, E}, {C, D♭, E♭}, and {B, C, D} with the final three pc-sets in this sequence temporally fragmented and overlapped. Significantly, (02) emerges as a subset, embedded in a chromatic voice-leading motion E♭–D–D♭–C as a lower anchor for seven pc-sets (Example 6.5c: staves four and five). During the shift in salience from (013) to (025), the dyad {D, E} appears within T_n-types (024), (023) and (025). In this transition to (025) salience, the pc-set sequence: {B , C, D}, {D, E, F}, {D, E, F♯}, {D, E, F}, {D, E, G} features as a retrograde formation (and extension) of the previous set configuration: {D, E, F♯}, {D, E, F}, {B, C, D} that appeared as the transitional sequence to (013) (see again Figure 6.5 for this correlation). While it is highly likely that this structural correlation results from unconscious processes and is potentially influenced by muscle memory, it nevertheless exemplifies the highly structured nature of Coltrane's improvisatory thinking. This manner of heterogeneous trichordal integration becomes more prevalent later in 'Saturn', where trichordal salience is established across multiple T_n-types.

(025) 06:43–07:14

Upon the emergence of (025), the music develops by primary means of two overlapping interval cycles – C2 (whole-tone) and C5 (perfect fourths/fifths) – as T_n operations for the pc-sets (Example 6.6a and b). T_n-type (025) is harmonically meaningful because of its inversional relationship to (035), and its two occurrences as subsets within the pentatonic scale. As an essential component of Coltrane's sound, and serving as a vital connection to the blues tradition, this sonorous importance of (025) and (035) can not be overstated.

A striking relationship exists between the initial (025) patterns in ‘Saturn’ (Figure 6.6 below) and the (035) patterns in ‘Acknowledgement’ from *A Love Supreme* (Figure 6.7), yet again pointing up the intricate intertextualities found within Coltrane’s work. This section of ‘Saturn’ begins as though it were extracted from ‘Acknowledgement’, substituting (025) members for (035) while using a segment of C5 for the T_n operations. Additionally, this locus offers the second parallel to Slonimsky’s *Thesaurus* in ‘Saturn’, with Exercise #827 containing members of both (025) and (035) within the C5 pattern (Figure 6.8) (Bair’s alternate interpretation of this section was previously discussed in Chapter 1.6). It is worth noting that Slonimsky’s Exercises #827 is rotationally related to Exercise #828 (illustrated in the Chapter 5 analysis of ‘Acknowledgment’), with both exercises expressing identical interval structure. In a final parallel to ‘Acknowledgment’, where the C5 pc-set pattern creates overlapping pentatonic scale transpositions (illustrated in Figure 5.21 above), in ‘Saturn’ supersets A, D, G♭, A♭, and B minor pentatonic are formed from consecutive (025) sets related at T_5/T_7 (see again Example 6.6a).

A closer examination of the C2 and C5 cycles contained in ‘Saturn’ reveals three instances where trichords are used to pivot between these transpositional cycles (Example 6.7). During this section, $C2_1$ is the only interval cycle that sounds completely, while smaller segments of $C2_0$ and C5 also appear. Significantly, there are three disruptions to these cycles. The first occurs with the insertion of {A♭, B♭, D♭} between the previously repeated two-trichord pattern {C, D, F} and {G, A, C}. In the second disruption, a chromatic pc-set substitution appears within the C5 cycle, where {B♭, C, E♭} replaces {B, C♯, E} during what otherwise would be a sequence of six T_5-related sets starting with {A♭, B♭, D♭}. In the final disruption, there is a denial of the expected trichord {G, A, C} within this $C2_1$ cycle because of an alteration in this set's pitch-class content (F♯ replacing G). The resulting pc-set {F♯, A, C}, a member of (036), is immediately followed by {F, G, B♭}, returning to the $C2_1$ cycle and members of (025).

Figure 6.6 'Saturn': (025) members within a C5 cycle (06:43)

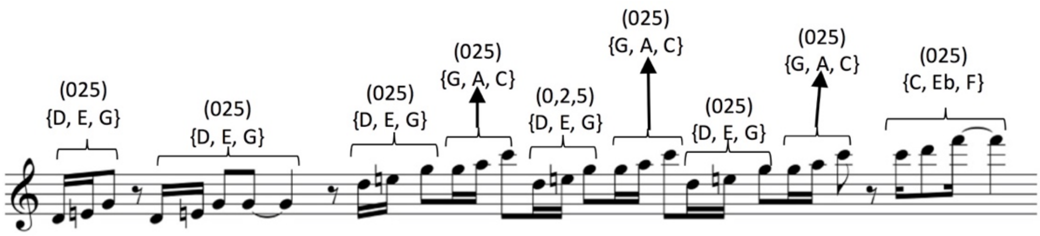


Figure 6.7 'Acknowledgement': (035) members within a C5 cycle (02:05)

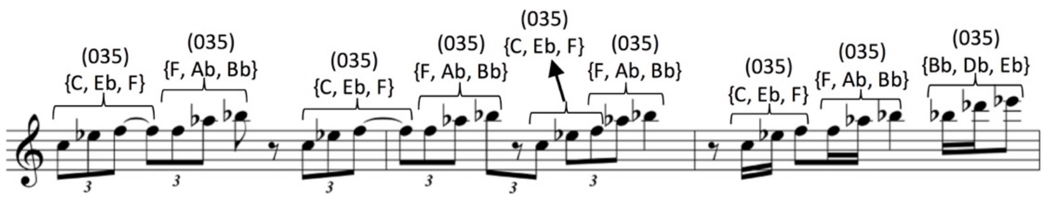
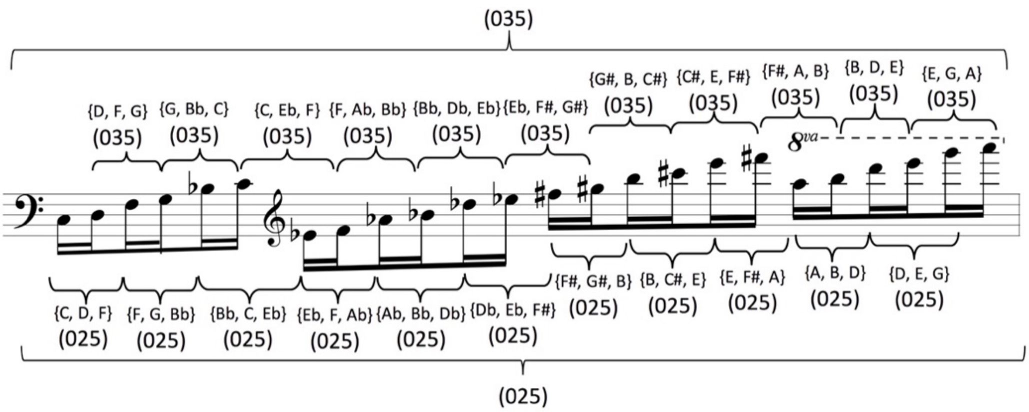


Figure 6.8 Slonimsky's *Thesaurus*: Exercise #827 (excerpt with analysis)



Coltrane ends this section with a transition that contains several structural layers (shown in Example 6.8). The first and most obvious feature is the tonal reference to an authentic cadence in A minor. Secondly, {E, F♯, B}, as a member of (027), represents a whole-step intervallic expansion of (025) that reproduces the preceding melodic contour. Additionally, the grouping {E, F♯, B} anticipates the extended exploration of members of (027) that immediately follows this section. A third interpretation offers another connection to the (025) structure with a prolongation of {E, F♯, A}, embellished by tones B and G♯, which both resolve to A. Lastly, the harmonic shift from the tetrachord {A, B, D, E} to {G, A, C, D} suggests a movement from B minor pentatonic to A minor pentatonic, demonstrating another connection to Exercise #827 and its overlapping pentatonic scales. The emergence of (027) in the next section is a sign of the close structural relationship existing between (025), (035), and (027), due both to their common membership of the pentatonic scale and their being pc-sets generated from the first three consecutive perfect-fifth intervals in the circle of fifths (examined in Chapter 2.2). Additional examples of harmonic interaction between these three T_n-types are presented in Chapter 6.3.

(027) 07:14–07:58

While a structural focus is maintained with (027) through the section beginning at 07:14 (Example 6.9a), pentatonic supersets also have a significant presence, emerging where consecutive T_2/T_{10} related (027) sets appear. This locus mirrors how the T_5/T_7 related (025) and (035) members appeared as subsets of the pentatonic in 'Acknowledgement' (Chapter 5.4). Although the pentatonic scale contains three (027) subsets, only two of these subsets related at T_2/T_{10} are needed to form a complete pentatonic scale. The other potential transpositional relationships between (027) subsets of the pentatonic may be combined at T_5/T_7 to form (0257). This manipulation of trichordal pc-sets as both a salient structure and members of a pentatonic superset demonstrates that Coltrane is not merely playing around with the pentatonic scale randomly, but utilises its (027) subsets in a particular manner. Supersets A, B♭, D, F, G, C, F♯ and E minor pentatonic appear sequentially (Example 6.9a, 6.9b), with four pc-sets appearing as interruptions within this pattern: {E, F♯, B} between B♭ and D minor pentatonic; {D♭, E♭, A♭} and {D, E, A} between C and F♯ minor pentatonic; and {A♭, B♭, D♭} between F♯ and E minor pentatonic. In stave one of Example 6.9a, A minor pentatonic emerges, comprising motives constructed from the (027) member {C, D, G} and (035) member {E, G, A}. In stave two, the figure {E, G, A} is transformed into the (027) member {G, A, D}, exemplifying how pitch structure is reshaped motivically in support of an emerging salient structure. In this transformation from (035) to (027), the contour and common-tones G and A are retained between pc-sets.

Back in stave one of Example 6.9a, the pitch structure develops in a mirror form when {E♭, F, B♭} enters, utilising a descending and ascending motivic contour for the pitch sequence: F, B♭, E♭, B♭, E♭, B♭, F. This contour is duplicated and modified in the (027) formations that follow. Ironically perhaps, it is the entry of the triad {C, E, G} in the *altissimo* that signals a destabilising of the (027) unity (Example 6.9b), beginning a transition away from its salience. Here the triad {C, E, G} is nested between two statements of {F, G, C}, retaining C and G as common-tone pivots in its intervallic expansion from and contraction to (027). During this transition phase (027) still continues as some kind of referential structure, with pc-sets {F, G, C}, {B♭, C, F}, and {A♭, B♭, E♭} subsumed within the (0257) members {C, D, F, G}, {F, G, B♭, C}, and {A♭, B♭, D♭, E♭}. The appearance of {F, G, B♭, C} as a transpositional combination of the (027) sets {F, G, C} and {B♭, C, F} points up how (0257) resonates (027). Additionally, a G minor pentatonic is also formed from the transpositional combination of tetrachords {C, D, F, G} and {F, G, B♭, C}. The resonance of ic4, (i.e. the major-third interval) as a structural component of the destabilising triad {C, E, G}, is projected by the sets {D, E, F♯} and {A♭, B, D♭, E♭}, with the appearance of {A♭, B, D♭, E♭} representing a synthesis of (027) and (024) – as expressed by subsets {D♭, E♭, A♭} and {B, D♭, E♭}.

As the focus on (027) ends, ic4 comes to assert a prominent role in the pitch structure of the next section. This conclusion of (027) as a salient structure also marks the end of the extended use of individual trichordal T_n-types as structural generators. In the sections that follow, the fluid integration of trichordal and tetrachordal T_n-types creates a melodic surface that, while continuing to emphasise pc-sets, no longer focuses at length on the salience of only one T_n-type.

6.2 PC-SET INTEGRATION AND HARMONIC COHESION

Coltrane's improvisation changes focus at 07:58 by integrating varied pc-sets into a shifting texture that exploits their shared interval content. While during the opening main portion of 'Saturn' its harmonic cohesion is realised through extended trichordal T_n-type homogeneity, from 07:58 onwards it is typically produced by the projection of interval-classes through a variety of trichordal and tetrachordal formations.

THE EMERGENCE OF (04) AND TONAL REFERENCES 07:58–08:07

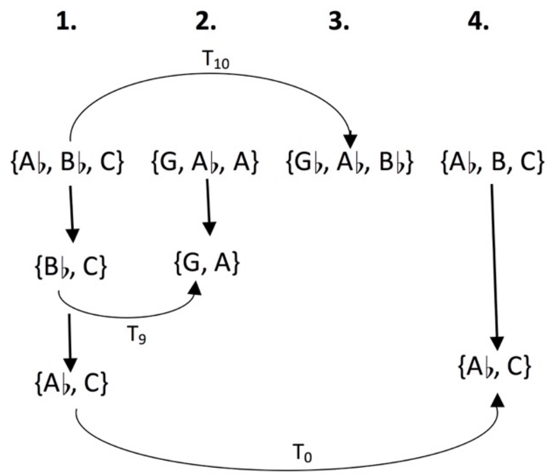
The pitch structure between 07:58 and 08:07 contrasts distinctly with the other regions in 'Saturn' due to a decreased focus on T_n-type homogeneity and the saturation of ic4 projecting through numerous sequential pc-set constructs. The frequent appearances of (024), (047), (037), and (0247) act fundamentally as embellishments of (04) and so resonate with an ic4 salience. Additionally, segments of WT_0, WT_1, Oct_{12}, and Hex_{34} integrate these structural layers and also promote the resonance of ic4. This section serves as a kind of bridge between the extended use of individual T_n-types as referential structures (as previously seen with (024), (013), (025), and (027)), and the diverse, integrated melodic surfaces consisting of numerous T_n-types that emerge at 08:07. The opacity of these structures points up the clarity of the previous pc-set design and the diverse manner in which the underlying musical resources are expressed.

A distinguishing characteristic of this section is the way that Coltrane adjusts his air flow and embouchure to produce harmonics and timbral changes, paralleling techniques used in 'Leo' and 'Mars' (Chapters 5.2; 5.3). This creates a complex melodic surface that may be interpreted in two potential ways; firstly, the fundamental pitch (and its associated fingering), and, secondly, the harmonic. Carl Woideck accurately notes that, although Coltrane's critics generally disliked his use of harmonics, this usage of harmonics in jazz is 'well-established' within the saxophone tradition as epitomised by Lester Young, an early influence on Coltrane (2009, p.180). Coltrane is known to have practised from the well-known book *Top-Tones for the Saxophone* (Raschér, 1941) which is a collection of melodic studies using harmonics as alternatives for the standard saxophone fingerings (Porter, 1998, p.63). As a professional saxophonist, I would add that this type of intentional use of harmonics as timbral substitutions for specific pitches continues to be a commonly employed technique in a variety of musical styles. Since the harmonics are emphasised (sounding louder than the fundamentals), and no clear pc-set salience is established (where repeated fingering patterns would delineate the importance of the fundamental), the analysis principally interprets the impact of the harmonics upon the pitch structure.

Four staves in Example 6.10a illustrate the progressive development of pitch structure centred around ic4 and (04). Within sequences of (04), (024), (047), (037), and (0247) constructs that reinforce the salience of ic4, there are occasional embellishments to the pc-set structure, as with the addition of C♯ to {D, E, F♯} in stave one, and the passing note E within {E♭, F, G} in stave two. Additionally, in stave one the pitch-class sequence D, C, D, A♭, B, B♭, G contains a nesting of {A♭, B♭, C} – a member of (024) – within the pitch-classes forming {G, B, D}. This nested (024) structure is flanked by {G, A, B, D} and {G, B, D}, related sets that further promote the sonority and salience of ic4. Again, a frequently used technique appears here, whereby the last note of the first phrase (C♯) becomes a member of the next set introduced {A, B, C♯}. This type of temporal fragmentation is a crucial structural feature of this section, with an (04) dyad {E, A♭} connecting across the end of staves two to three, and staves three to four. While in these instances the disjunct element {E, A♭} is followed by {G, B}, in stave four {E, G♯} and {G, B} are finally joined together as one complete melodic figure.

As a related development to the disjunct dyad {E, A♭}, A♭ is emphasised centrically in four phrases (see numbering in Example 6.10a starting in stave two), whereby phrases 1, 2, and 3 each end on pitch-class A♭, while phrase 4 continues briefly after the A♭ entry. Within this sequence, the referential set {A♭, B♭, C} becomes chromatically altered (see Figure 6.9 below). An evolving {A♭, B♭, C} transformation is seen where subset {B♭, C} maps to {G, A} at T_9; (A♭, B♭, C} maps to {G♭, B♭, A♭} at T_{10}; and A♭ and C common-tones are retained between {A♭, B♭, C} and {A♭, B, C}. Additionally, in stave three {A♭, B♭, B} appears as a contraction of the referential set {A♭, B♭, C} and is similarly conjoined (as in phrase 1) with {E♭, G, B♭}, before ending with {G♭, A♭, B♭}. Overall, this section is generated as a series of variations developed from the initial melodic gesture in stave two – E♭, G, B♭, D, B♭, C, A♭.

Figure 6.9 'Saturn': A♭ centricity and (024) transformation in four phrases (08:01)



As a result of the ic4 saturation, the A♭ centricity, and tonal properties inherent to (04), (024), (047), and (035), the melodic lines in this section appear as though chord changes guide the improvisation. A reference to the tonal harmonic functions of VI^7 II– ♭II^7occurs in stave one of Figure 6.10 below. The implied chord sequence B^7, E–, E♭^{7} is temporally displaced from the A♭ cadence that occurs in stave two, with two melodic gestures suggesting a modified V to I cadence from E♭ to A♭. At the end of this section, the major-third related keys C, A♭, and E major emerge, with E minor functioning as a III – substitution for C major and pitch-classes B and G♯ rhythmically displacing E major (Figure 6.11). The superset Hex_{23} results from the overall pitch structure with only the chromatic approach B♭ interrupting its continuity. A projection of the major sonorities G, D, and F completes this section with a truncated E♭ major enveloped within a broader allusion to the chord F^7.

Figure 6.10 ‘Saturn’: Tonal harmonic reference suggesting cadences to A♭ (07:59)

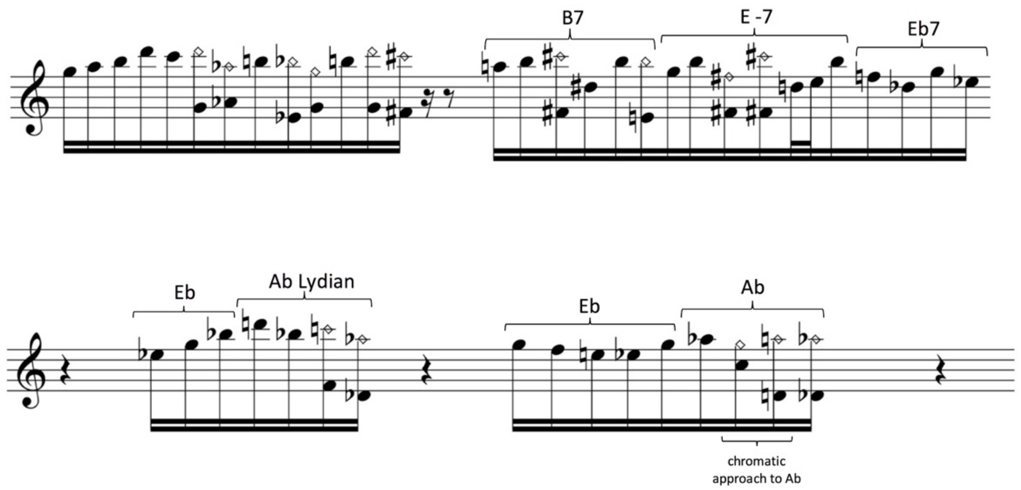
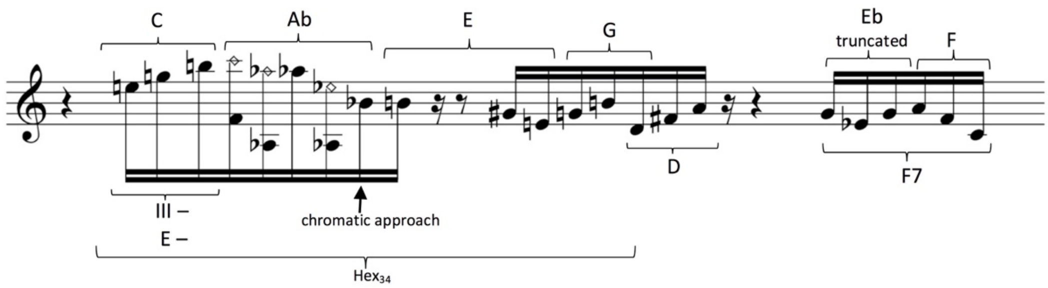


Figure 6.11 ‘Saturn’: C4-related tonal references and major sonorities (08:05)



The textural richness and harmonic complexity expressed in this section communicates an evolving idea synthesising sound and pitch structure. The significance of the major-third interval (ic4) saturates this section on three levels: in the recurring (04) dyad and its trichordal expansion; in the allusion to major sonorities and functional harmony; and in the reference to C4-related tonal centres. The emergence of WT_1 and WT_0 also further conveys the resonance of (04). In turn, the resonance of ic4 indicates a larger issue: that of dyadic constancy and harmonic cohesion across diverse melodic structures. The projection of salient interval-classes through heterogeneous trichordal T_n-types becomes a central property of the pitch structure in the following sections.

TRICHORD INTEGRATION AND INTERVAL PROJECTION 08:07–09:09

Between 08:07 and 09:09, the dyads (04), (05), and (02) emerge as principal structures, projecting harmonic coherence through supersets (047), (037), (035), (025), and (024). Additionally, (04), (035), and (024) are each briefly emphasised as salient structures in consecutive T_n-related pc-set formations. At 08:07, the trichord {F, A, C}, produced by consecutive interval-classes 4 and 5, functions as a pivot between the previous focus on (04), and the new emergence of (05) and (02) (Example 6.11a). An ic5 salience is projected across {F, A, C}, {C, D, F}, {B, D♭, E}, {B♭, D♭, E♭} by means of the series of (05) subsets: {C, F}, {G, C}, {C, F}, {B, E}, {B♭, E♭}. A descending chromatic voice-leading motion plays out here with dyads {C, F}, {B, E}, and {B♭, E♭}. The emergence of {B♭, D♭, E♭} synthesises the interval content (ic2 and ic5) of the consecutive dyads {B, E} and {D♭, E♭} into one pc-set. This (02) subset {D♭, E♭} is used as a lower common-tone anchor for sets {B♭, D♭, E♭}, {B, D♭, E♭}, and {C, D♭, E♭} until (035) returns with {B♭, D♭, E♭}. Within this sequence of trichords, the ascending upper melodic contour – B♭, B, C – reflects (in retrograde) the zero integers of the previous descending chromatic (05) dyads {C, F}, {B, E}, {B♭, E♭}.

During the brief salience of (035), {B♭, D♭, E♭} is used referentially, juxtaposed four times with {G, B♭, C} and then nested within statements of {E, G, A}. In staves three and four of Example 6.11a, the collected pc-sets – {C, D♭, E♭}, {B♭, D♭, E♭}, {G, B♭, C}, {E, G, A} – reveal superset Oct_{01}. This employment of {035} members as subsets of the octatonic scale is a unique development, not found in other utterances of (035) and so connotes a new engagement with subset and superset relationships. C minor pentatonic also briefly emerges as a superset for the repeated T_5/T_7-related sets {C, E♭, F} and {G, B♭, C}. However, the rotational contour of these pc-sets is distinct from other instances of (035) where pentatonic supersets are formed. Significantly, throughout this section, the contour of (035) duplicates the (013) N1b motive of 'Iris' (Chapter 4.1). The use of this contour marks a development in Coltrane's handling of (035), contrasting with its earlier use in 'Acknowledgment', and other loci within *Stellar Regions* and *Interstellar Space*. Additionally, it proves that the N1b contour is not an exclusive feature of 'Iris' with (013), but that the rotational and contour manipulation of pc-sets exists as a fundamental technique for a broad range of T_n-types.

In stave two of Example 6.11b, ic2 is projected in a contraction from (035) to (013), with the dyad {B♭, C} retained between {G, B♭, C} and {A, B♭, C}. Immediately following, the dyads {C, F} and {G, C} are projected as reflections of the (05) subsets that appeared within the previously stated sets {C, E♭, F} and {G, B♭, C}. As (024) begins to emerge, the intervallic focus shifts from ic5 to ic4 in a contraction from {G, C} to {G, B}, with G retained between these dyads. Projecting ic4, the pc-set members of (024) and (047) precede the emergence of (04) as an autonomous structure at 08:40. Upon the occurrence of (024), the sequence of trichords {G, A, B}, {D, E, F♯}, {D♭, E♭, F}, {A♭, B♭, C} exhibits a unique structural relationship within *Stellar Regions* and *Interstellar Space*. Significantly, a twelve-tone aggregate is formed from these four pc-sets. Dyads {A♭, B♭} and {D♭, E♭} are interjected as fragments of {A♭, B♭, C} and {D♭, E♭, F}: a strategy that delays a complete statement of the final pc-set in the series {A♭, B♭, C} (Figure 6.12 below). The appearance of pitch-class D within {G, A, B} anticipates the entrance of {D, E, F♯}. Furthermore, within this twelve-tone series, the transpositional combination of T_7-related sets {G, A, B}–{D, E, F♯} and {D♭, E♭, F}–{A♭, B♭, C} produces two (024579) constructs, providing another example of this hexachord's pervasiveness in Coltrane's music (earlier in 'Saturn', {F♯, G♯, A♯} and {B, C♯, D♯} formed

(024579), with other intersections of (024) and (024579) discussed in Chapters 4.3 and 5.2). Lastly, this same pc-set formation is found in Slonimsky's *Thesaurus* as Exercise #1293, so establishing a third connection between Coltrane's improvisational approach in 'Saturn' and the *Thesaurus* (Figure 6.13). (Issues related to Coltrane and twelve-tone music are discussed in Chapter 2.3.) This parallel to the *Thesaurus* is unique within *Interstellar Space* because no cyclical processes are present here, whereas in other instances interval-cycles appear as transpositional operations for pc-sets.

Figure 6.12 'Saturn': Twelve-tone aggregate derived from (024) (08:27)

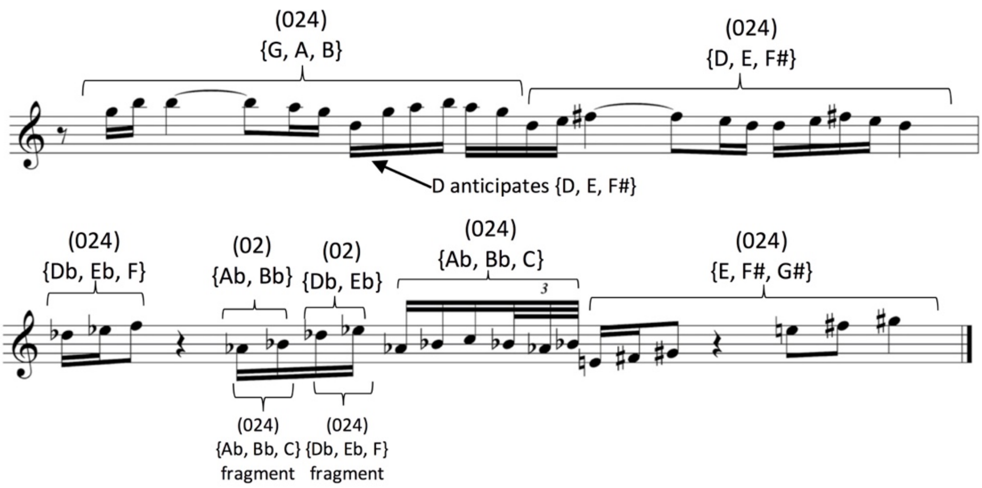
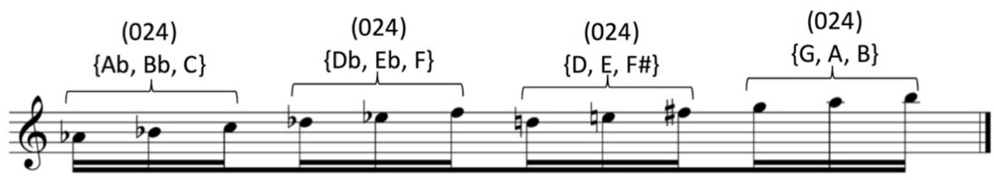


Figure 6.13 Slonimsky, *Thesaurus*: Exercise #1293 (transposed excerpt)



Following the twelve-tone series, the dyads {E, G♯}, {C, E}, {E, G♯}, {B♭, D} and {F, A} continue to project ic4 by means of a sequence of (024) and (047) trichords found in staves four and five of Example 6.11b. The interval content of (047) – ic3, ic5, ic4 – is projected in the dyad sequence {E, G}, {D, G}, {D, F♯}, thus demonstrating how interval content is the unifying force connecting large-scale and small-scale pc-set structure. The entrance of {D, F♯} initiates the salience of (04) as an autonomous structure. A sequence of twenty-two (04) dyads appears, utilising segments of $C3_0$, C1, Hex_{23}, and $C2_1$ as transpositional operations (Example 6.11b and c).[86] Dyads are frequently used as pivots between interval-cycles, mirroring (025) transpositional patterns appearing earlier in 'Saturn' (Example 6.7). Within the C1 segment, set {C, E} is omitted from the descending transpositional pattern. As the (04) salience ends, the upper melodic contour of dyads {G, B} and {F, A}, formed by pitch-classes B and A, is integrated as members of the trichord {F♯, A, B}.

The transition from (04) to (035) shown in Example 6.11c utilises two structural components for harmonic cohesion: an ic2 voice-leading as an intervallic constituent of (035); and the synthesis of pitch-classes B and A as members of {F♯, A, B}. A sequence of descending chromatic (03) dyads – {F♯, A}, {F, A♭}, {E, G} – then ensues from a fragmentation of {F♯, A, B}. This short (03) series echoes the previous chain of (04) motives. The trichord {C♯, E, F♯} is generated from the structural components it shares with {E, G} – ic3 and pitch-class G. Its emergence marks the beginning of a new section with a structural focus on ic2 and tetrachordal supersets. The recurring presence of (035), as an autonomous structure projecting interval salience (08:09), and as a subset of (0257) (09:09; Example 6.12a), demonstrates an overall continuity in the harmonic development. While the rapidly changing salience of (035), (024), and (04) is integrated through a projection of their interval

[86] Bair notes the presence of this C3-cycle isolated from its interaction with C1, Hex_{23}, and $C2_1$ (2003, p.77).

content, the ongoing integration of heterogeneous T_n-types gains another layer of complexity with the appearance of tetrachordal supersets at 09:09.

6.3 DYAD ANCHORS AND TRICHORDAL SUBSETS OF (0257)

Coltrane's improvisation between 09:09 and 09:32 (Examples 6.12a, b and c) projects ic2 through varied structural layers encompassing (02) dyads, a prolonged WT_0 and WT_1 voice-leading, and the (035), (025), (027), and (0257) supersets. Initially, the (0257) supersets are hidden by the temporal displacement of their trichordal subsets. This appearance of (035), (025), and (027) as subsets of (0257) parallels the 'Saturn' theme structure, and the 'Seraphic Light' and 'Sun Star' themes examined in Chapter 5. The projection of (02) dyads as low-register anchors saturates this section. Additionally, (02) appears in the upper melodic contour, either as explicit dyads, or as prolonged through several pc-sets. The appearance of (024) in repeated juxtaposition with (035) represents the only digression from (0257) and its subsets during this section. Significantly, as a synthesis of two (02) dyads at T_2, (024) expresses harmonic unity with the other pc-set structures in this section and with the overall salience of ic2. Examples 6.12a, b, and c illustrate the structural layers between 09:09-09:32 in three staves: trichordal and tetrachordal pc-sets (stave one); (02) dyad saturation (stave two); and prolonged WT_0 and WT_1 voice-leading (stave three). In staves two and three octave reductions of the pitch content serve to clarify the structural relationships.

In Example 6.12a, a sequence of seven tetrachords – {B, C♯, E, F♯}, {G, A, C, D}, {F, G, B♭, C}, {E♭, F, A♭, B♭}, {B♭, C, E♭, F}, {A♭, B♭, D♭, E♭}, {B♭, C, E♭, F} – function as background supersets for the dyads and trichords that appear. Initially, within this pattern, the subsets of {B, C♯, E, F♯} and {G, A, C, D} are temporally displaced, alternating in succession until {G, A, C, D} clearly emerges (Example 6.12a). The appearance of the trichord {G, B♭, C}, nested twice within three statements of {G, A, C, D}, anticipates the emergence of {F, G, B♭, C}. A trichordal sequence {G, B♭, C}, {E♭, F, B♭}, {F, A♭, B♭} then forms overlapping tetrachords {F, G, B♭, C} and {E♭, F, A♭, B♭} (Example 6.12b). In the only divergence from subsets of (0257), {F, A♭, B♭} is repeatedly juxtaposed with {G♭, A♭, B♭}, a member of (024), using {A♭, B♭} as a low-register common-tone pivot between pc-sets. The previous focus on an ic2 voice-leading in the upper register shifts here to ic1 in the prolonged motion from F to G♭. Meanwhile, the introduction of {E♭, F, B♭} signals a return to (0257) and its subsets. The pc-set sequence {E♭, F, B♭}, {C, E♭, F}, {B♭, D♭, E♭}, {A♭, B♭, D♭}, {E♭, F, B♭}, {C, E♭, F} appears as the (027), (035), and (025) subsets of {B♭, C, E♭, F}, {A♭, B♭, D♭, E♭}, and {B♭, C, E♭, F} (Example 6.12c). This tetrachord sequence clearly displays multiple pc-set layers, with background (0257) supersets; (027), (035), and (025) as trichordal motives; low-register (02) common-tone anchors; and a prolonged ic2 voice-leading in the upper register.

The T_5-related (02) subsets of (0257) that saturate this section are juxtaposed in two registers (illustrated across stave two of Examples 6.12a, b, and c), creating a prolonged WT_1 and WT_0 voice-leading motion that spans the entire section between 09:09 and 09:32 (Figure 6.14 below). At its midway point of this section, the appearance of G♭ in the upper register completes the lower-register WT_0 voice-leading progression.

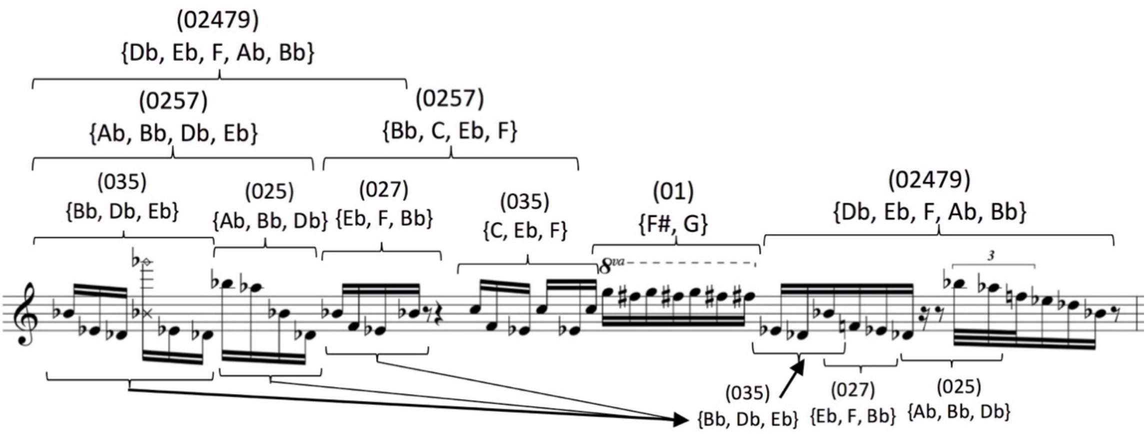
Figure 6.14 'Saturn': WT_0 and WT_1 voice-leading in two registers (09:09–09:32).

During this section intensity builds as Coltrane manipulates his sound, producing harmonics achieved through a combination of overblowing notes, changing throat shape, and alternative fingerings. Significantly, a squeak that occurs at 09:30 develops into an *altissimo* dyad {F♯, G}, juxtaposed by descending pentatonic scales. This new structural design marks the end of the focus on (0257) and its subsets. The emergent, organic nature of Coltrane's improvisation is exemplified by the squeak's development into the *altissimo* motive, signifying the heightened state of the moment that improvisers experience as they respond, not only to musical events instigated by other band members, but also to events created by themselves.

6.4 PENTATONICS, PC-SET HETEROGENEITY, AND VOICE-LEADING

The music from 9:32 to 10:15 increases in intensity as a precursor to the dramatic climax of 'Saturn'. Two major features characterise it: the integration of heterogeneous trichordal T_n-types that project shared interval content; and the emergence of pentatonic supersets. Significantly, ic2 continues to project its salience through (02) low-register anchors, through voice-leading, and as an intervallic component of the pc-sets that appear. While the emergence of the *altissimo* dyad {F♯, G} and {D♭, E♭, F, A♭, B♭} seemingly marks a new focus at 09:32, these constructs are inherently connected to the pc-set structure of the preceding section. The transition to 09:32 begins at 09:29 where three, consecutive trichordal subsets of {A♭, B♭, D♭, E♭} and {B♭, C, E♭, F} combine to form a pentatonic {D♭, E♭, F, A♭, B♭}. The trichords {B♭, D♭, E♭}–{A♭, B♭, D♭}–{E♭, F, B♭} are reordered as {B♭, D♭, E♭}–{E♭, F, B♭}–{A♭, B♭, D♭} and integrated within the emergence of {D♭, E♭, F, A♭, B♭} (Figure 6.15 below). Furthermore, {F♯, G} promotes the structural continuity of (01) established in the previous voice-leading {F, G♭}; the resonance of (01) appears notably as an upper-register anchor for pc-sets in the following analyses.

Figure 6.15 ‘Saturn’: Trichordal synthesis forming (02479) (09:29)



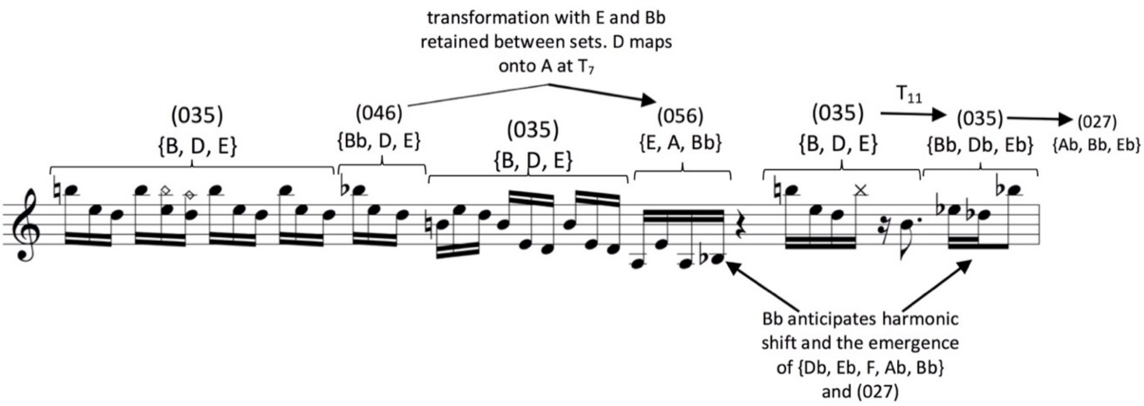
A striking feature of this section is the harmonic symmetry forged by the pitch content at its beginning and end. Pentatonic sets {D♭, E♭, F, A♭, B♭} and {G♭, A♭, B♭, D♭, E♭} appear at both 09:32 (in juxtaposition with the *altissimo* {F♯, G}), and at 10:13 (integrated within hexachords {A♭, B♭, C, D♭, E♭, F} and {G♭, A♭, B♭, C♭, D♭, E♭}). Additionally, a third middle pentatonic section comprising consecutive (027) sets forms the overlapping sequence: {A♭, B♭, C, E♭, F}, {D♭, E♭, F, A♭, B♭}, {G, A, B, D, E}, {A, B, C♯, E, F♯}, {D♭, E♭, F, A♭, B♭}, {E, F♯, G♯, B, C♯}, {G♭, A♭, B♭ D♭, E♭}. This sequence is flanked on either side by chains of assorted trichordal T_n-types, utilising (02) anchors, common-tone pivots, and chromatic voice-leading.

In Example 6.13a, the initial melodic contour of {D♭, E♭, F, A♭, B♭} and {G♭, A♭, B♭, D♭, E♭} resembles the rapid descending (024579) constructs that saturate *Interstellar Space*, foreshadowing the emergence of these descending hexachords at the climax of 'Saturn' (the structural characteristics of (024579) were previously examined in Chapter 4.3). Pitch-class B♭ is used as an upper common-tone anchor for these two pc-sets. As a subset of the pentatonic {D♭, E♭, F, A♭, B♭}, tetrachord {B♭, D♭, E♭, F} precedes the entrance of {G, A, B, D, E} which establishes B as a new upper-register anchor. The chromatic, upper-registral voice-leading from B♭ to B is synthesised in the emergence of the dyad {B♭, B}; related at T_4 to {F♯, G} in the *altissimo*, and projecting a structural continuity of (01) that originated in the previous section. The succeeding phrases continue this juxtaposition of B♭ and B as upper anchors for a variety of pc-sets, creating an antecedent–consequent dialogue that becomes less pronounced over time as other more prominent structures emerge.

TRICHORD AND DYAD SYNTHESIS

The heterogeneous trichord sequence generated at 09:38 – {B D, E}, {E, F♯, B}, {E, F♯, B♭}, {E, F♯, B}, {E, F♯, B♭}, {B, D, E}, {B♭, D, E}, {B, D, E} – clearly illustrates how trichordal salience evolves without ever being fixed on one single T_n-type (see again Example 6.13a). As a subset generated from {G, A, B, D, E}, the contour of {B, D, E} mimics the descending contour B, G, E, D, contained in its pentatonic superset. The prolonged pitch-classes B and B♭ function as upper-register anchors, juxtaposed against shifting low-register (02) dyads {D, E} and {E, F♯}. This structural formula, utilising upper and lower anchors {B♭, B}, {D, E}, and {E, F♯}, is synthesised into T_n-types (035), (027), (046), and (026) within a repeated descending contour (Example 6.13a). In the transition to (027) salience, {E, A, B♭} appears as a transformation of {B♭, D, E} within the set pattern: {B, D, E}, {B♭, D, E}, {B, D, E}, {E, A, B♭}, {B, D, E}, {B♭, D♭, E♭}. Pitch-classes B♭ and E are retained between {B♭, D, E} and {E, A, B♭} with D mapping onto A at T_7 (Figure 6.16 below).

Figure 6.16 'Saturn': Transition to (027) salience (09:40)



Additionally, these latter two pc-sets appear nested within statements of {B, D, E}, with pitch-class B♭ of {E, A, B♭} anticipating the harmonic shift that occurs in the T_{11} movement from {B, D, E} to {B♭, D♭, E♭}, and the forthcoming emergence of {D♭, E♭, F, A♭, B♭}.

(027) AND P4/P5 SEQUENCES

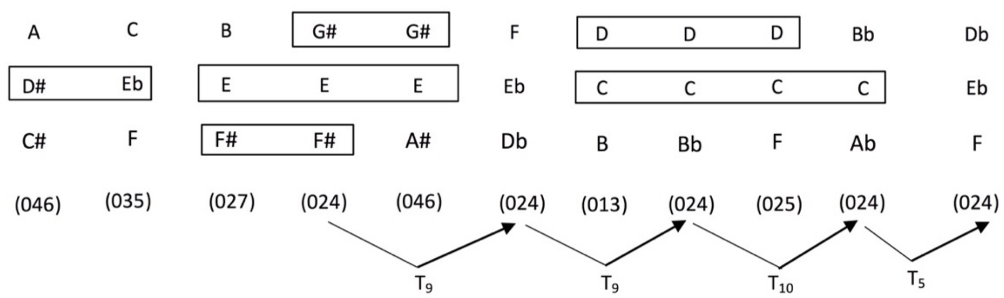
Following the emergence of {B♭, D♭, E♭} – which is synthesised within overlapping pentatonic supersets {D♭, E♭, F, A♭, B♭} and {A♭, B♭, C, E♭, F} – multiple structural layers appear comprising consecutive and overlapping members of (027), pentatonic supersets, P4/P5 sequences, and ic2 voice-leading (Example 6.13b). Here, (027) salience emerges in a progression of thirteen pc-sets that function equally as subsets of six pentatonic supersets. Significantly, within these pentatonic and trichordal layers, P4/P5 (ic5) sequences project towards, and away from three referential anchors: D♭/C♯, A, and A♭/G♯. Examples 6.13b and c illustrate these referential anchors in eight, numbered sequences. Pitch-class G, as the only structural anomaly within these layers, appears within {D♭, E♭, F, A♭, B♭} and alludes to the 6th scalic degree of the transient harmonic region B♭ minor. Although the presence of (027) and pentatonic supersets resemble the pitch structure previously examined at 07:14, the rapidly changing pc-sets, and the extensive P4/P5 sequences create more harmonic instability than in the previous section.

The ongoing voice-leading motion around B♭ and B is subsumed within the emergence of prolonged WT_0 and WT_1 movements (Example 6.13b). Additionally, the prolonged ic2 voice-leading is reflected in the projection of (02) dyads {D♭, E♭}, {A♭, B♭}, {F, G}, {E♭, F}, {E, F♯}, {B, C♯}, and {F♯, G♯} nested within the other structural layers (Example 6.13c). In a shift away from pentatonic supersets and (027), an ic2 resonance is manifested as low-register (02) anchors for the emerging trichords. Two distinct prolonged voice-leading lines appear which generally express the contour of the upper and lower-registers (Examples 6.13d, e, and f).

As Coltrane's music is seen to return to integrating a wider variety of trichordal T_n-types, two interval-classes have a significant impact upon the structural development: ic2, as both a low-register (02) anchor, and a structural component of the pc-sets that appear; and ic4, which is gradually revealed and then synthesised with ic2 to form (046), (024) and superset (024579). Example 6.13d illustrates the re-emergence of heterogeneous trichordal pc-sets saturated with low-register (02) dyads. In this transition from (027) salience, {B, D♭, F} appears as a (026) compression of the previous set {B, C♯, F♯}, retaining two pitch-classes. Consecutive trichords {G♭, B♭, D♭} and {D♭, E♭, A♭} form the superset {G♭, A♭, B♭, D♭, E♭}, so ending the pentatonic saturation. Significantly, {G♭, B♭, D♭} and {D♭, E♭, A♭} influence the evolving pitch structure in the following two ways: (1) the ascending contour of {D♭, E♭, A♭} and its subset {D♭, E♭} are developed into a complex series of ascending trichords with low-register (02) dyads; (2) the pc-set {G♭, B♭, D♭} introduces ic4 as a structural element, prompting its projection initially through tetrachords {A♭, B, C, D}, {A♭, B♭, C, D}, {C, D, E, G}, and later in the emergence of (024).

Still in Example 6.13d, the (02) dyad sequence {D♭, E♭}, {C, D}, {A♭, B♭}, {C, D}, {E, F♯}, {E♭, F} emerges as as a series of low-register anchors for pc-sets {D♭ E, A♭}, {B, C, D}, {A♭, B♭, C, D}, {C, D, E, G}, {E, F♯, B}, {E♭, F, B♭} (Example 6.13d). The tetrachordal sequence that follows {A♭, B, C, D}, which is formed by pitch-class A♭ in combination with {B, C, D}, demonstrates the progressive development of this pitch structure. In the movement from {A♭, B, C, D} to {A♭, B♭, C, D}, pitch-class B is mapped to B♭ at T_{11}, with the consecutive (02) dyads {A♭, B♭} and {C, D} that form superset {A♭, B♭, C, D} then followed by an intervallic expansion from (0246) to (0247) and its subset (027). This complex pc-set sequence can alternatively be interpreted as lower-register (02) anchors juxtaposed against the chromatic voice-leading B♭–B–B♭ and A♭–G–F♯. As a result of this (02) saturation, WT_0 is formed from the low-register dyads {C, D}, {A♭, B♭}, {C, D}, {E, F♯}. With the emergence of {A, C♯, D♯}, ic4 begins to occur more frequently as a component of the trichord structure. An expansion from {A, C, D} to {A, C♯, D♯} retains A in the upper-register, whilst the lower-register subset {C, D} moves chromatically to {C♯, D♯}. As (02) continues to be used as a lower-register anchor, common-tone pivots connect disparate trichordal T_n-types (Example 6.13e). Figure 6.17 below illustrates the common-tone connections between six alternating T_n-types and the gradual emergence of (024).

Figure 6.17 ‘Saturn’: Common-tone pivots and the emergence of (024) (10:01)

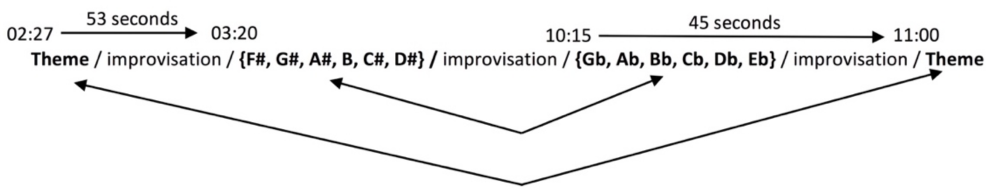


With the arrival of two contiguous sets {A♭, B♭, C} and {D♭, E♭, F}, the pitch structure again displays strong subset and superset relationships. Although the motivic characters of {A♭, B♭, C} and {D♭, E♭, F} individuate them from each other, collectively they form the hexachord {A♭, B♭, C, D♭, E♭, F}. Significantly, as a subset of {A♭, B♭, C, D♭, E♭, F}, a pentatonic {D♭, E♭, F, A♭, B♭} emerges within the melodic development: this appearance of {D♭, E♭, F, A♭, B♭} completes the large-scale harmonic symmetry of this section, mirroring its initial introduction at 09:32.

(024579) 10:15

The emergence of {A♭, B♭, C, D♭, E♭, F}, comprising consecutive (024) and (027) sets {A♭, B♭, C}, {D♭, E♭, F}, and {A♭, B♭, E♭}, {D♭, E♭, A♭}, focuses the harmonic development upon (024579) and instigates the entrance of {G♭, A♭, B♭, C♭, D♭, E♭} as a rapid descending figure (see again Example 6.13f). This hexachord is repeated and fragmented, building in intensity and abstraction as Coltrane’s focus gradually shifts, ascending higher and higher while manipulating the saxophone’s timbre and harmonics. The appearance of {G♭, A♭, B♭, C♭, D♭, E♭} is structurally significant because it duplicates the pitch structure present at the beginning of ‘Saturn’, where the construct {F♯, G♯, A♯, B, C♯, D♯} emerges as a result of the transpositional combination of (024) sets {F♯, G♯, A♯} and {B, C♯, D♯} (see Chapter 6.1). As subsets of C♯ minor Dorian, these two pc-sets affirm the tonality of the theme. An appearance of the enharmonic set {G♭, A♭, B♭, C♭, D♭, E♭} at 10:15 similarly signals the forthcoming statement of the ending theme and the return to C♯ minor. A large-scale symmetrical pattern is formed by this hexachord to theme relationship, with the introduction of {F♯, G♯, A♯, B, C♯, D♯} and {G♭, A♭, B♭, C♭, D♭, E♭} virtually equidistant symmetrically from the thematic statements (Figure 6.18) – a remarkable formation for improvised music. After the climax, the music quickly settles as the 'Saturn' theme is stated for the final time, with the omission of the bridge and closing 'A' section.

Figure 6.18 'Saturn': Large-scale harmonic symmetry



SUMMARY

'Saturn' is remarkable because it displays a structural integrity usually regarded as inhabiting the domain of composition. A persistent logic is seen to unfold as Coltrane moves from one idea to another, revealing an improvisational structure that continually develops its pitch and intervallic properties, and refuting the notion that so-called 'free jazz' is disorganised or chaotic. The intervallic structure traces a coherent path as salience shifts between dyad, tetrachord, pentachord, and hexachord layers within an extensive recurrent concentration upon trichord formations. 'Saturn' not only demonstrates Coltrane's consummate skill in developing an improvisation around individual trichordal T_n-types as referential structures, but also in constructing an improvisation from multiple trichordal T_n-

types which are integrated through common-tone pivots, interval content, chromatic voice-leading, and (02) anchors. The interplay of subset and superset relationships within 'Saturn' indicates a deep understanding of the melodic potential of each T_n-types and of their relationships to larger collections, twelve-tone aggregates, and tonal harmony. Musical parallels to texts by Slonimsky and Messiaen, represented by a variety of cyclical patterns and symmetric constructions, highlight intertextuality and, undeniably, a measure of 'influence' upon Coltrane. However, most importantly, they serve to demonstrate Coltrane's keen theoretical mind and advanced interest in pitch structures that extend well beyond functional harmony. While the other pieces of *Interstellar Space* and *Stellar Regions* are remarkable in a variety of ways, none display the trichordal abundance of 'Saturn'. This overlooked masterpiece should be considered as the culmination and most potent expression of an improvisational language that permeates Coltrane's late-period music.

PART III –

CONCLUSIONS

CHAPTER 7: CONCLUSIONS: STRUCTURE, COMPLEXITY AND ORGANISATION

7.1 SUMMARY AND DISCUSSION OF ANALYTICAL FINDINGS

The main research question of this dissertation was posed early in the Introduction (section 1.1): To what extent do Coltrane's performances on *Stellar Regions* and *Interstellar Space*, widely regarded merely as free improvisations, contain evidence of structural rigour and pitch organisation? In response, we may now conclude that the analyses in Part II present overwhelming evidence that Coltrane's improvisations are, in fact, highly organised and rigorously structured around pc-set formations – signified by the (013) saturation in 'Iris'. Crucially, 'Iris' establishes a theoretical precedent for interpreting other similar structures within *Stellar Regions* and *Interstellar Space*, revealing a wide-ranging approach that exploits interval relationships and pc-sets in a manner more typically seen in twentieth-century post-tonal music. The 'motivic development' so frequently cited as a characteristic of Coltrane's late period is shown to be a part of a holistic approach that encompasses both tonality and atonality within an inclusive modality. I argue that the structural rigour evidenced proves that Coltrane's music has been wrongly mischaracterised as chaotic and undisciplined. Furthermore, the analyses demonstrate that the detailed organisation of Coltrane's music, as constantly evolving states of unity, transformation, and interaction, serves to refute wider, persistent misconceptions about 'free jazz' and improvised music.

In terms of the subquestion probing the relations between the collections, while numerous structural parallels exist between *Interstellar Space* and *Stellar Regions*, including the evolving approaches to 'Stellar Regions' and 'Venus', there is equally an intensifying of the pc-set saturation within *Interstellar Space* that is unique in Coltrane's recorded works. The integration of rapidly descending (024579) lines within every track of *Interstellar Space* contrasts with *Stellar Regions* where the phenomenon only fully emerges in ‘Offering’. This facet potentially indicates the ongoing development of (024579) across both recordings. The closeness of the recording dates (15 and 22 February 1967) enables such structural observations and demonstrates the advantage of comparing these recordings in depth. And in turn, all of this reveals, where Coltrane is concerned, an exceptional conceptual approach.

My analyses have shown that the relationship between Coltrane’s compositions and improvisations is not always clear, even though his compositional themes typically exhibit the same type of structural logic and sensibilities as his improvisations. While some pieces display a tenuous structural relationship between theme and improvisation, others fully integrate composition and improvisation – so obscuring their boundaries to a point where there is no perceptible difference (as with ‘Iris’). However, to complicate matters further, Coltrane’s themes often reference major and minor tonalities, while his improvisations are constructed through methods that function independently from tonal constraints, focusing instead on developing the melodic line and its pitch and interval structure. Certainly, the analyses have demonstrated that the complexities of this music warrant considerations beyond the confines of tonal and modal frameworks that still typify existing scholarship. Coltrane’s synthesis of composition and improvisation represents the development of a concept where tonality and chromaticism are subsumed within a comprehensive approach that encompasses both domains.

Apropos the role of Coltrane's earlier recordings, 'Selflessness' (1969), 'Suite: Prayer and Meditation (Day)' (1970b), and 'Acknowledgement' (1965) have been shown to contain nascent, analogous structures to those within *Interstellar Space* and *Stellar Regions*, revealing Coltrane's musical conception at various stages of evolution and so repudiating claims of an artistic schism between his earlier and later music. Through the juxtaposition and comparison of different improvisations and different recording sessions, an underlying constructive method is revealed centred on pc-sets, with aligned practices employed by Coltrane for their development.

Additionally, parallels to the major-third cycles widely known as 'Coltrane changes' appear frequently within *Interstellar Space*, thus establishing a link to Coltrane's earlier music rooted in functional harmony and song forms. While existing scholarship has observed intertextualities between 'Acknowledgement', 'Offering', 'Iris', and 'Mars', analysis here has shown that the structures involved – (027) and (013) – are pervasive features of a more expansive improvisational language and that this distinctive aspect of Coltrane's 'sound' results from his overall approach to pitch structure.

Finally, although predominantly speculative, numerous connections between Coltrane's musical education, extra-musical interests (detailed in Chapter 2), and the musical artefacts in *Interstellar Space* and *Stellar Regions* (Chapters 4–6) certainly serve to establish the music's capacity to represent his eclecticism and varied multicultural and interdisciplinary issues, with the added dimension that pitch structure could well have been employed symbolically. This is exemplified by the structural correlations visible (and sometimes audible) between Coltrane's music and Kepler's astronomical theories, the musical constructs of Slonimsky and Messiaen, twelve-tone aggregation (see too below), and Sandole's pedagogy.

7.1.1 EVALUATION OF PC-SET AND T_n-TYPE USAGE

As a further response to the main question about structural rigour and the closely associated sub-question about melodic/linear pitch devices, it can be concluded that Coltrane's approach to pitch structure, working with what we identify as pc-sets, frequently exhibits two general characteristics: one where the surface texture is built up from sequences of smaller sets; and another where the surface texture results from the division of a superset into subsets. The boundary between these approaches is not clearly defined, with the musical structures intersecting and shifting focus between dyad, trichord, tetrachord, pentachord, and hexachord layers, while individual T_n-types often emerge referentially. While Coltrane's improvisations are frequently centred on trichordal and hexachordal determinacy (where one T_n-type is used as a salient feature), the pitch structure also evolves in a way such that diverse trichordal T_n-types emerge as a result of transformative processes. This process occurs through: set expansions and contractions; set fragmentation, set truncation; common-tone transformations; and the use of added pitch-classes to established set formations so as to generate new trichordal salience. Numerous other processes appear within this pc-set development, such as:

- The referential pairing of one trichord with contrasting set transpositions and T_n-types.
- The use of transposition as a transformative operation.
- The use of interval-cycles (and their segments) as transpositional operations.

- The use of common-tone pivots between pc-sets.
- The use of ordered and unordered pc-sets.
- The manipulation of superset and subset relationships.
- An engagement with diatonicism and pentatony that maintains a connection to the blues within a framework embracing pc-sets.
- The registral partitioning of pc-sets.
- A spontaneous improvisational approach that encourages the emergence of new structural elements.

Additionally, Coltrane's improvisations contain symmetrical configurations (and a twelve-tone aggregate in 'Saturn') correlating to structures in works by Slonimsky, Messiaen, Sandole, Schillinger, and Hodeir – theoretical resources of which Coltrane had knowledge.

Eight trichordal T_n-types appear as referential structures within *Interstellar Space* and *Stellar Regions* – (013), (023), (024), (025), (035), (026), (046), (027) – with the hexachord (024579) construct being the most frequent T_n-type occurring across both recordings (see Figure 7.1). Furthermore, the major-third related members of the diatonic collection (as major scales and tonal centres) are the primary means that inform the pitch structure of 'Stellar Regions' and 'Venus', with major-third cycles also emerging for significant spans in 'Mars' and 'Leo'. The motivic contours of the pc-sets establish a variety of rotational permutations, with scale-like formations sometimes appearing when trichords are arpeggiated across several octaves. Where heterogeneous pc-sets appear, structural cohesion often results from the projection of referential pitch-classes and interval classes through the set formations. The regular presence of (02) dyads as common-tone anchors for connecting various pc-sets represents the ic2 saturation that encompasses all the referential T_n-types appearing in Coltrane's improvisations (as shown in Figure 7.2).

Figure 7.1 Emergence of referential T_n-types and major-third cycles

'Seraphic Light'		(023)			(035)			(027)	
'Sun Star' alt tk		(023)							
'Sun Star'		(023)	(024)						
'Stellar Regions' alt tk		*Major-third cycles*							(024579)
'Stellar Regions'		*Major-third cycles*							(024579)
'Iris'	(013)								
'Offering'								(027)	(024579)
'Configuration'			(024)			(026)	(046)		(024579)
'Tranesonic'								(027)	
'Mars'	(013)	*Major-third cycles*					(046)	(027)	(024579)
'Leo'			(024)	*Major-third cycles*		(026)	(046)		(024579)
'Venus'		*Major-third cycles*							(024579)
'Jupiter Variation'		(023)						(027)	(024579)
'Jupiter'		(023)							(024579)
'Saturn'	(013)		(024)	(025)	(035)			(027)	(024579)

Figure 7.2 Interval-class content of referential T_n-types

T_n-type	ic1	ic2	ic3	ic4	ic5	ic6
(013)	1	1	1			
(023)	1	1	1			
(024)		2		1		
(025)		1	1		1	
(035)		1	1		1	
(026)		1		1		1
(046)		1		1		1
(027)		1			2	
(0257)		2	1		3	
(0247)		2	1	1	2	
(0357)		2	1	1	2	
(02479)		3	2	1	4	
(024579)	1	4	3	2	5	
(02468T)		6		6		3
(013568T)	2	5	4	3	6	1

7.2 CRITICAL REFLECTION ON ANALYTICAL METHODOLOGY

In answer to the subquestion about suitable analytical methods, while Coltrane's improvisations are inherently well suited for set-theoretic analysis, no single analytical approach could completely capture their structural complexities, and so a hybridisation of set-theory and post-tonal analysis, functional harmony, jazz harmonic approaches, jazz improvisational practices, and voice-leading approaches has worked effectively as a broad spectrum of tools that enabled a variety of perspectives. By using Rahn's (1980) system for identifying a pc-set's 'representative form', the complications concerning Forte's (1973) numbering system and the unsatisfactory premise of inversional equivalence were avoided.

The challenge of working with Coltrane's recordings was mitigated by using a computer programme (Roni Music) to adjust their speed and audio quality when needed. Although the use of this software did not resolve every issue, it was crucial to the process of producing accurate transcriptions. Correspondingly, while the production of transcriptions remains admittedly a subjective endeavour, incapable of capturing all the nuances of recorded music, through the faithful dedication to repeated listening and to rendering accurately the essential elements relevant to the analysis, the transcriptive process nevertheless established the crucial first stage from which all the analyses were generated.

Equally, the blended objective and subjective nature of set-theoretic segmentation was predicated on the importance of listening and that the segments chosen should reflect audible structures in the music. Even though Coltrane's improvisations often signalled suitable segmentations through their rhythm, contour, and phrasing, the establishing of improvisational patterns also enabled less apparent segmentations where pc-sets were rhythmically fragmented or registrally partitioned. Furthermore, overlapping segmentations helped to illustrate an improvisation's layered complexities; the superset and subset relationships; and how given pc-sets interacted and emerged as salient structures. The process of analysis was a creative and evolving endeavour, where insights resonated and inspired new viewpoints. At times, the analytical discoveries instigated a re-examination of previous approaches, so providing clearer pathways for illustrating the music's salient features. Additionally, the rendering of the notated analyses into written text was periodically challenging because of multi-layered relationships that resisted simple descriptions.

7.3 FINAL THOUGHTS AND RECOMMENDATIONS FOR FUTURE RESEARCH

The broader meaning of this research acts to challenge the existing ways in which John Coltrane's last recordings are understood, providing new insights into Coltrane's creative processes. Embedded in this music is an inherent message. While the spiritual and philosophical dimension of that message is experienced subjectively by listeners and is open to (re)interpretation, its musical dimension is more measurable, comprising a comprehensive perspective on interval and pitch contents and relations. This thesis has demonstrated how Coltrane's later music develops logically from his earlier practices and that the accepted musical narrative about his late period therefore misrepresents it as a radical departure. John Coltrane's improvisations on *Interstellar Space* and *Stellar Regions* clearly reveal an approach to pitch structure where pc-sets of various cardinalities and T_n-types emerge, combine, and are transformed. It is to be hoped that this research will begin a new dialogue about the nature and meaning of John Coltrane's music and of free improvisation in general, and that it will inspire further, thorough research into the musical artefacts left by Coltrane, considering both analytical and cultural themes as essential to research and balancing the current discourse.

A broad range of issues beyond this thesis's scope provide fertile areas for future research, with the potential for further expanding our understanding of Coltrane's late-period music. Avenues of research should entail investigations into the rhythmic dialogue between Coltrane and Ali on *Interstellar Space* and what Coltrane described as 'multi-directional' time. Similarly, a more comprehensive study of the late-period ensemble's interaction and its dialectical properties is needed. Additionally, in order to better understand the place of *Interstellar Space* and *Stellar Regions* within the context of Coltrane's musical evolution, there should be an examination of his other recordings, working chronologically backwards through his late period, looking for contrasting and similar structural developments related to *Interstellar Space* and *Stellar Regions*. Likewise, analyses of the music that follows *Interstellar Space* ('Number One', 'Expression', 'Ogunde', and *The Olatunji Concert* (2001)) could enhance our understanding of Coltrane's late-period. Equally, the development of new analytical means is needed to investigate Coltrane's use of sound as represented by the emergent harmonics, *altissimo*, and timbral manipulation of the saxophone.

Importantly, the hybridised methodology centred on set theory employed in this thesis could also be useful for examining the musical structure of several other jazz artists who defy easy categorisation, such as: Jimmy Giuffre's trio (with Paul Bley and Steve Swallow), Henry Threadgill, Steve Coleman, Eric Dolphy, Matt Mitchell, Tim Berne, Muhal Richard Abrams, Julius Hemphill, Ornette Coleman, and Evan Parker.

While this doctoral study has the potential to instigate new processes of artistic research as extensions of Coltrane’s methods, inspiring new frameworks for composition and improvisation, it also has the capacity to challenge and change the preconceptions surrounding Coltrane and free jazz. The establishment of a structural methodology within *Stellar Regions* and *Interstellar Space* now secures the opportunity to instigate a new dialogue about the nature and meaning of Coltrane’s later music.

REFERENCES

PRIMARY SOURCES

DISCOGRAPHY

Ali, R. (1999) *Rings of Saturn*. [CD] New York, NY: Knitting Factory Records KFR–232.

——— (2009) *Configurations*. [CD] New York, NY: Bluemusicgroup.com.

Coltrane, A. (1978) *Transfiguration.* [LP, CD] Los Angeles, CA: Warner Bros. Records WB–3218.

Coltrane, J. (1958a) *Blue Train*. [LP] Englewood Cliffs, NJ: Bluenote Records BLP–1577.

——— (1958b) 'Russian Lullaby'. *Soultrane*. [LP] Englewood Cliffs, NJ: Prestige Records PRLP–7142.

——— (1960a) *Giant Steps*. [LP] New York, N.Y.: Atlantic 1311.

——— (1960b) 'Countdown'. *Giant Steps*. [LP] New York, N.Y.: Atlantic 1311.

——— (1960c) 'Giant Steps'. *Giant Steps*. [LP] New York, N.Y.: Atlantic 1311.

——— (1960d) 'Naima'. *Giant Steps*. [LP] New York, N.Y.: Atlantic 1311.

——— (1961a) 'Little Melonae'. *Settin' the Pace*. [LP] Englewood Cliffs, NJ: Prestige Records PRLP–7213.

——— (1961b) *My Favorite Things*. [LP] New York, N.Y.: Atlantic SD–1361.

——— (1961c) 'My Favorite Things'. *My Favorite Things*. [LP] New York, NY: Atlantic SD–1361.

——— (1962) 'Chasin' the Trane'. *Coltrane Live at the Village Vanguard*. [LP] Englewood Cliffs, NJ: Impulse! IMP- A-10.

——— (1965a) *A Love Supreme*. [LP] Englewood Cliffs, NJ: Impulse! A–77.

——— (1965b) 'Acknowledgment'. *A Love Supreme.* [LP] Englewood Cliffs, NJ: Impulse! A-77.

——— (1965c) ‘Brasilia’. *The John Coltrane Quartet Plays.* [LP] Englewood Cliffs, NJ: Impulse! AS-85.

——— (1965d) ‘Psalm’. *A Love Supreme.* [LP] Englewood Cliffs, NJ: Impulse! A-77.

——— (1965e) ‘Song of Praise’. *The John Coltrane Quartet Plays.* [LP] Englewood Cliffs, NJ: Impulse! AS-85.

——— (1965f) ‘Creation’. *The John Coltrane Quartet, Creation.* [LP] New York, NY: Blue Parrott AR-700.

——— (1966a) *Ascension*. [LP] Englewood Cliffs, NJ: Impulse! A–95.

——— (1966b) *Live at the Village Vanguard Again*. [LP] Englewood Cliffs, NJ: Impulse! A–9124.

——— (1966c) *Meditations*. [LP] Englewood Cliffs, NJ: Impulse! A–9110.

——— (1966d) ‘Compassion’. *Meditations*. [LP] Englewood Cliffs, NJ: Impulse! IMP- A-9110.

——— (1966e) ‘Love’. *Meditations*. [LP] Englewood Cliffs, NJ: Impulse! IMP- A-9110.

——— (1966f) ‘Serenity’. *Meditations*. [LP] Englewood Cliffs, NJ: Impulse! IMP- A-9110.

——— (1966g) ‘The Father and the Son and the Holy Ghost’. *Meditations*. [LP] Englewood Cliffs, NJ: Impulse! IMP- A-9110.

——— (1966h) ‘My Favorite Things’. *Live at the Village Vanguard Again*. [LP] Englewood Cliffs, NJ: Impulse! A–9124.

——— (1967a) *Kulu Sé Mama*. Recorded 1965. [LP] Englewood Cliffs, NJ: Impulse! A–9106.

——— (1967b) ‘Vigil’. *Kulu Sé Mama*. Recorded 1965. [LP] Englewood Cliffs, NJ: Impulse! A–9106.

Davis, M. (1959) ‘So What’. *Kind of Blue*. [LP] New York, NY: Columbia Records. CL 1355.

POSTHUMOUS COLTRANE RELEASES

Coltrane, J. (1967c) *Expression.* Recorded 1967 [LP, CD] Englewood Cliffs, NJ: Impulse! A–9120.

——— (1967d) ‘Number One’. *Expression.* Recorded 1967 [LP, CD] Englewood Cliffs, NJ: Impulse! A–9120.

——— (1967e) ‘Ogunde’. *Expression.* Recorded 1967 [LP, CD] Englewood Cliffs, NJ: Impulse! A–9120.

——— (1967f) ‘To Be’. *Expression.* Recorded 1967 [LP, CD] Englewood Cliffs, NJ: Impulse! A–9120.

——— (1968) *Om*. Recorded 1965 [LP, CD] Lynwood, WA: Impulse! AS–9140.

——— (1968) *Cosmic Music.* Recorded 1966. [LP] San Francisco, CA: Coltrane Records AU 4950.

——— (1969) *Selflessness: Featuring My Favorite Things*. Recorded 1965. [LP] Englewood Cliffs, NJ: Impulse! AS-9161.

——— (1970a) *Transition*. Recorded 1965. [LP, CD] Englewood Cliffs, NJ: Impulse! AS-9195.

——— (1970b) ‘Suite: Prayer and Meditation’. *Transition*. Recorded 1965. [LP, CD] Englewood Cliffs, NJ: Impulse! AS-9195.

——— (1970c) ‘Transition’. *Transition*. Recorded 1965. [LP, CD] Englewood Cliffs, NJ: Impulse! AS-9195.

——— (1971a) *John Coltrane Featuring Pharoah Sanders, Live in Seattle*. Recorded 1965. [LP, CD] Englewood Cliffs, NJ: Impulse! AS-9202-2.

——— (1971b) ‘Evolution’. *John Coltrane Featuring Pharoah Sanders, Live in Seattle*. Recorded 1965 [LP] Seattle, WA: Impulse! AS-9202-2.

——— (1971c) *Sun Ship*. Recorded 1965. [LP, CD] Impulse! AS-9211. NY, NY. Reissued *Sun Ship: The Complete Session*. 2013. Impulse! B0018075-02

——— (1972) *Infinity*. Recorded 1965. [LP] Englewood Cliffs, NJ: Impulse! AS-9225.

——— (1974) *Interstellar Space*. Recorded 1967. [LP, CD] Englewood Cliffs, NJ: Impulse! ASD–9277. Reissued *Interstellar Space*. 2000. Impulse! 543 415-2.

——— (1977a) *First Meditations*. Recorded 1965. [LP, CD] Englewood Cliffs, NJ: Impulse! ASD–9332.

——— (1977b) 'Love'. *First Meditations*. Recorded 1965. [LP, CD] Englewood Cliffs, NJ: Impulse! ASD–9332.

——— (1991) *Live in Japan*. Recorded 1966 [CD] Englewood Cliffs, NJ: Impulse! GRD-4-102.

——— (1993) 'Impressions'. *John Coltrane, Newport '63*. Recorded 1963 [CD] Newport, RI: Impulse! GRD-128.

——— (1995) *Stellar Regions*. Recorded 1967. [CD] Englewood Cliffs, NJ: Impulse! IMP–169.

——— (1997) 'Miles' Mode'. *The Complete 1961 Village Vanguard Recordings.* Recorded 1961. [CD] New York, NY: Impulse! IMPD-4-232.

——— (1998a) 'Last Blues'. *The Classic Quartet: The Complete Impulse! Recordings*. Recorded 1962–1965. [CD] Englewood Cliffs, NJ: Impulse! IMPD8-280.

——— (1998b) 'Nature Boy'. *The Classic Quartet: The Complete Impulse! Recordings*. Recorded 1962–1965. [CD] Englewood Cliffs, NJ: Impulse! IMPD8-280.

——— (2001) *The Olatunji Concert: The Last Live Recording*. Recorded 1967 [CD], New York, NY: Impulse! 314 589 120-2.

——— (2005) 'One Down One Up'. *One Down One Up, Live at the Halfnote*. Recorded 1965 [CD], New York, NY: Impulse! 986 214-3.

——— (2009) *Last Performance at Newport*. Recorded 1966 [CD], Unofficial Release: Domino Records 891234.

——— (2014) *Offering: Live at Temple University*. Recorded 1966 [CD] Philadelphia, PA: Impulse! /Resonance Records. B0019632-02.

——— (2020) *Unissued Rehearsal Recording*. April–July 1963. Unknown venue, unknown city. [Featuring Eric Dolphy, Roy Haynes, Jimmy Garrison].

MUSIC SCORES AND TRANSCRIPTIONS

Babbitt, M. (1963) *All Set: For Jazz Ensemble.* New York, NY: Associated Music Publishers.

Bauer, B. and Sher C., eds. (1991) *The New Real Book Volume Two*. Petaluma, CA: Sher Music Co.

Coltrane, J. (1991) *The Music of John Coltrane*. Milwaukee, WI: Hal Leonard.

Varèse, E. (1946) *Density 21.5*. Milan: BMG Ricordi Music Publishing.

White, A. (2016) *Transcriptions of John Coltrane Solos*. Washington, DC: Andrew's Musical Enterprises.

Yamaguchi, M. (2003) *John Coltrane Plays 'Coltrane Changes'*. Milwaukee, WI: Hal Leonard.

INTERVIEWS

Devito, C. (2010) *Coltrane on Coltrane: The John Coltrane Interviews*. Chicago, IL: Chicago Review Press.

O'Gallagher, J. (2016a) Interview with Alan Chase. 30 October.

——— (2016b) Interview with Kenny Wessel. 09 March.

——— (2019) Personal correspondence with Paul Dunmall. 27 June.

SECONDARY SOURCES

BIBLIOGRAPHY

Abbate, C. (2004) ‘Music–Drastic or Gnostic?’. *Critical Inquiry* 30: 505–536.

Adorno, T. (2002) ‘Late Style in Beethoven’. In *Essays on Music.* trans. Susan H. Gillespie, (ed.) Richard Leppert, 564–568. Berkeley, CA: University of California Press.

Agawu, K. (2004) ‘How We Got Out of Analysis, and How to Get Back in Again’. *Music Analysis* 23/2–3 [Jul.–Oct.]: 267–286.

Ake, D. (2002) *Jazz Cultures*. Berkeley, CA: University of California Press.

Alexander, S. (2016) *The Jazz of Physics, the Secret Link Between Music and the Structure of the Universe*. New York, NY: Basic Books.

Antokoletz, E. and Susanni, P. (2012). *Music and Twentieth-Century Tonality: Harmonic Progression based on Modality and the Interval Cycles*. New York, NY & Oxford: Routledge Press.

Aristotle (1922) *De Caelo*. (tr.) J. L. Stocks and H. B. Wallis. Oxford: The Clarendon Press.

Baham, N. L. (2015) *The Coltrane Church: Apostles of Sound, Agents of Social Justice*. Jefferson, NC: McFarland and Company.

Bair, J. J. (2003) ‘Cyclic Patterns in John Coltrane’s Melodic Vocabulary as Influenced by Nicolas Slonimsky’s *Thesaurus of Scales and Melodic Patterns*: An Analysis of Selected Improvisations’. D.M.A. Thesis. University of North Texas.

Baker, J. M. (1990) ‘Voice Leading in Post-Tonal Music: Extending Schenker’s Theory’. *Music Analysis* 9/2: 177–200.

Barham, J. (2009) ‘Rhizomes and Plateaus: Rethinking Jazz Historiography and the Jazz-Classical Relationship’. *Jazz Research Journal* 3/2: 171–202.

Bayley, A. (2010) *Recorded Music: Performance, Culture and Technology*. Cambridge: Cambridge University Press.

Bergonzi, J. (1992) *Melodic Structures*. Mainz. Advance Music.

——— (2000) *Thesaurus of Intervallic Melodies*. Mainz. Advance Music.

Berkman, D. (2013) *The Jazz Harmony Book*. Petaluma, CA: Sher Music Co.

Berkman, F. (2007) 'Appropriating Universality: The Coltranes and 1960s Spirituality'. *American Studies* 48/1 [Spring]: 41–62.

Berliner, P. (1994) *Thinking in Jazz: The Infinite Art of Improvisation*. Chicago, IL: University of Chicago Press.

Bigand, E. (1997) 'Perceiving Musical Stability: The Effect of Tonal Structure, Rhythm, and Musical Expertise'. *Journal of Experimental Psychology: Human Perception and Performance* 23/3: 808–822.

Block, S. (1990) 'Pitch-Class Transformation in Free Jazz'. *Music Theory Spectrum* 12/2: 181–202.

Bonds, M. E. (2014) *Absolute Music: The History of an Idea*. [Kindle edition]. Oxford and New York, NY: Oxford University Press.

Booth, W., Colomb, G. and Williams, J. (1995) *The Craft of Research*. Chicago, IL: University of Chicago Press.

Borgo, D. (2005) *Sync or Swarm: Improvising Music in a Complex Age*. New York, NY: Continuum.

Brown, L., ed. (2010) *John Coltrane and Black America's Quest for Freedom: Spirituality and the Music*. New York, NY: Oxford University Press.

Bruckner-Haring, C. (2008) 'John Coltrane as a Composer'. *Jazz Research Journal* 2/2: 133–153

Butterfield, M. W. (2001–02) 'Music Analysis and the Social Life of Jazz Recordings'. *Current Musicology*, 71–73 [Spring]: 324–352.

Byrd, D. (1998) 'Math is Music is Art Symedicity: A Theory of Music'. 4 December Lecture at Cornell University. Available at: http://artsites.ucsc.edu/igama/2%20-%20Encyclopedia/e-LEGAM%20Content%20Files/A%20-%20Oral%20History/pres_Byrd_98dec.html [Accessed 12 June 2020].

Charyton, C., Holden, J. G., Jagacinski, R. J. and Elliott, J. O. (2012) 'A Historical and Fractal Perspective on the Life and Saxophone Solos of John Coltrane'. *Jazz Perspectives* 6/3: 311–335.

Chodos, A. T. (2019) 'The Blues Scale: Historical and Epistemological Considerations'. *Jazz Perspectives* 11/2: 139–171.

Clements, C. (2008) 'John Coltrane and the Integration of Indian Concepts in Jazz Improvisation'. *Jazz Research Journal* 2/2: 155–175.

Cole, B. (1976) *John Coltrane*. New York, NY: Da Capo Press.

Coleman, S. (2019) *songs like Fifth House, 26-2, Equinox, Satellite, etc., were not yet at the point where they were as symbolically descriptive* […]. [Instagram]. 19 January. Available at: https://www.instagram.com/p/BsoEM-NjnL1/?utm_source=ig_twitter_share&igshid=1jix4cc461w3v [Accessed 19 January 2019].

Coltrane, A. (1978) Liner notes for *Transfiguration*. [LP, CD] Los Angeles, CA: Warner Bros. Records WB–3218.

Cook, K. and Alfonso, R. (2013) 'Titles as Metaphors for Structures in the Music of John Coltrane'. *Hawaii Pacific University TESOL Working Paper Series* 11: 52–58.

Cook, N. (1987) *A Guide to Musical Analysis*. New York, NY: Norton & Co.

——— (2001) ‘Theorizing Musical Meaning’. *Music Theory Spectrum* 23/2 [Fall]: 170–195

Cook, N., Clarke, E., Leech-Wilkinson, D. and Rink, J., eds. (2009) *The Cambridge Companion to Recorded Music*. Cambridge: Cambridge University Press.

Cook, R. and Morton, B. (2004) *The Penguin Guide to Jazz on CD*. 7th edn. London: Penguin Books.

Cooke, M. (2002) ‘Jazz Among the Classics, and the Case of Duke Ellington’. *The Cambridge Companion to Jazz*. [Kindle Edition]. (eds.) Mervyn Cooke and David Horn, 153–174. Cambridge: Cambridge University Press.

Crook, H. (2002) *How to Improvise*. Munich: Advance Music.

Crouch, S. (2006) *Considering Genius: Writings on Jazz*. New York, NY: Basic Civitas Books.

——— (2013) *Kansas City Lightning, the Rise and Times of Charlie Parker*. New York, NY: Harper Collins.

Daniélou, A. (1943) *Introduction to the Study of Musical Scales*. London: India Society.

Davis, F. (2000) Liner Notes for *Interstellar Space* [CD reissue]. Verve Music Group, Impulse Records 543 415–2.

Demsey, D. (1991) ‘Chromatic Third Relations in the Music of John Coltrane’. *Annual Review of Jazz Studies 5*: 145–180.

DeVeaux, S. (1991) ‘Constructing the Jazz Tradition: Jazz Historiography’. *Black American Literature Forum* 25/3: 525–560.

DeVito, C., Fujioka, Y., Schmaler, W. and Wild, D. (2013) *The John Coltrane Reference*. (ed.) Lewis Porter. London: Routledge.

Dibben, N. (1999) ‘The Perception of Structural Stability in Atonal Music: The Influence of Salience, Stability, Horizontal Motion, Pitch Commonality, and Dissonance’. *Music Perception: An Interdisciplinary Journal* 16/3: 265–294.

Dibben, N. and Lamont, A. (2001) ‘Motivic Structure and the Perception of Similarity’. *Music Perception* [Spring] 18/3: 245–274.

Dingle C. (2017) ‘Middle-Aged Style: On Messiaen, Edward Said, and Lateness’. In *American Musicological Society Eighty-third Annual Meeting*. Rochester, NY. 9–12 November 2017: 177. Available at: https://cdn.ymaws.com/ams-net.site-ym.com/resource/resmgr/files/abstracts/2017-rochester.pdf. [Accessed 12 August 2020].

——— (2019) ‘Comparing Notes: Recording and Criticism’. In *The Cambridge History of Music Criticism*. (ed.) Christopher Dingle, 249–271. Cambridge: Cambridge University Press.

Dobbins, B. (1994) *A Creative Approach to Jazz Piano Harmony*. Mainz. Advance Music.

Dyer, G. (2014) ‘Catastrophic Coltrane’. *New York Review of Books*. 4 October. Available at: https://www.nybooks.com/daily/2014/10/04/catastrophic-coltrane/ [Accessed 10 June 2018].

Epstein, D. (1987) *Beyond Orpheus: Studies in Musical Structure*. Oxford: Oxford University Press.

Fielder, J. (2017) ‘Pitch Multiplication’. *Klang, New Music on the Fringe*. [blog] 28 August. Available at: http://klangnewmusic.weebly.com/direct-sound/pitch-multiplication [Accessed 2 May 2019].

Forte, A. (1973) *The Structure of Atonal Music*. New Haven, CT: Yale University Press.

——— (1985) ‘Tonality, Symbol, and Structural Levels in Berg’s *Wozzek*’. *The Music Quarterly* 71/4: 474–499.

——— (1988a) ‘Pitch-Class Set Genera and the Origin of Modern Harmonic Species’. *Journal of Music Theory* 32/2: 187–270.

——— (1988b) ‘New Approaches to the Linear Analysis of Music’. *Journal of the American Musicological Society* 41/2: 315–348.

Foss, L. (1962) ‘Improvisation Verses Composition’. *The Musical Times* 103/1436: 684–685.

Fujioka, Y. (1995) *John Coltrane: A Discography and Musical Biography*. Lanham, MD: Scarecrow Press.

Gabbard, K. (1995) *Jazz Among the Discourses*. Durham, NC: Duke University Press.

Gennari, J. (2006) *Blowin' Hot and Cool: Jazz and Its Critics*. [Kindle Edition]. Chicago, IL: University of Chicago Press.

Gingerich, L. L. (1986) ‘A Technique for Melodic Motive Analysis in the Music of Charles Ives’. *Music Theory Spectrum* 8: 75–93.

Gitler, I. (1958) Liner Notes for *Soultrane*. Hackensack, NJ: Prestige 7142.

Givan, B. (2003) ‘Jazz Taxonomies’. *Jazz Research News 10*: 472–486.

——— (2014) ‘Gunther Schuller and the Challenge of Sonny Rollins: Stylistic Context, Intentionality, and Jazz Analysis’. *Journal of the American Musicological Society* 67/1: 167–237.

Green, D. (2018) ‘John Coltrane and the End of Jazz’. *Washington Examiner*. [online] 26 August. Available at: https://www.washingtonexaminer.com/weekly-standard/john-coltrane-and-the-end-of-jazz [Accessed 12 August 2019]

Green, E. (2008) ‘It Don’t Mean a Thing if It Ain’t Got That *Grundgestalt*! – Ellington from a Motivic Perspective’. *Jazz Perspectives* 2/2 [July]: 215–249.

Godwin, J. (1993) *The Harmony of the Spheres, A Sourcebook of the Pythagorean Tradition in Music*. Rochester, VT: Inner Traditions.

Jones, L. (2010) *Black Music*. New York, NY: Akashic Books.

Hall, J. (2001) *Mercy, Mercy Me*. Oxford: Oxford University Press.

Haimo, E. (1997) ‘Developing Variation and Schoenberg’s Serial Music’. *Music Analysis* 16/3: 349–365.

Hamm, C. and Hughes B. (2021) American Standard Pitch Notation. *Open Music Theory*. Available at: https://viva.pressbooks.pub/openmusictheory/chapter/aspn/ [Accessed 11 February 2021]

Hasty, C. (1981) ‘Segmentation and Process in Post-Tonal Music’. *Music Theory Spectrum* 3 [Spring]: 54–73.

Haynes, G. (2018) ‘Heaven or Hell? The Problem of the Posthumous Album’. *The Guardian*. Available at: (https://www.theguardian.com/music/2018/apr/06/heaven-or-hell-the-problem-of-the-posthumous-album) [Accessed 10 March 2020].

Hentoff, N. (1960) Liner Notes for *Giant Steps* [LP, CD]. New York, NY: Atlantic Records 1311-2.

——— (1966) Liner Notes for *Live at the Village Vanguard Again* [LP, CD]. Englewood Cliffs, NJ: Impulse IMP-A-9124.

Hodeir, A. (1961) *Since Debussy: A View of Contemporary Music*. London: Secker and Warburg.

Hodson, R. (2007) *Interaction, Improvisation, and Interplay in Jazz*. New York, NY: Routledge.

Hollander, R. (2016) ‘John Coltrane’s Tone Circle’. *Roel’s World*. [blog] 22 January. Available at: https://roelsworld.eu/en/blog-saxophone/coltrane-tone-circle/[Accessed 8 August 2016].

Howison, J. (2012) *God's Mind in That Music. Theological Explorations Through the Music of John Coltrane*. Eugene, OR: Cascade Books.

Irabagon, J. (2017) 'Adaptable Conviction: A Glimpse into John Coltrane's Creative Process Through His 'Nature Boy' Studio Sessions'. In *Arcana VIII: Musicians on Music*. (ed.) John Zorn, 177–193. New York, NY: Hip's Road.

Jackendoff, R. and Lerdahl, F. (1983) *A Generative Theory of Tonal Music*. Cambridge, MA: The MIT Press.

Jost, E. (1974) *Free Jazz*. New York, NY: Da Capo Press.

Kahn, A. (2003) *A Love Supreme: The Story of John Coltrane's Signature Album*. New York, NY: Penguin (Non-Classics).

Kepler, J. (1939) *Harmonices Mundi*. [Kindle edition]. Translated by Charles Glenn Wallis. Annapolis, MD: St. John's Bookstore.

Kerman, J. (1980) 'How We Got into Analysis, and How to Get Out'. *Critical Inquiry* 7/2 [Winter]: 311–331.

Kernfeld, B. (1981) 'Adderley, Coltrane, and Davis at the Twilight of Bebop: The Search for Melodic Coherence (1958–59)'. (Vol. I and II). PhD Thesis. Cornell University.

——— (1983) 'Two Coltranes'. *Annual Review of Jazz Studies 2*: 7–66.

Kirchner, B. (2005) *The Oxford Companion to Jazz*. Oxford: Oxford University Press.

Kivy, P. (1990) *Music Alone, Philosophical Reflections on the Purely Musical Experience*. Ithaca, NY and London: Cornell University Press.

Kofsky, F. (1998) *John Coltrane and the Jazz Revolution of the 1960s*. 2nd edn. New York, NY: Pathfinder Books.

Kramer, L. (2001) *Musical Meaning, Toward a Critical History*. Berkeley, CA: University of California Press.

Kruth, J. (2017) 'Chasing Trane' Illuminates the Spirit of John Coltrane. *The Observer*. [online] Available at: https://observer.com/2017/04/john-coltrane-documentary-movie-review [Accessed 7 August 2020].

Kubik, G. (1999). *Africa and the Blues*. Jackson, MS: University Press of Mississippi.

Lange, A. (2014) 'A Fickle Sonance'. *Point of Departure, an Online Music Journal* 48 Sept. [online] Available at: http://www.pointofdeparture.org/archives/PoD-48/PoD48FickleSonance.html [Accessed 21 September 2020].

Larson, S. (1998) 'Schenkerian Analysis of Modern Jazz: Questions About Method'. *Music Theory Spectrum* 20/2: 209–241.

——— (2005) 'Composition Versus Improvisation?'. *Journal of Music Theory* 49/2: 241–275.

——— (2009) *Analyzing Jazz: A Schenkerian Approach*. New York, NY: Pendragon.

Lateef, Y. (1981) *Repository of Scales and Melodic Patterns*. Amherst, MA: Fana Music.

Lendvai, E. (1994) 'Symmetries of Music'. *Symmetry: Culture and Science* 5/3: 229-268.

Lerdahl, F. (1989) 'Atonal Prolongational Structure'. *Contemporary Music Review 4*: 65–87.

——— (1996) 'Calculating Tonal Tension'. *Music Perception: An Interdisciplinary Journal* 13/3 [Spring]: 319–363.

——— (1998) 'Prolonging the Inevitable'. *Revue belge de musicologie*: *Belgisch Tijdschrift voor Muziekwetenschap* 52: 305–309.

Levine, M. (1989) *The Jazz Piano Book*. Petaluma, CA: Sher Music Co.

——— (2011) *The Jazz Theory Book*. Petaluma, CA: Sher Music Co.

Levy, B. (2012) 'Harmonic and Rhythmic Interaction in the Music of John Coltrane'. PhD Thesis. Brandeis University.

Lewin, D. (1982) 'A Formal Theory of Generalized Tonal Functions'. *Journal of Music Theory* 26/1 [Spring]: 23–60.

——— (1990) ‘Klumpenhouwer Networks and Some Isographies That Involve Them’. *Music Theory Spectrum* 12/1 [Spring]: 83–120.

Lewis, G. (1996) ‘Improvised Music after 1950: Afrological and Eurological Perspectives’. *Black Music Research Journal* 16/1: 91–122

Liebman, D. (1991) *A Chromatic Approach to Jazz Harmony and Melody*. Mainz: Advance Music.

——— (1996) ‘John Coltrane’s Meditations Suite: A Study in Symmetry’. *Annual Review* of *Jazz Studies* 8: 167–180.

——— (2016) ‘The Complete Transcription Process’. [online] Davidliebman.com. Available at: http://davidliebman.com/home/ed_articles/the-complete-transcription-process [Accessed 22 March 2016].

Litweiler, J. (1984) *The Freedom Principle*. New York, NY: W. Morrow.

Lott, T. (2010) ‘When Bar Walkers Preach: John Coltrane and the Crisis of the Black Intellectual’. In *John Coltrane & Black America’s Quest for Freedom: Spirituality and the Music*. (ed.) Leonard L. Brown, 115–137. New York, NY: Oxford University Press.

Mandelbrot, B. (1982) *The Fractal Geometry of Nature*. San Francisco: W. H. Freeman.

Martin, H. (2001) *Charlie Parker and Thematic Improvisation*. 2nd edn. [Kindle edition]. Lanham, MD: Scarecrow Press.

Mawer, D. (1997) *Darius Milhaud: Modality and structure in the Music of the 1920s*. Farnham: Ashgate Publishing Limited.

——— (2014) *French Music and Jazz in Conversation*. Cambridge: Cambridge University Press.

McGill, T. S. (2013) 'Dennis Sandole's Unique Jazz Pedagogy'. *Current Research in Jazz* 5. Available at: https://www.crj-online.org/v5/CRJ-DennisSandole.php [Accessed 19 September 2018].

——— (2016) 'Arnold Schoenberg, Dennis Sandole, and John Coltrane: Important Links in Modern Jazz Pedagogy and Practice'. [online]. Available at: https://www.academia.edu/27068692/Arnold_Schönberg_Dennis_Sandole_and_John_Coltrane_Important_Links_in_Modern_Jazz_Pedagogy_and_Practice [Accessed 9 April 2017].

Medwin, M.H. (2008) 'Attaining Unity: Self-Reference in the Music of John Coltrane'. *Jazz Research Journal* 2/2: 119–131.

——— (2008) 'Listening in Double Time: Temporal Disunity and Structural Unity in the Music of John Coltrane 1965–1967'. PhD Thesis. The University of North Carolina at Chapel Hill.

Messiaen, O. (2007) *The Technique of My Musical Language*. Reprint, Paris: A. Leduc.

Meyer, L. (1956) *Emotion and Meaning in Music*. Chicago, IL and London: University of Chicago Press.

Modirzadeh, H. (2001) 'Aural Archetypes and Cyclic Perspectives in the Work of John Coltrane and Ancient Chinese Music Theory'. *Black Music Research Journal* 21/1: 75–106.

Monson, I. (1996) *Saying Something: Jazz Improvisation and Interaction*. [Kindle Edition] Chicago, IL: University of Chicago.

——— (1998) On Freedom: George Russell, John Coltrane, and Modal Jazz. *In the Course of Performance: Studies in the World of Musical Improvisation*. (eds.) Bruno Nettl and Melinda Russell, 149-168. Chicago, IL and London: University of Chicago Press.

——— (2007) *Freedom Sounds: Civil Rights Call Out to Jazz and Africa*. New York, NY: Oxford University Press.

Moreno, J. (2001) 'Schenker's Parallelisms, Schoenberg's Motive, and Referential Motives: Notes on Pluralistic Analysis'. *College Music Symposium* 41: 91–111.

Morgan, R. (2003) 'The Concept of Unity and Musical Analysis'. *Music Analysis* 22/1–2 [March – July]: 7–50.

Morris, R. (1998) 'Voice-Leading Spaces'. *Music Theory Spectrum* 20: 175–208.

Mwamba, C. (2013) 'Ways of Seeing Coltrane'. *Making, Presenting, and Researching Music.* [blog] 27 December. Available at: https://www.coreymwamba.co.uk/rambles/1388150764 [Accessed 18 February 2018].

Nattiez, J. J. (1990) *Music and Discourse: Toward a Semiology of Music*. Princeton, NJ: Princeton University Press.

Nisenson, E. (1995) *Ascension: John Coltrane and His Quest*. New York, NY: Da Capo Press.

O'Gallagher, J. (2013) *Twelve-Tone Improvisation*. Mainz: Advance Music.

——— (2020) 'Pitch-Class Set Usage and Development in Late-Period Improvisations of John Coltrane'. *Jazz Perspectives* 12/1: 93–121.

O'Meally, R. (1998) *The Jazz Cadence of American Culture*. New York, NY: Columbia University Press.

Owens, T. (1974) 'Charlie Parker: Techniques of Improvisation Vol. 1'. PhD Thesis. University of California, Los Angeles.

Pearsall, E. (2004) 'Transformational Streams: Unraveling Melodic Processes in Twentieth-Century Motivic Music'. *Journal of Music Theory* 48/1 [Spring]: 69–98.

Perle, G. (1962) *Serial Composition and Atonality: An Introduction to the Music of Schoenberg, Berg, and Webern*. Reprint 1991. Berkeley, CA: University of California Press.

Pressing, J. (1982) 'Pitch Class Set Structures in Contemporary Jazz'. *Jazzforschung/Jazz Research* 14: 133–172.

Pople, A. (1994) *Theory, Analysis and Meaning in Music*. Cambridge: Cambridge University Press.

Porter, L. (1985) 'John Coltrane's A Love Supreme: Jazz Improvisation as Composition'. *Journal of the American Musicological Society* 38/3: 593–621.

——— (1998) *John Coltrane: His Life and Music*. 5th edn. Ann Arbor, MI: The University of Michigan Press.

Powell, M. (2021) 'Obscure Musicology Journal Sparks Battles Over Race and Free Speech'. *The New York Times*. [online] 14 February. Accessed at: https://www.nytimes.com/2021/02/14/arts/musicology-journal-race-free-speech.html

Rahn, J. (1980) *Basic Atonal Theory*. New York, NY: Schirmer Books.

Raschér, S. (1941) *Top Tones for the Saxophone.* New York, NY: Carl Fischer.

Rasula, J. (1995) 'The Media of Memory: The Seductive Menace of Records in Jazz History'. *Jazz Among the Discourses* (ed.) Krin Gabbard, 134–162. Durham, NC: Duke University Press.

Ratliff, B. (2008) *Coltrane: The Story of a Sound*. London: Faber & Faber.

Russell, G. (2001) *Lydian Chromatic Concept of Tonal Oranization*. Brookline, MA: Concept Publishing.

Said, E. (2004) 'Thoughts on Late Style'. *London Review of Books*. 26/15 [August]. Available at: https://www.lrb.co.uk/the-paper/v26/n15/edward-said/thoughts-on-late-style [Accessed 15 June 2020].

——— (2007) *On Late Style: Music and Literature Against the Grain*. London: Bloomsbury.

Sallis, F. (2015) *Musical Sketches*. Cambridge: Cambridge University Press.

Salzer, F. (1962) *Structural Hearing: Tonal Coherence in Music*. New York, NY: Dover Publications.

Schenker, H. (1979). *Free Composition: Volume III New Musical Theories and Fantasies*. New York, NY: Longman Books.

Schillinger, J. (1946) *The Schillinger System of Musical Composition*. New York, NY: Carl Fischer.

Schimmel, A. (1993) *The Mystery of Numbers*. New York, NY: Oxford University Press.

Schoenberg, A. (1995). *The Musical Idea and the Logic, Technique, and Art of its Presentation.* Edited and Translated by Patricia Carpenter and Severine Neff. New York, NY: Columbia University Press.

——— (2010) *Style and Idea: Selected Writings of Arnold Schoenberg*. (ed.) Leonard Stein. Berkeley, CA: University of California Press.

Schott, J. (2000) 'We Are Revealing a Hand That Will Later Reveal Us: Notes on Form and Harmony in Coltrane's Work'. In *Arcana: Musicians on Music.* (ed.) John Zorn, 345–366. New York, NY: Hips Road.

Schuller, G. (1958) 'Sonny Rollins and the Challenge of Thematic Improvisation'. *The Jazz Review* 1/1 [November]: 6–11, 21.

Service, T. (2010) 'Magic Numbers: Composers and their Clandestine Codes'. *The Guardian*. [online] 1 July. Accessed at:

https://www.theguardian.com/music/tomserviceblog/2010/jul/01/composers-clandestine-codes-plato [Accessed 6 November 2019].

Shoemaker, B. (2019) 'Eric Dolphy: The Illinois Concert'. *Jazztimes*. [online] 25 April. Available at: https://jazztimes.com/archives/eric-dolphy-the-illinois-concert/ [Accessed 16 December 2019].

Shteamer, H. (2017) 'John Coltrane's 'Interstellar Space' at 50: Legacy of a Free-Jazz Masterpiece'. *RollingStone*. [online] 22 February. Available at: https://www.rollingstone.com/music/music-features/john-coltranes-interstellar-space-at-50-legacy-of-a-free-jazz-masterpiece-191760/ [Accessed 2 March 2019].

Simms, R. (1992–93) 'Aspects of Cosmological Symbolism in Hindusthani Musical Forms'. *Asian Music* 24/1 [Autumn – Winter]: 67–89.

Simpkins, C. O. (1975) *Coltrane: A Biography*. Baltimore, MD: Black Classic Press.

Slonimsky, N. (1947) *Thesaurus of Scales and Melodic Patterns*. New York, NY: Scribner.

Smith, M. (2001) *John Coltrane: Jazz, Racism and Resistance*. London: Redwords.

Solis, G. (2015) 'Timbral Virtuosity: Pharaoh Sanders, Sonic Heterogeneity, and the Jazz Avant-garde in the 1960s and 70s'. *Jazz Perspectives* 9/1: 47–63.

Solomon, L. (1973) 'Symmetry as a Compositional Determinant: VII Bartók & Webern'. [online] Available at: http://solomonsmusic.net/diss7.htm [accessed 6 March 2007].

——— (2005) Solomon's Table of Pitch-Class Sets. [online] Available at: http://solomonsmusic.net/pcsets.htm [accessed 6 March 2007].

Straus, J. N. (1987) 'The Problem of Prolongation in Post-Tonal Music'. *Journal of Music Theory* 31: 1–25.

——— (1991) 'A Primer for Atonal Set Theory'. *College Music Symposium* 31: 1–26.

——— (2003) ‘Uniformity, Balance, and Smoothness in Atonal Voice Leading’. *Music Theory Spectrum* 25: 305–352.

——— (2005) *Introduction to Post-Tonal Theory*. 3rd edn. Englewood Cliffs, NJ: Prentice Hall.

——— (2008) ‘Disability and ‘Late Style’ in Music’. *The Journal of Musicology* 25/1: 3–45.

Such, D. (1994) *Avant-Garde Jazz Musicians*. Iowa City, IA: University of Iowa Press.

Thomas, J. C. (1976) *Chasin’ the Trane: The Music and Mystique of John Coltrane*. New York, NY: Da Capo Press.

Tymoczko, D. (2011) *A Geometry of Music: Harmony and Counterpoint in the Extended Common Practice*. New York, NY: Oxford University Press.

Van Khe, T. (1977). ‘Is the Pentatonic Universal? A Few Reflections on Pentatonism’. *The World of Music* 19/1–2: 76–84.

Voss, D. (2012a) ‘The Red Planet’ (‘Miles Mode’). *Music Blog-Übergreifen*. [blog] 27 August. Available at: http://uebergreifen.blogspot.com/2012/08/the-red-planet-miles-mode.html [Accessed 21 February 2016].

——— (2012b) ‘Coltrane and Kepler?’. *Music Blog-Übergreifen*. [blog] 2 October. Available at: http://uebergreifen.blogspot.com/2012/10/coltrane-and-kepler.html [Accessed 21 February 2016].

——— (2013a) ‘‘Brasilia’: Octatonicism, Self-Similarity, and Blues’. *Music Blog-Übergreifen*. [blog] 20 June. Available at: http://uebergreifen.blogspot.com/2013/06/brasilia-octatonicism-self-similarity.html [Accessed 21 February 2016].

——— (2013b) ‘Harmonic Tension in Coltrane’s Chromatic Major Third Cycles’. *Music Blog-Übergreifen*. [blog] 29 August. Available at:

http://uebergreifen.blogspot.com/2013/08/harmonic-tension-in-coltranes-chromatic.html [Accessed 21 February 2016].

——— (2014a) 'The Father and the Son and the Holy Ghost'. *Music Blog-Übergreifen*. [blog] 6 November. Available at: http://uebergreifen.blogspot.com/2014/11/the-father-and-son-and-holy-ghost.html [Accessed 21 February 2016].

——— (2014b) 'Problems of Harmonic Interpretation in Late Coltrane'. *Music Blog-Übergreifen*. [blog] 23 April. Available at: http://uebergreifen.blogspot.com/2014/04/problems-of-harmonic-interpretation-in.html [Accessed 21 February 2016].

——— (2014c) '*Transition*'. *Music Blog-Übergreifen*. [blog] 21 June. Available at: http://uebergreifen.blogspot.com/2014/06/transition.html [Accessed 21 February 2016].

——— (2014d) 'Key Transformation and Motive Relation in *First Meditation* and *Sun Ship*'. *Music Blog-Übergreifen*. [blog] 30 May. Available at: http://uebergreifen.blogspot.com/2014/05/key-transformation-and-motive-relation.html [Accessed 21 February 2016].

——— (2015) 'Venus'. *Music Blog-Übergreifen*. [blog] 22 May. Available at: http://uebergreifen.blogspot.co.uk/search?updated-min=2015-01-01T00:00:00-05:00&updated-max=2016-01-01T00:00:00-05:00&max-results=13 [Accessed 21 February 2016].

Wallenstein, S. O. (2012) 'Adorno and the Problem of Late Style'. *Site* 31/32: 95–111.

Walser, R. (1993) 'Out of Notes: Signification, Interpretation, and the Problem of Miles Davis'. *The Musical Quarterly* 77/2: 343–365.

——— (1997) ‘Deep Jazz: Notes on Interiority, Race, and Criticism’. In *Inventing the Psychological: Toward a Cultural History of Emotional Life in America*. (eds.) Joel Pfister and Nancy Schnog, 271–296. New Haven, CT: Yale University Press.

Walton, A., Richardson, M., Langland-Hassan, P. and Chemero, A. (2015) ‘Improvisation and the Self-Organization of Multiple Musical Bodies’. *Front. Psychol*. 6:313. Available at: https://www.frontiersin.org/articles/10.3389/fpsyg.2015.00313/full#h3 [Accessed 6 May 2019].

Waters, K. (2011) *The Studio Recordings of the Miles Davis Quintet, 1965–68*. New York, NY: Oxford University Press.

Weiskopf, W. (1995) *Intervallic Improvisation: The Modern Sound: A Step Beyond Linear Improvisation*. New Albany, IN: Jamey Aebersold.

Wessel, K. (2020) *The Music of Ornette Coleman, New York Jazz Workshop Saturday Masterclass Series*. [video] Available at: https://www.youtube.com/watch?v=bWKayWR4mEM [Accessed 30 June 2020].

Westendorf, L. (1994) ‘Analysing Free Jazz’. D.M.A. Thesis. University of Washington.

Whyton, T. (2013) *Beyond a Love Supreme: John Coltrane and the Legacy of an Album*. New York, NY: Oxford University Press.

Wikipedia Contributors (2018). *Interstellar Space*. [online] Available at: https://en.wikipedia.org/wiki/Interstellar_Space [Accessed 26 May 2019].

Wild, D. (1995) Liner Notes for *Stellar Regions* [CD]. Englewood Cliffs, NJ: Impulse IMP–169.

Woideck, C. (2008) ‘John Coltrane: Development of a Tenor Saxophonist, 1950–1954’. *Jazz Perspectives* 2/2: 165–213.

Yasser, J. (1932) *A Theory of Evolving Tonality*. New York, NY: American Library of Musicology.