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Sonority and Linear Structure in Three Early Works of Olivier Messiaen

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Abstract

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ABSTRACT

In this study I examine three early works of Olivier Messiaen: the motet *O sacrum convivium* (1937), "La colombe" from the eight piano preludes (1928-9), and the closing passage of "La fiancée perdue" from the song cycle *Trois mélodies* (1930). All three works exhibit varying degrees of tonal behavior in combination with a foreground focus on harmonic sonority. As such, I approach each of them with two contrasting analytic methods: modified Schenkerian linear-reductive analysis, informed by the interaction of diatonic and octatonic collections, and set-class analysis. The latter approach incorporates the harmonic complexity index (HCI) as an innovative harmonic measure calculated from the interval-class vector of each set-class. Informed by established and recent scholarly work, the introduction to the thesis provides a background for the application of these analytic techniques to this repertoire, while the thesis itself demonstrates that form is revealed powerfully through the combination of these two separate perspectives.

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CHAPTER ONE: INTRODUCTION

Olivier Messiaen exemplifies the 20th century ideal of exploring new ideas while sitting apart from his contemporaries in his own unique pursuit of it. The two most well-known examples of his innovation are perhaps those which exemplify the "charm of impossibilities" he sought in his music: modes of limited transposition, which cannot be transposed past a certain number of transpositions, and nonretrogradable rhythms, which, played in reverse, give the original order of durations.[1] His outlook on the world and the nature of reality was just as distinctive as his compositional style: Messiaen, unlike nearly all of his contemporaries, held an unshakable Catholic faith throughout his entire life. As such, there is a streak of spirituality – sometimes subtle, often overt – running through his entire oeuvre, with particular attention to God's love (shown through Christ), human love (told through stories like the Tristan and Isolde legend), and God's creation (expressed in birdsong).[2] Against the pull of countless 20th-century currents, Messiaen remained

[1] Olivier Messiaen, *Technique de mon langage musical,* trans. John Satterfield (Paris: Alphonse Leduc, 1944), 13.

[2] Andrew Shenton, *Olivier Messiaen's System of Signs* (Aldershot, England: Ashgate Publishing Limited, 2008), 26.

faithful to his own worldview in everything he wrote, producing some of the century's most daringly original, spiritually elevated music.[3]

Though many scholars have studied later music featuring typical elements of Messiaen's mature style, such as birdsong, the modes of limited transposition, and non-retrogradable rhythms, the earlier works have earned less attention. The present study will focus on three works written in the earlier part of Messiaen's life: the motet *O sacrum convivium* (1937), "La colombe" from *Huit préludes* (1928-9), and the closing passage of "La fiancée perdue" from *Trois mélodies* (1930). Each of these exhibits tonal closure and linear relationships along with clearly defined vertical sonorities, which range in sound from triadic consonance to atonal, mixed-interval dissonance. Bearing in mind these two distinct components of the musical fabric, in this paper I will demonstrate the usefulness of a two-part analytic strategy, flexible enough to examine each piece on its own special terms. While my first method is a modified version of Schenker's approach to tonal music, the second draws on pitch-class set theory and expands on it with a new measure of harmonic complexity. Observing where the two methods intersect and where they diverge informs us about Messiaen's early harmonic practice as it relates to form.

Below, I will describe the two analytic methods separately, referring to other authors who have utilized them in similar repertoire and explaining how I will apply them to the three specific works to be studied. For each specific work, I will provide musical examples and figures to illustrate the two types of analysis, including linear-reductive graphs for the first type and simple line graphs for the second. *O sacrum convivium,* with

[3] Paul Griffiths, *Olivier Messiaen and the Music of Time* (Ithaca, NY: Cornell University Press, 1985), 22.

its rather tonal bass line and pure homophony, invites the linear-reductive approach and facilitates the task of defining vertical set-classes and, therefore, harmonic complexity; I will analyze this piece first. The other two works test the flexibility of both methods. For both *O sacrum convivium* and "La colombe," I will begin with the linear/modal approach and refine each analysis by examining set-class and harmonic complexity; for the end of "La fiancée perdue," I will start with the set-class approach and then overlay three possible linear readings. Finally, I will conclude with remarks on the limitations and wider applicability of this two-step analytic method, including suggestions of other repertoires for which it may be well-suited.

Analytic Method 1: Linear Relationships and Modal Identity

In one of the most frequently referenced articles on the topic of post-tonal music and Schenkerian theory, Joseph Straus lists four conditions for prolongation, which post-tonal music largely fails to meet. These include:

1. The consonance-dissonance condition: A consistent, pitch-defined basis for determining relative structural weight
2. The scale-degree condition: A consistent hierarchy of consonant harmonies
3. The embellishment condition: A consistent set of relationships between tones of lesser and greater structural weight
4. The harmony/voice leading condition: A clear distinction between the vertical and horizontal dimensions[4]

[4] Joseph Straus, "The Problem of Prolongation in Post-Tonal Music," *Journal of Music Theory* 31 no. 1 (Spring 1987): 1-21.

This article has initiated a series of discussions on the meaning of prolongation among various other scholars. While Steve Larson, without making any vast claims about the usefulness of Schenkerian theory in post-tonal analysis, contradicts the consistency and meaning of Straus' four conditions,[5] Fred Lerdahl responds with ten prolongational "salience conditions" of his own, intended to expand upon Straus' proposed associational model for post-tonal music.[6] Lerdahl's conditions, which include attack, metric emphasis, loudness, timbral distinction, registral distinction, density, length, motivic importance, position at a grouping boundary, and correspondence to another analytic choice, focus on the surface prominence of particular moments rather than on the implied hierarchical structures required by Straus. The majority of Messiaen's music, and certainly his best-known works, fail to meet Straus' four conditions for prolongation. Though each of the three early works that are the subject of this paper contains some "tonal vestige,"[7] the harmonic complexity of their surfaces, which sometimes prioritize stepwise voice-leading over clear distinctions of consonance and dissonance, prevents them from consistently meeting Straus' conditions. Wherever possible, my choices in creating voice-leading graphs have been informed by Schenkerian principles, laid out in Straus' conditions, by set-class recurrence where practical (as a modification of Straus' second condition), and by some of Lerdahl's salience conditions when necessary.

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[5] Steve Larson offers a critique of Straus' definition of prolongation through the four conditions in "The Problem of Prolongation in 'Tonal' Music," *Journal of Music Theory* 41, no. 1 (Spring 1997): 101-136.

[6] Fred Lerdahl, "Atonal Prolongational Structure," *Contemporary Music Review* 4, no. 1 (1989): 73-74.

[7] On p. 13, Straus notes that "there are isolated passages of post-tonal music that might be considered prolongational, but these occur mainly where some tonal vestige is present."

Of course, the extreme diversity found in the post-tonal repertoire makes some works better suited than others for the linear-reductive approach, and theorists have applied many different versions of it, despite notable objections, depending on their repertoire and analytic goals. For instance, Jim Samson uses his own freer system of symbols to annotate reductions of the rarely triadic music of Scriabin, Berg, and others, indicating motivic connections, pitch centricity, and long-range harmonic relationships. Samson's very flexible notation allows him to approach each new work on its own terms, and to show easily whatever he deems most important in his reductions.[8] David Forrest, on the other hand, reduces Britten's much more triadic choral music with Schenkerian stem-and-slur notation, which enables him to show functional background motion where it exists and to illustrate hierarchy, interval cycles (the focus of the article), and different types of prolongation with elegance and precision.[9] He modifies the system to suit his own analytic needs – showing prolonged symmetrical interval cycles with open noteheads, for instance – but the notation remains familiar and easily understood.

Since we know that Messiaen was profoundly influenced by the music of Claude Debussy,[10] it will provide a richer context for this study to mention the work of two theorists who have applied Schenkerian techniques to Debussy's music. In the first chapter of his book *The Music of Claude Debussy,* Richard Parks analyzes five pieces,

[8] Jim Samson, *Music in Transition* (London: J.M. Dent & Sons Ltd., 1977).

[9] David Forrest, "Prolongation in the Choral Music of Benjamin Britten," *Music Theory Spectrum* 32 no. 1 (Spring 2010): 1-25.

[10] Gareth Healey, *Messiaen's Musical Techniques: The Composer's View and Beyond* (Farnham, England: Ashgate Publishing Limited, 2013).

"tonal" in varying degrees, with linear reductions.[11] Parks concludes that, though Debussy's early style adheres to Schenkerian models in some ways, specific works often lack a discernible *Ursatz*, even when their foregrounds are "replete with conventional diminutions." He also notes a freer use of chromaticism that leads to a "detachment of sonority from scale step." From here, Parks calls for a new method of determining referential pitch-classes, one that takes as its foundation "intrinsic intervallic properties;" this new method is laid out in the remaining chapters of the book.[12]

While Parks uses Schenkerian theory as a starting point to prove the necessity of his own approach, Matthew Brown applies it to two Debussy songs near the end of his book to demonstrate the theory's own broad usefulness. The book aims to explain Schenkerian theory based on the following criteria: accuracy, scope, fruitfulness, consistency, simplicity, and coherence.[13] With the two Debussy analyses, of "C'est l'extase langoureuse" and "La mort des amants," Brown tests the scope of the theory. He prefaces the analyses by explaining Schenkerian mechanisms for some problematic features of Debussy's music, such as parallel major-minor 7^{th} chords, free dissonance, pervasive chromaticism, and incomplete deep-level projections of tonality. Having cited several examples of Schenker's own work, Brown argues that Schenkerian theory is "powerful enough to explain surfaces that are almost continuously dissonant and

[11] Richard Parks, *The Music of Claude Debussy* (New Haven, CT: Yale University Press, 1989).

[12] Ibid., 20.

[13] Matthew Brown, *Explaining Tonality* (Rochester, NY: University of Rochester Press, 2005), xiv.

chromatic."[14] Then, Brown draws connections between musical and textural structures, providing mostly partial foreground graphs and substantial written commentary. Though informed by both of these scholars, my own work is more closely related to Parks' in that, finding linear analysis insufficient, I discuss set-classes as a structural element in early Messiaen, as Parks does with Debussy. However, unlike Parks, I use the linear-reductive and set-class approaches in combination with each other. Like Brown, I will draw conclusions about textual expression in relation to structure in the two texted works.

The harmonic structure in each of the three works examined in this study will be defined in terms of the following two broad concepts: linear relationships in combination with modal identity, and harmonic complexity by set-class. To assist in defining the former, I have borrowed linear reduction with stem-and-slur notation from the realm of tonal analysis. Such notation, while originating from the Schenkerian tradition, will be used in this paper not to claim the existence of functional fundamental structures in Messiaen, but to show voice-leading relationships exhibiting varying degrees of tonal behavior. As mentioned above, I do not claim that this music always meets Straus' four strict conditions, but rather that, with a variety of decision-making tools, hierarchical associations are possible and revealing. With their aim redirected in this way, most of the resulting graphs will stop at foreground-level relationships rather than seeking to define tonal hierarchies at deeper levels. Because of Messiaen's multifaceted harmonic language in all three of these compositions, my graphs will also include labels for collection and/or set-class.

[14] Ibid., 186.

In addition to exhibiting some degree of tonal behavior, each of the three works to be studied here contains, to some extent, pitch-class material drawn from Messiaen's modes of limited transposition, and most commonly from the three transpositions of the octatonic collection. Octatonic and other modal material ("modal" will refer to Messiaen's modes of limited transposition throughout this paper, unless otherwise indicated) often interacts with diatonic writing to create a uniquely colored musical surface; diatonic and modal identity will be shown with brackets below the linear-reductive graphs. In addition to linear relationships and scalar identity, I will address the specific vertical sonorities that act as small but essential building blocks for each work under discussion. Although set-class analysis will also be addressed as a separate topic in each piece, select pitch-class sets, labeled on the graphs with their prime forms, help us to define more clearly the distinctive sound world of each composition; prime-form labels specifically allow for quick comparisons of sonorities within and between works.

Analytic Method 2: Set-Class and Harmonic Complexity Index

Numerous theorists have invented models to describe set-class dissonance. Two of the most important of these models come from Paul Hindemith and Howard Hanson, both of whom put forth their theories with an eye toward teaching composition. Hindemith argues that the conventional theory of harmony is insufficient as a consistent approach to chordal analysis, presenting his own system that categorizes chords based first on whether they contain a tritone, then on intervallic content and root placement.[15]

[15] Paul Hindemith, *The Craft of Musical Composition*, book I, *Theoretical Part,* trans. Arthur Mendel (London: Associated Music Publishers, Inc., 1937), 90-106.

Though neither theorist makes use of the interval-class vector as we know it today, Hanson systematizes intervallic content by assigning one letter to each interval-class.[16] Unlike Hindemith, Hanson spends little time concerned with the "root" of a sonority, labeling original sets and their inversions identically.[17]

A more recent approach to set-class description by Célestin Deliège seeks to establish a figured-bass labeling system for atonal music, including spectral music, based on the ratios found in the upper octaves of the harmonic series. The fundamental is the bottom of a perfect fifth, major third, or major second; the mode is then described through pitch-class and their harmonics. Roman numerals are used to designate changes in fundamental (as in tonal harmony, not always equivalent to the bass) from one chord to the next.[18] Like Deliège, Norman Cook seeks to explain harmony perception through the acoustic properties of a chord alone, without reference to cultural factors. Cook summarizes several different perceptual studies, but ultimately quantifies dissonant sonorities (here, primarily triads) based on their composite intervallic dissonance and a "tension factor" determined by the interaction of the constituent pitches' upper partials.[19]

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[16] Howard Hanson, *Harmonic Materials of Modern Music* (New York: Appleton-Century-Crofts, Inc., 1960), 9-16.

[17] Ibid., 23.

[18] Célestin Deliège, "Atonal Harmony: From Set to Scale," in *Contemporary Music: Theoretical and Philsophical Perspectives*, ed. Max Paddison and Irène Deliège (Farnham, England: Ashgate Publishing Limited, 2013), 51-76.

[19] Norman Cook, "Harmony Perception: Harmoniousness is More than the Sum of Interval Consonance," *Music Perception* 27, no. 1 (September 2009): 25-42.

Example 7.9 Messiaen, *Quatuor pour la fin du Temps*, 'Liturgie de Cristal': the twenty-nine chords

No.	Name	Normal order	Octatonic	Transformations/Comments	
1	7-20:	3 4 5 7 10 11 0		T_0	Mode 7
2	7-35:	9 10 0 2 3 5 7		T_0	Non-modal
3	7-20:	1 2 3 5 8 9 10		T_{10}	Mode 7
4	7-35:	7 8 10 0 1 3 5		T_{10}	Non-modal
5	7-20:	10 11 0 2 5 6 7		T_1	Mode 7
6	7-35:	4 5 7 9 10 0 2		T_9	Non-modal
7	7-20:	5 6 7 9 0 1 2		T_7	Mode 7
8	7-35:	11 0 2 4 5 7 9		T_7	Non-modal
9	5-z38:	10 1 4 5 6			Modes 3 & 4
10	5-25:	11 2 4 5 7	CI	T_0	Mode 2
11	5-27:	0 3 5 7 8		T_0	Mode 3
12	6-34:	4 5 7 9 11 1			Modes 3 & 6
13	5-27:	3 6 8 10 11		T_3	Mode 3
14	5-35:	1 3 5 8 10		T_0	Non-modal
15	5-35:	11 1 3 6 8		T_{10}	Non-modal
16	5-21:	10 1 2 5 6			Mode 3
17	6-15:	6 9 10 0 1 2		T_0	Mode 3
18	6-21:	8 10 0 1 2 4			Modes 3 & 6
19	6-14:	9 0 1 2 4 5			Mode 3
20	6-15:	10 1 2 4 5 6		T_4	Mode 3
21	6-15:	2 5 6 8 9 10		T_4	Mode 3
22	6-z23	3 5 6 8 9 1	CII	T_0	Mode 2
23	5-25:	2 4 5 7 10	CI	T_9	Mode 2
24	4-z29:	1 2 4 8	CI	T_0	Mode 2
25	5-25:	11 1 2 4 7	CI	T_9	Mode 2
26	4-z29:	10 11 1 5	CI	T_9	Mode 2
27	4-z29:	4 8 10 11	CI	IT_9	Mode 2
28	4-z29:	1 5 7 8	CI	T_9	Mode 2
29	4-z29:	11 3 5 6	CII	T_{10}	Mode 2

Figure 1: Forte's analysis of "Liturgie de cristal"

A final analysis specifically relevant to the present paper is Forte's chapter on Messiaen's chords in Dingle and Simeone's anthology.[20] Forte notes that, although

[20] Allen Forte, "Messiaen's Chords," in *Olivier Messiaen: Music, Art, and Literature*, edited by Christopher Dingle and Nigel Simeone (Cornwall, England: Ashgate Publishing Limited, 2007), 91-113.

Messiaen's music is "full of new chords" and "they are extraordinary in their diversity," careful study of them has yet to be undertaken. In his examination, he names many of these unique simultaneities by their Forte numbers so that they might be carefully studied in terms of their pitch-class and interval content. In the chapter's most extensive example, Forte presents in his Example 7.9 (reproduced as Figure 1) a table of all twenty-nine of the chords from the piano part in the first movement of *Quatour*, listing numbers 1 through 29, Forte label, normal order, octatonic membership (if any), transformation(s), and membership in Messiaen's modes of limited transposition (if any).[21]

In addition to this kind of systematic labeling of individual chords, Forte shows in a second table (Example 7.11) the common-tone connections between adjacent chords in this ostinato, demonstrating the primacy of smooth voice-leading in this instance of Messiaen's chordal syntax.[22] [23]

While these large chords of six notes or more contribute significantly to much of Messiaen's output, the sonorities in the three works analyzed in this paper are, for the most part, limited to six or fewer pitch-classes, and thus ineligible for confident attribution to any of Messiaen's special chords.[24] [25] In addition to simply noting the

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[21] Ibid., 100.

[22] Ibid., 103.

[23] For a more extensive discussion of Messiaen's "special chords," see Cheong Wai-Ling, "Rediscovering Messiaen's Invented Chords," *Acta Musicologica* 75, no. 1 (2003): 85-105.

[24] Gareth Healey, *Messiaen's Musical Techniques: The Composer's View and Beyond* (Farnham, England: Ashgate Publishing Limited, 2013), 99.

[25] Messiaen himself discusses these chords in the seventh volume of his *Traité de rythme, de couleur, et d'ornithologie* (Paris: Leduc, 2002).

location and frequency of the various set-classes, I have created a formula for transforming the ic-vector of each set-class into a Harmonic Complexity Index, or HCI, to make observations about overall dissonance through the work. Though the ic-vector is of course limited in its ability to describe each unique set-class (in that z-pairs exist), it can, at a glance, reveal the approximate dissonance of a given set-class.[26] My approach, designed specifically for music that integrates tonal and post-tonal languages, takes advantage of the ic-vector's capacity to show dissonance with a precise yet simple formula. This formula allows the theorist to view set-classes on a continuum between tonal, tertian consonance (perfect intervals, major and minor thirds and sixths) and atonal, non-tertian dissonance (major and minor seconds and sevenths, tritones).

To calculate HCI, each integer in the ic-vector is multiplied by the following, in order: {532214}. The resulting six numbers are then summed to yield the harmonic complexity index. The two all-interval tetrachords, [0146] and [0137], provide a simple example of the calculation. The ic-vector for either of these two tetrachords is <111111>. To calculate HCI, we multiply the cardinality of each interval-class in the ic-vector by {532214}, in that order, to obtain 5+3+2+2+1+4 = 17. The harmonic complexity index is useful in that it allows us to observe and graph a single quantifiable feature of set-classes over time; this feature describes both the dissonance by interval-class and the cardinality of each set-class, as explained below.

In refining the HCI formula, I have held in mind the following goals: to acknowledge the tonal, common-practice categories of consonant and dissonant intervals,

[26] Stefan Kostka, *Materials and Techniques of Post-Tonal Music*, 4th ed. (Upper Saddle River, NJ: Pearson Education, Inc., 2012), 177-179.

as derived from the harmonic series; to reflect the aural experience of dissonance across set-classes of various cardinalities; and to account for the cardinality of each set-class. First, the factors of the {532214} formula have been determined broadly from commonly accepted tonal categorizations of consonant and dissonant intervals, which have their own origins in the harmonic series. The first three interval-classes, then, encompassing tritones and major and minor 2nds and 7ths, are dissonant in a tonal context, while the second three, including perfect 4ths and 5ths and major and minor 3rds and 6ths, are consonant. More specifically, the HCI factors break down as follows, from least to most dissonant: ic5 (1), ic3 and ic4 (2), ic2 (3), ic6 (4), and ic1 (5). I have assigned these particular integers based on the harmonic series and on the use of dissonance in the vast body of tonal writing, from which many listeners develop their aural perceptions of dissonance.[27] Figure 2 shows an equal-tempered version of the harmonic series as displayed in Paul Hindemith's *Craft of Musical Composition:*[28]

[27] Previous versions of the HCI formula have ranked interval-classes differently; for instance, the first iteration gave the following integers: {321114}, ranking the tritone as more dissonant than ic1, and ic5 at the same consonance level as ic3 and ic4. While the current formula of {532214} generally produces more nuanced HCI data, the preserved higher ranking of three dissonant ics1, 2, and 6 and lower ranking of three consonant ics3, 4, and 5 yields similar overall HCI trends in the works studied here.

[28] Hindemith, 17.

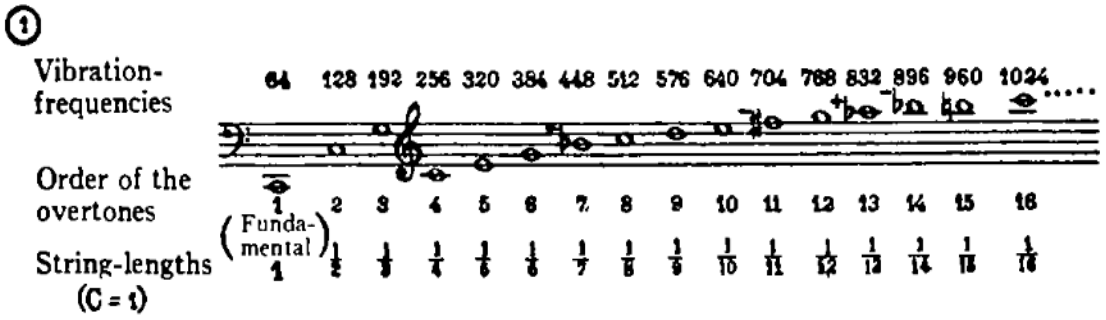

Figure 2: Harmonic series.

It must be noted that the starting point of the HCI calculation, a measure applied to set-classes, is the interval-class vector, a description of intervallic relationships within a set-class without reference to a particular pitch or pitch collection. Therefore, the concept of a "fundamental" within the harmonic series is not intended to apply to particular sets of pitches in the works I will examine, but merely to account for the abstract concept of intervallic dissonance.

In analyzing set-classes rather than sets, I necessarily deal in pitch-class rather than in pitch, and therefore disregard spacing and, in considering interval-class, presume inversional equivalence for each set-class we examine. In using the harmonic series as a source for the HCI formula, I will apply the same disregard for spacing and inversional equivalence in looking at intervals away from the fundamental. ic5 appears first, at the 3rd overtone, followed by ic4 at 5, ic2 at 7, ic6 at 11, ic3 at 13, and ic1 at 15. These interval-classes are ordered with integers in the same way in the HCI formula, with the exception of ic3, which I have paired with ic4 to reflect the common-practice use of major and minor 3rds and 6ths in stable, tonic harmonies.

By the same principle, the remaining intervals are already properly ranked by tonal use as they appear in the harmonic series. Placing ic5 (perfect 4ths and 5ths) before ic3 and ic4, for example, results in a lower HCI for [037] (major and minor triads, HCI = 5) than for [036] or [048] (diminished and augmented triads, HCI = 8 and 6, respectively). Of the three dissonant interval-classes, ic2 is perhaps most commonly used in the verticalities of tonal music (associated with minor predominant, half-diminished, and dominant 7^{th} chords), followed by ic6, used only in unstable harmonies (dominant 7ths and both types of diminished 7ths), and finally ic1, which appears perhaps most rarely (for example, as a chord tone in major 7^{th} chords).

Finally, the HCI formula accounts for the cardinality of each set-class by adding the resultant multiples together without dividing the sum by the number of intervals, which would weight the interval-classes appropriately but disregard the increase in aural complexity resulting from the addition of more pitch-classes to a given set. Cardinality itself is a meaningful factor in determining the perceived complexity of a sonority, interacting with measures of dissonance in this formula to produce the final HCI of a set-class. For example, although a tritone [06] is generally considered more dissonant than a major or minor triad [037], the former has an HCI of 4, while the latter, though consisting of more consonant interval-classes, has an HCI of 5 because of its higher cardinality. Meanwhile, a comparison of [01], the most dissonant interval-class in this system, and [037] shows that the two set-classes have the same HCI of 5. Table 1 lists set-classes of various cardinalities by HCI for further comparison.

HCI	Set-Class	Forte Label	Int./Chord/Collection Name
1	[05]	//	P4, P5
2	[03]	//	m3, M6
2	[04]	//	M3, m6
3	[02]	//	M2, m7
4	[06]	//	A4/d5
5	[01]	//	m2, M7
5	[037]	3-11	M triad, m triad
5	[027]	3-9	sus4 chord
6	[048]	3-12	A triad
8	[036]	3-10	d triad
8	[024]	3-6	//
10	[016]	3-5	//
11	[0358]	4-26	mm7 chord
13	[012]	3-1	//
13	[0158]	4-20	MM7 chord
14	[0258]	4-27	Mm7, dm7 chord
16	[0369]	4-28	dd7 chord
17	[0137]	4-Z29	all-interval tetrachord
17	[0146]	4-Z29	all-interval tetrachord
18	[0236]	4-12	//
19	[02479]	5-35	M triad add 6, 9
23	[02469]	5-34	V9 chord
36	[014589]	6-20	hexatonic collection
36	[0134689]	7-32	V13b9 chord
49	[013568T]	7-35	diatonic collection
76	[0134679t]	8-28	octatonic collection

Table 1: HCI of various set-classes.[29]

[29] Forte labels from Allen Forte, *The Structure of Atonal Music* (New Haven, CT: Yale University Press, 1973), 179.

CHAPTER TWO: ANALYSIS OF *O SACRUM CONVIVIUM*

Introduction

Composed in 1937, when Messiaen was just 29 years old, *O sacrum convivium* offers an early glimpse of the composer's fascination with harmonic color. The work is unique in that it foreshadows the intricate rhythmic and harmonic complexities of his mature style; however, Messiaen himself has denied the work a place among those works he considers representative of his musical language.[30] That is, though Messiaen's musical language here predates *Technique de mon langage musical* (1944), the work nonetheless applies both tonal and atonal tools in the definition of significant formal sections.

In an effort to describe more accurately this motet's radiant, multi-dimensional sound world, I will study it through the lens of linear-reductive analysis and with set-class labels, including the HCI, and will demonstrate that significant parallels exist between the results provided by these two different methods. First, I will examine the horizontal elements of underlying tonality and voice-leading procedures with the support of linear reductions and a simplified pitch-space map. Second, I will summarize Messiaen's use of distinctive set-classes to create formal shape and below a surface of shimmering, shifting colors. In so doing, I hope to demonstrate Messiaen's ultimate

[30] Messiaen, *Technique,* 72.

concern with expressive, highly intentional text setting, here achieved with a truly innovative coupling of approximately tonal background bass motion with a foreground focus on vertical sonority.

Perhaps due to its brevity (usually around four to five minutes), its liturgical usefulness, and its uniqueness as Messiaen's only motet,[31] *O sacrum convivium!* enjoyed immense success during the composer's lifetime and has remained popular in the choral world through the present day, earning its place alongside settings of the same text by Tallis, Pergolesi, and others.[32] It has not, however, gained comparable analytic attention. After all, in terms of length and complexity it pales in comparison with the more widely analyzed *Quatour pour la fin du Temps* or *Turangalîla-Symphonie*, and Messiaen himself, as noted, did not even consider it to be representative of his musical language.

In the only analysis devoted exclusively to *O sacrum convivium,* Tim Pack argues against Messiaen's own assessment, presenting evidence that the motet does in fact demonstrate Messiaen's style, as described by the composer himself and by modern scholars Peter Hill, Nigel Simeone, Paul Griffiths, and Anthony Pople. Pack looks for hallmarks of Messiaen's style, as described by Messiaen and these scholars, in the motet; these include theological subject matter, the use of pedal tones, progressive growth of intervals, symmetry, metric freedom, use of the tritone, redirected harmonies, use of the added-sixth major triad as a final tonic sonority, numerical symbolism, added values,

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[31] Père Jean-Rodolphe Kars, "The works of Olivier Messiaen and the Catholic liturgy," in *Olivier Messiaen: Music, Art, and Literature*, edited by Christopher Dingle and Nigel Simeone (Cornwall, England: Ashgate Publishing Limited, 2007), 324.

[32] Peter Hill and Nigel Simeone, *Messiaen* (New Haven, CT: Yale University Press, 2005), 72.

inexact augmentation, and the modes of limited transposition.[33] Pack indeed finds evidence within the motet to support several of these points, particularly showing the influence of the modes 2, 3, and 4 on Messiaen's harmonic choices. In labeling the modes, which often change every few beats or are only present in one voice, the harmonic analysis (which is only a small part of Pack's overall argument), comes across as somewhat fragmented, though effective in supporting Pack's broader claims. With the recognition that Pack's result is different because he succeeds in accomplishing a different goal than my own, I hope to present a somewhat more cohesive analysis by linear reduction before dividing the work into smaller parts with a set-class analysis.

First, to provide some context for the analysis that will follow, the work's well-known liturgical text, by St. Thomas Aquinas, is provided below, and Figure 3 displays a formal map of the motet, including rhythmic groupings. Since the clearest formal demarcation divides the work into two large sections that begin identically, I have placed A over A^1 for easy comparison.

O sacrum convivium! In quo Christus sumitur: recolitur memoria passionis ejus: Mens impletur gratia : et futurae gloriae nobis pignus datur. Alleluia.[34]

O sacred banquet: in which Christ is assumed, the memory of his Passion recollected, The mind completed with grace, the pledge of future glory granted to us. Alleluia![35]

[33] Tim Pack, "Searching for a Star: Melodic, Harmonic, and Rhythmic Structures in Olivier Messiaen's *O sacrum convivium!,*" in *Olivier Messiaen: The Centenary Papers*, edited by Judith Crispin (Cambridge, England: Cambridge Scholars Publishing, 2010), 233.

[34] Olivier Messiaen, *O sacrum convivium!* (Paris: Editions Durand, 1937).

[35] Gregory Robbins, personal communication, Denver, CO, July 20, 2016.

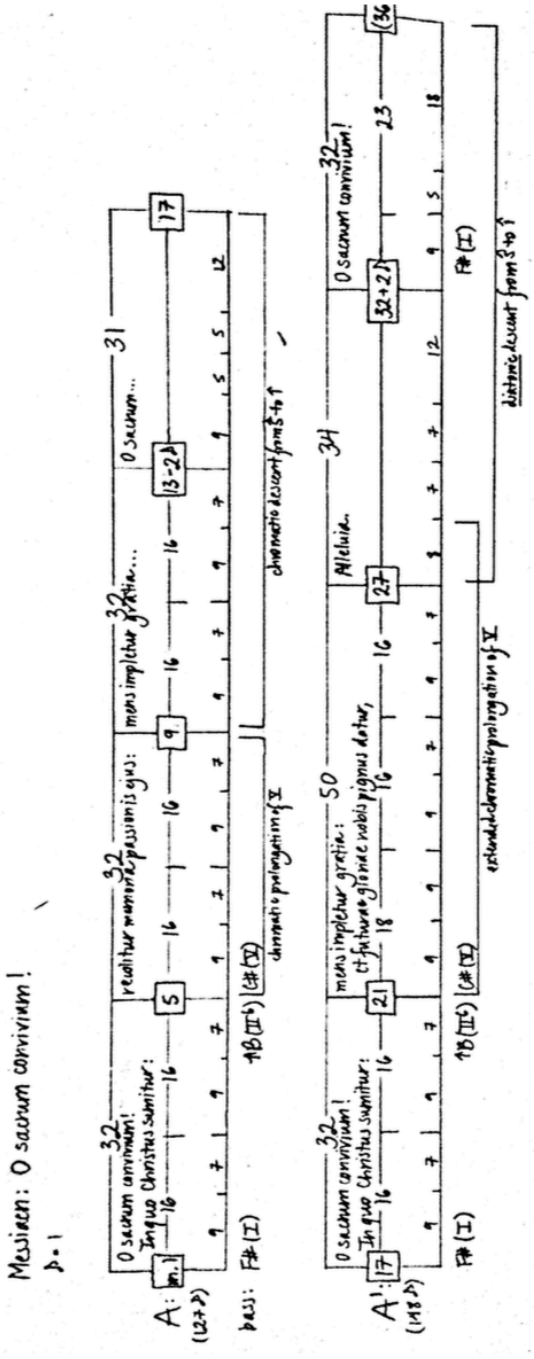
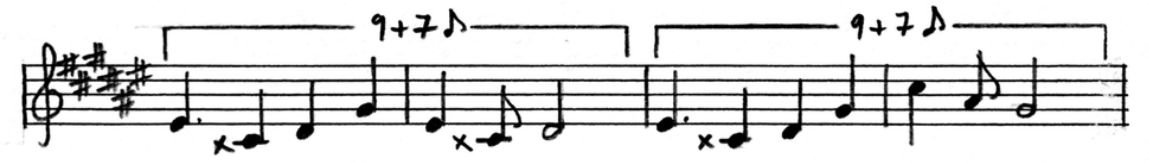


Figure 3: Formal map of *O sacrum convivium.* Following Gareth Healey's classifications, the work perhaps comes closest to modified strophic form.[36]

[36] Gareth Healey, "Form: Messiaen's Downfall?" *Twentieth Century Music* 4, no. 2 (September 2007): 172.

Numbers in boxes indicate measure numbers (plus or minus eighth notes, in some cases). The basic unit is the eighth note, as Messiaen writes at the beginning "Battre les croches." In regular patterns of 3+2+2+2 (9) and 3+2+2, at a tempo slow enough to beat the eighth, the motet sounds inspired by the Gregorian chant Messiaen so admired, but within a more regular metric framework.[37] In Figure 3, the smallest groupings are shown at the bottom, with bigger groupings in the middle (between measure numbers) and the largest groupings written over the top. As suggested by this chart, Messiaen repeats the basic 9 + 7 idea (Example 1) many times, varying it only in the two ending sections (13-2 eighths and 32+2 eighths) and at measure 21, which leads up to the work's most climactic moment two measures later. As we will see, at this moment (m. 23) many factors combine to produce a high point of startling, passionate intensity.



Example 1: *O sacrum convivium.* The first two iterations of the 9 + 7 rhythmic motive, mm. 1-4. The rhythmic skeleton remains the same for every "9 + 7" labeled in Figure 3, though occasionally the part of the pattern shown in boxes becomes three distinct eighth notes (often in the soprano line) or a single dotted quarter note (in the other voices). The motet remains homophonic throughout.

[37] Hill and Simeone, 73.

Linear-Reductive Reading

A linear analysis provides a deeper understanding of form; it not only reveals the possibility of a tonal reading, but interacts with set-class identity to reveal relationships between chords. At a glance, the bass motion in *O sacrum convivium* suggests the possibility of a roughly tonal scheme: each of the two sections (mm. 1-16 and 17-35) begins with three measures of scale degree 1 (F-sharp)[39] and one measure of scale degree 4 (B) in the bass, supporting approximately tonic and subdominant harmonies, respectively. What follows immediately in the fifth bar of each section is a V13, supported in root-position by scale degree 5 (C-sharp, mm. 5 and 21). Both sections, and thus the whole piece, end on F-sharp in the bass, supporting bVI^6 in m. 16, and Iadd6/9 in mm. 33-35. The material between each of the V13s and the "tonic" endings of each section, however, is less readily understood, and requires deeper analysis.

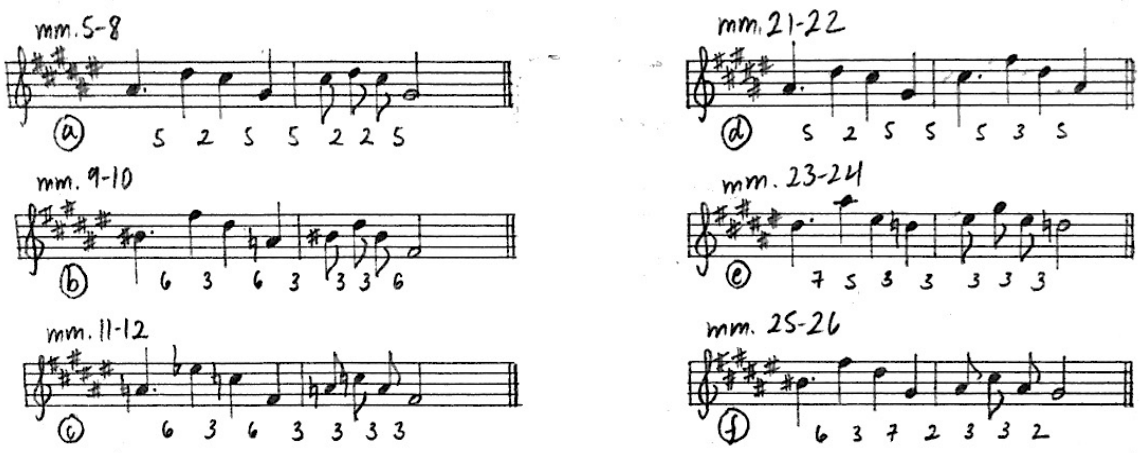
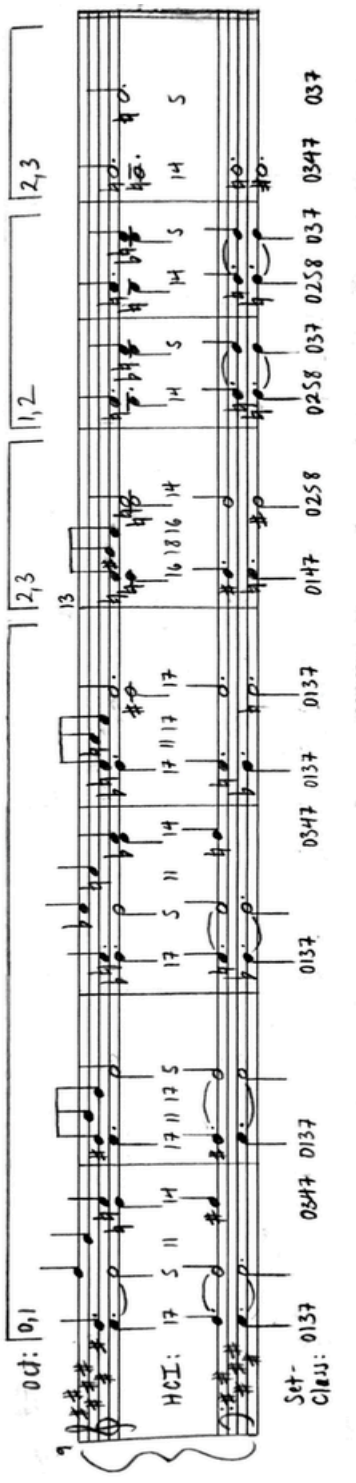


Figure 4: *O sacrum convivium,* two-bar melodic cell; intervals (in half-steps) shown below staff.

[39] In addition to agreeing with the 6-sharps key signature, F-sharp asserts itself as tonic through the continual return of the F#maj7 through the first three measures of each section (1-3, 17-19); it also serves as the bass note of the tonic triad (with added sixth) on which the whole piece finally resolves.



Example 2: *O sacrum convivium,* piano reduction, mm. 9-16

Octatonic and diatonic collections interact to create formal shape at key points in *O sacrum*. Although pure octatonicism in all four voices occurs only once (from m. 9 to m. 16, shown in Example 2), the soprano voice alternates between octatonic and diatonic material throughout. The two-bar melodic cell, present from the beginning, persists throughout the work until m. 27, most often at its original length and with the original contour or its inversion. The soprano's transformation of this cell from diatonic to octatonic corresponds to the bass descent, also octatonic (see Figure 5), from scale degree 5 (C-sharp) to scale degree 1 (F-sharp) beginning at m. 9. Figure 4a displays the diatonic cell as stated at the beginning of the dominant pedal in mm. 5-8; 4b and 4c show the octatonic transformations of the cell in mm. 9-10 and 11-12 (the melodic tetrachord has changed from [0257] to [0369]).

The octatonic melody at m. 9 marks the only section in the work of purely octatonic writing in all voices, as the text expresses the image of a mind filled with grace. Beginning here, Messiaen writes a succession of measures incorporating each of the three distinct octatonic collections, beginning with [0,1] and moving through [2,3], [1,2], and back to [2,3] (see Example 2). Despite the "tonic" F-sharp in the bass at m. 16, the bVI^6 fails to provide a true sense of harmonic closure. Instead of landing squarely on a tonic F-sharp major chord, Messiaen has taken the listener on a winding journey away from the F-sharp diatonic collection and through an array of octatonic sonorities, finally stopping the chromatic bass descent in m. 16 on first-inversion D major – a sound which offers stability through its length and relative consonance, but not through its functional meaning.

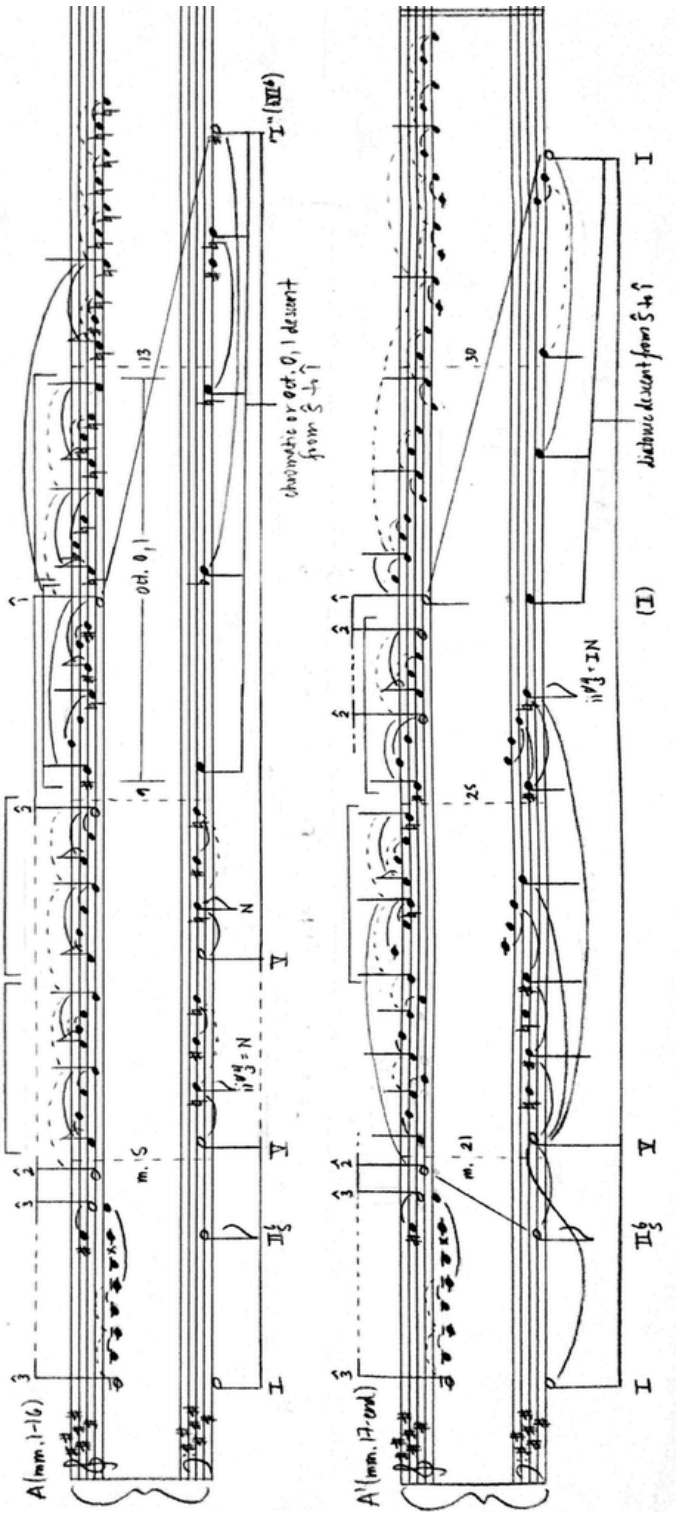


Figure 5: *O sacrum convivium*: foreground reduction by section

Messiaen delays the true resolution until the end of the work; this closure emerges from similar melodic motion in the soprano but yields a completely new result. Not only does the A-sharp beginning the word "futurae" in m. 23 mark a brief pivot from diatonic to octatonic in the soprano, it also represents the highest point in both overall range and distance from the previous pitch. Figures 4d-f show the progress of the melodic cell from m. 21 to m. 26: 4d repeats the first part of the cell in modified diatonic sequence, while 4e and 4f present modified, intensified versions of the cell shown in Figures 4a-c. The octatonicism here is only in the soprano and only lasts for about three measures (overlapping with the diatonic collection that precedes and follows). However, this tinge of octatonic color in the melody, recognizable as a reference to the octatonic cells in mm. 5-12, is sufficient to prepare with new intensity the return to full diatonicism at m. 27. Almost as though the first ending at m. 16 were a failed attempt at closure, at m. 33 Messiaen concludes a fully diatonic closing section by ending on an F-sharp major triad with an added sixth – Messiaen's equivalent to the major triad.[40]

The relationship between octatonic and diatonic collections shapes the whole work in that the first section, ending at m. 16, wanders into octatonicism and away from true tonal resolution, while the second section briefly hints at octatonicism in the melody, but eventually yields to the pull of diatonic resolution. These passages are noted with beams beneath the staves in Figure 5, along with the extended oct. [0,1] in all voices in mm. 9-12. Although of course Schenker's own system of reductive analysis was not designed to accommodate music verging into post-tonality (and Messiaen had no aims of writing in the tradition that gave rise to this analytic method), the stem-and-slur notation

[40] Pack, 238.

associated with the system allows us to see many of the music's underlying patterns more clearly.

While finding the *Urlinie* requires piecing together the alto and soprano voices at the beginning and accounting for many leaps, the lower voice is much more straightforward. Added to set-class, function, and collection labels, the bass line reveals important structural differences between the first and second endings. The start of the first ending, for example, includes a dominant pedal, embellished by chromatic neighbor motion (itself decorated with a chromatic neighbor, mm. 5-8). Although the sonorities above the pedal tone undergo dramatic momentary alteration, structurally speaking these measures are static, prolonging the [0137] (V13) on the downbeats of mm. 5 and 7. Measure 9 begins with a new [0137] on the same bass note (belonging to the new oct. [0,1] collection, rather than [1,2]). As a parallel to the ending of the piece, my reading shows this C-sharp as belonging ultimately to the tonic harmony, not the dominant.

The first few measures of the second ending (mm. 21-24) contain perhaps the most significant linear motion in the work, quickly ascending from C-sharp to F-sharp in the bass. This motion supports the expansion of the melodic cell in m. 22, along with the peak in range and intervallic distance in m. 22 (Figure 4e). Stem-and-slur notation allows us to see this difference with ease. Moving forward in the graphs, we might also note that the second ending has its own deceptive harmonic motion in m. 26, related to the move to D major/F-sharp in m. 16 and more explicitly to the "backwards" neighbor note in the bass from mm. 5-9. Without a hierarchical reduction, the bass motion from D-sharp to D-

natural might seem disconnected from what comes before, but with a slur we can propose that the D-natural connects back to the C-sharp at m. 21 as a deceptive resolution.

Furthermore, a side-by-side comparison of the two graphs, abridged to just the bass voice in Figure 6, shows us that both endings share descending bass motion from scale degree 5 (C-sharp) to scale degree 1 (F-sharp). Of course, chord and set-class labels illustrate the harmonic differences between these two sections, but the linear notation permits us to compare the two bass-line descents at a glance. In my reading, both motions embellish their own tonic-related goal harmonies (bVI^6 at m. 16, and Iadd6 at mm. 27-end), but through octatonic pitches in the first ending and diatonic pitches in the second. Figures 5 and 6 also point out my interpretation of the D-natural in m. 26 as the end of the dominant span, an outgrowth of the same incomplete neighbor from the prolongations at mm. 5-9. These linear reductions are not intended to prove definitively that *O sacrum* is a tonally conceived work; rather, they aim to illuminate the possibility of a tonal reading.

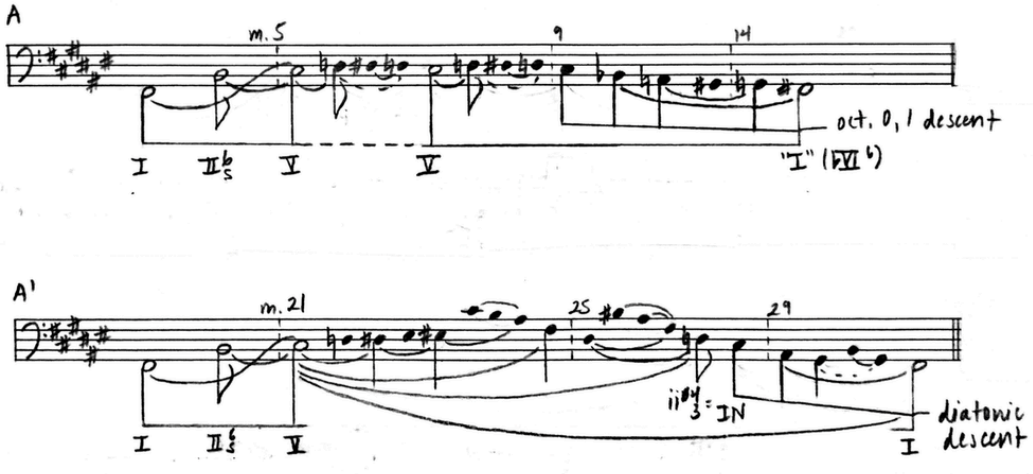


Figure 6: *O sacrum convivium*, complete bass line graph by section.

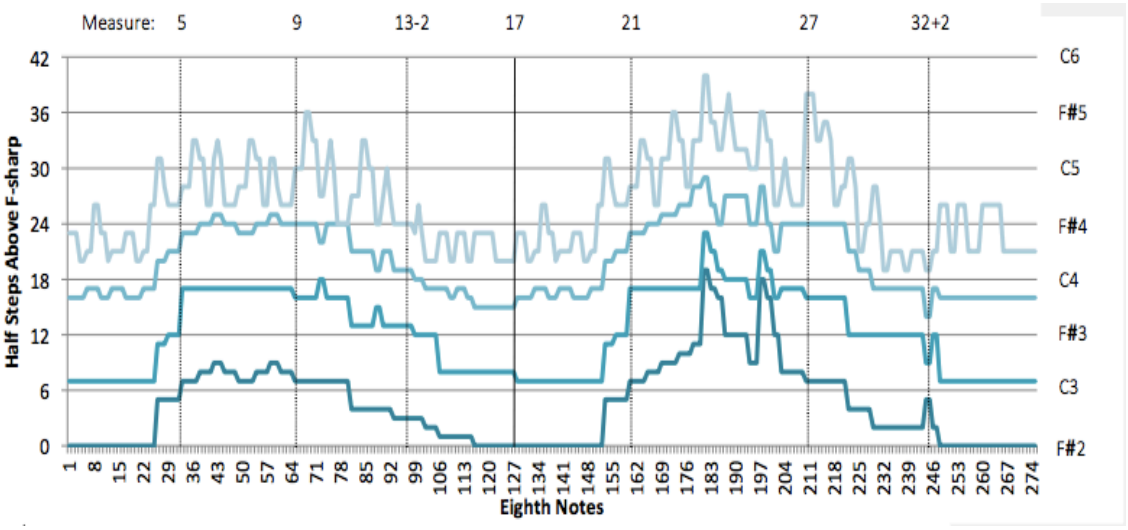


Figure 7: *O sacrum convivium,* distance in half-steps above the bass by eighth notes.

Before we move away from this tonal analysis, it will round out this view to note some of Messiaen's voice-leading patterns. In particular, long, sustained tones and restricted motion in the lower three voices create a steady foundation for the more freely-moving soprano. Additionally, and perhaps more importantly, this also results in an even more dramatic effect at "et futurae gloriae" (m. 23). The graph above (Figure 7) plots half-step distance away from F#2 (which equals zero in this system) against eighth notes. Measure numbers, corresponding with those provided as sectional divisions in Figure 3, are written above the graph with vertical lines on the plot area. At first glance, this graph might seem superfluous in that it simply conveys information about pitch and duration that is already present in the notation itself. However, barlines and different clefs can obscure longer-range connections and exact intervallic distance. Eighth notes provide an accurate abstract image of the work in time since there are no tempo shifts marked in the

score. With the exception of a final fermata, Messiaen has simply made note values longer to create the impression of slowing down.

This graph provides a clearer, more immediately comprehensible image of movement versus stasis in each voice. As mentioned above, the relative stasis of the lower three voices further dramatizes their increased activity at m. 23 (178th eighth note), where we see two quick spikes in register corresponding to the upward movement in mm. 23 and 25. Obviously, this graphic representation also makes changes in register and spacing very clear. We may note that each of the two halves has a slightly left-leaning arch shape corresponding to the relatively quick movement up to the dominant (C#3 in the bass, just above the second horizontal line) and slower descent back to tonic (F#3). It is also clear that the voices – especially alto, tenor, and bass – generally move together. Finally, these three voices are most often somewhat evenly spaced, with the most audible and visible exception at, again, mm. 23 and 25. Here the close-voiced tenor and bass lose their spacious grounding and fly up together, momentarily untethered.

Set-Class and Harmonic Complexity Index

What is missing from the foregoing analysis is an explanation of Messiaen's exquisitely colorful, one-of-a-kind sound world, defined to a considerable extent by vertical sonority. Despite the tonal underpinnings of *O sacrum convivium!,* a linear-reductive approach alone fails to engage fully the harmonic colors of the fascinating musical surface. In the following analysis, I will attempt to characterize Messiaen's harmonic language by examining both the most commonly and most rarely used set-

classes in this motet and their strategic placement within it. While Tim Pack successfully divides much of the work into fragments of the modes of limited transposition, and while the foregoing linear approach reveals deeper-level connections, the following approach zooms in further to study individual set-classes based on their own inherent properties; namely, their interval-class content and cardinality as determining factors of harmonic complexity.

O sacrum convivium's thoroughly homophonic texture disposes it especially to vertical divisions by individual chord. Since the soprano is the most agile voice throughout, its motion often determines the harmonic rhythm from chord to chord, as the other voices often remain static. The table below (Table 2) shows the percentages, by duration, of each of the set-classes listed, along with their HCI, any apparent tonal functions, and the sections to which they belong. T refers to the measures that unfold over a tonic pedal: mm. 1-3 and 17-19, while T (end) refers to the final structural tonic at mm. 27-end. PD refers to the two measures over scale degree 4, mm. 4 and 20; D1 and D2 point to the parallel passages beginning on V13 [0137]: mm. 5-9 and 21-26. The data in Table 2 represent every change in vertical sonority, even those resulting from eighth-note melodic embellishment. Embellishing chords have been abbreviated with HE and ME (harmonic and melodic embellishment) and HN and MN (harmonic and melodic neighbor).

Set-Class	Eighth Notes	Percentage	HCI	Primary Functions	Sections
[0358]	49	17.8	11	ii6/5, Iadd6, ii7	PD, T (end)
[0258]	39	14.2	14	iiø4/3	D1, D2
[0247]	37	13.5	12	IVadd9, Iadd9	PD, T (end)
[0137]	29	10.5	17	V13	D1, D2
[037]	23	8.4	5	Gm, bVI6	D1
[0158]	20	7.3	13	I7	T
[0148]	17	6.2	14	HE to IVadd9	T
[0257]	12	4.4	11	ME to IVadd9	T
[0347]	10	3.6	14	HN to {0137}	D1
[0248]	7	2.5	16	HN to iiø4/3	D1, D2
[0237]	7	2.5	14	ME to iiø4/3	D1, D2
[0147]	6	2.2	16	ME to {0236}, stepwise bass	PD, D1, D2
[0246]	6	2.2	17	V9	D1, D2
[0236]	6	2.2	18	HE to ii6/5, ME to {0147}	PD, D1, D2
[0157]	3	1.1	16	~viiø7	D2
[0135]	2	0.7	16	ii9	T (end)
[048]	1	0.4	6	MN to {0248}	D1
[025]	1	0.4	6	ME to ii9	T (end)

Table 2: Set-classes in *O sacrum convivium,* from most to least common.

[0358] is the most common single sonority by far, comprising a full 17.8% of the work. A major triad with an added sixth or a minor seventh chord, its sound is gentle and somewhat harmonically ambiguous, depending on the context. Its ic-vector is <012120>, revealing a somewhat even distribution of interval-classes other than the dissonant ic1 and ic6. At 11, [0358] has the lowest HCI of all the tetrachords in the work. [0358] occurs at various points of repose throughout, at end of mm. 4 and 20 as the predominant ii6/5, as an embellishment to more dissonant sonorities in section D1, and most notably in

the coda (m. 27ff) in two diatonic forms: as G#m7 and as the final, serene F#add6. Unsurprisingly, this settled sound is missing completely from the climactic D2 section.

Equally significant information may be gathered by considering the placement of two of the rarest tetrachords: [0157] and [0135], each of which occurs only once in the whole motet. Their rarity makes them all the more striking when they do occur, as they mark a deviation from (or perhaps a sudden expansion of) the surrounding harmonic palette. [0157] sounds on the downbeat of m. 23, at precisely the most climactic moment as decided by several other factors: new text, stretched rhythm of the two-bar melodic motive at m. 22 (from 9+7 to 9+9), upward sequenced melodic material in the two preceding measures, higher register, and increased motion in all voices. Messiaen's use of a unique tetrachord contributes to this decidedly special moment in the motet's form.

An even rarer tetrachord, [0135], occurs just once and for a shorter duration, in the coda (m. 30). With an HCI of 16, [0135] is the most dissonant sonority in the whole coda (beginning at m. 27) and occurs just before the choir finishes the long, drawn-out "Alleluia." It is also the downbeat of the last statement of the descending quarter-eighth-quarter-quarter pattern that begins in m. 28. Melodically, m. 30 continues the pattern established two measures earlier, beginning a diatonic third down from the downbeat of m. 29. Harmonically, however, Messiaen breaks from the decorated tonic harmony of the previous three measures and writes a ii9 instead. Especially in comparison with the much more consonant [0358] and [037] of the previous measure, and considering the bass note move away from the tonic triad to scale degree 2, [0135] sounds surprising and poignant.

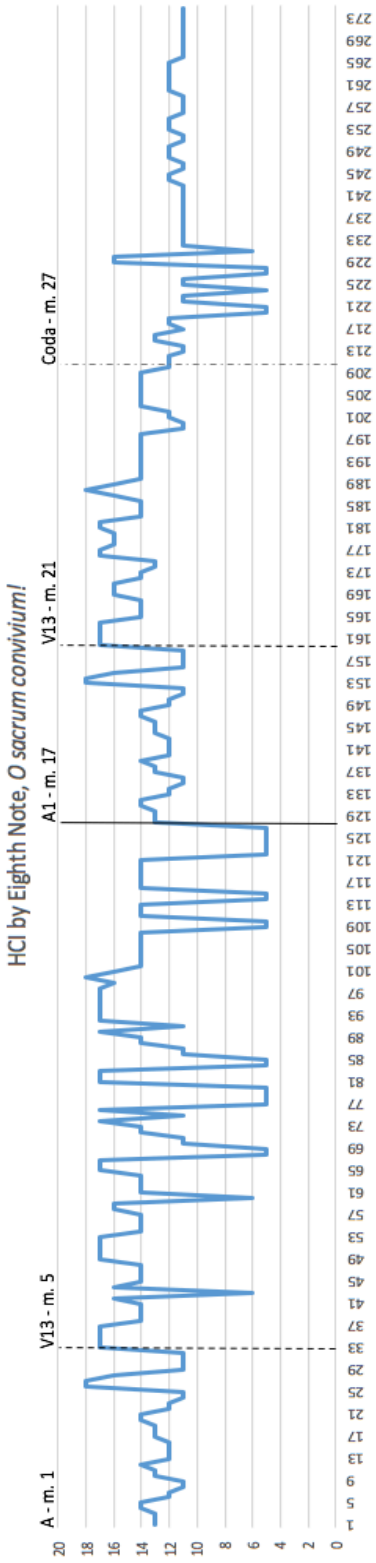


Figure 8: Graph of HCI against eighth notes.

Although there is significant variation within each section marked on the graph (Figure 8, again, corresponding with the sections assigned in Figures 3 and 5), the sections of highest overall HCI (those after mm. 5 and 21) actually match those highest in overall register (Figure 7). Looking back to the linear approach, these are also the sections that conventionally carry the most tension and expectation: those that prolong the dominant. Two separate analyses, then, each tell a similar story. In presenting a variety of analytic approaches, my aim has been to address Olivier Messiaen's *O sacrum convivium!* on its own special terms. While I believe Tim Pack succeeds in presenting evidence that relates the motet to the rest of Messiaen's output, I have sought instead to examine it in several ways that the music itself seems to request, hopefully describing its own unique harmonic idiom. This includes the tonal and octatonic elements mentioned by Pack[41] and the set-classes so carefully and innovatively considered by Forte in his writing on other Messiaen works. In its consistent homophony, clear form, and quasi-tonal bass motion, *O sacrum* serves as a useful first example of this multifaceted approach, to be further explored in two other early works.

[41] Pack, 243.

CHAPTER THREE:

ANALYSIS OF "LA COLOMBE" FROM *HUIT PRÉLUDES*

Introduction

Messiaen wrote his *Huit Préludes* for piano in 1928-9, while still a student at the Paris Conservatoire. Though this early collection has justifiably drawn comparisons with Debussy's preludes, Messiaen's preludes display formal symmetry and stricter rhythmic organization, along with a harmonic language derived from his modes 2 (octatonic) and 3.[42] The first prelude foreshadows the composer's development of his own unique modal language while expressing straightforward linear relationships. In some ways, "La colombe" ("The Dove") is more conventionally written than *O sacrum convivium* in that most chords may be easily explained with tonal labels, and all fit within a recognizable tonal pattern, even at the deepest level of structure. However, the prominent use of the octatonic [1,2] collection in combination with the E major tonality imbues the prelude with its own distinctive harmonic color.[43] Like *O sacrum,* "La colombe" presents similar formal patterns when examined from a linear viewpoint and a view focused on set-class.

[42] Griffiths, 33.

[43] This feature is also mentioned in these two overviews of the prelude: Griffiths, 34-35, and Peter Hill, "Piano Music I," in *The Messiaen Companion,* edited by Peter Hill (Portland, OR: Amadeus Press, 1994), 73-76.

The work's modal contents are thoroughly explained in Jonathan Bernard's article on Messiaen's synesthesia. Here, Bernard writes that the two distinctive voices – the lower two staves and the intermittent, embellishing upper staff – derive from modes 3(2) and 2(2) (mode 3, 2nd transposition, and mode 2, the octatonic collection, 2nd transposition; henceforth labeled "oct. 1,2") respectively, while the piece as a whole may be read in E major.[44] Bernard's Figure 2b, which displays the pitch overlap between 3(2) and 2(2), is reproduced below as Figure 9. Bernard, aiming to account for Messiaen's own description of the work as "orange, veined with violet,"[45] perhaps overemphasizes the importance of mode 3(2) (which Messiaen associated with orange); though there are a few chords in mm 8-9 and 18-19 that can only be classified as 3(2), much of what Bernard calls 3(2) can easily be explained as E major, which is in line with the readings of Griffiths and Hill (cited above). Regardless, Bernard's article is worth studying for its thorough account of Messiaen's "color-hearing" and its implications for analysis.

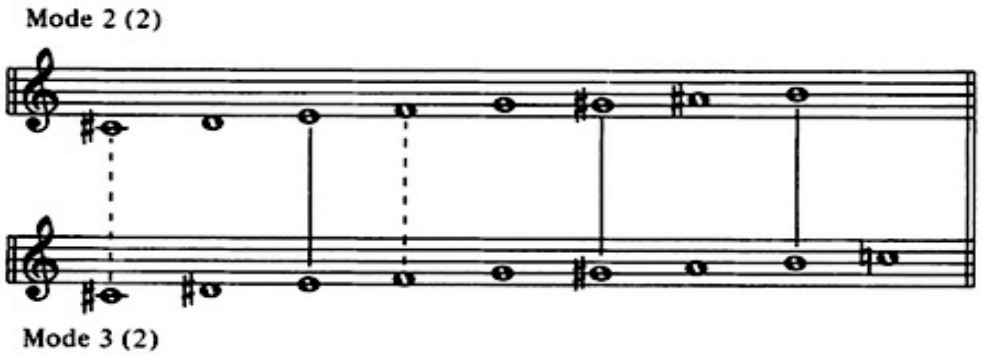


Figure 9: From "Messiaen's Synaesthesia."

[44] Jonathan Bernard, "Messiaen's Synaesthesia" *Music Perception* 4, no. 1 (Fall 1986): 50.

[45] Olivier Messiaen, "Olivier Messiaen analyse ses oeuvres," in *Hommage à Olivier Messiaen: novembre-décembre 1978* (Paris: La Recherche artistique, 1979), 22.

Linear-Reductive Reading

Though in my reading the prelude lacks the predominant of most conventional *Ursatz* forms, a linear representation of its harmonic contents allows us to see some clear tonal patterns. In fact, we will see that this work is the most closely tied to tonality of all three works discussed in this paper, and thus the most readily represented by linear analysis. As shown in the graph below (Figure 10), this short work may be read conceptually as an extended parallel interrupted period, with the interruption occurring at the V9 chord in m. 10.[46] Unlike *O sacrum convivium*, which shares this basic modified strophic form,[47] the prelude features clearer bass lines and more definitive cadences, particularly at the end. Furthermore, here there is a clear structural interruption with a dominant-function sonority at the end of section A (m. 10), while the end of A in *O sacrum* moves mysteriously to bVI^6 (m. 16); there, the initial tonality is left unresolved, but is not interrupted in the traditional sense. In the motet, Messiaen expands and blurs the space between scale steps with highly chromatic chords; here, he decorates a more straightforward underlying structure with splashes of color in the highest voice (see the upper staff, for example, at mm. 1-2, 11-12, and 21-22) and with chordal extensions on the functional dominant, such as in mm. 10 and 19-20. Figure 10 expresses the pared-down harmonic construction of the prelude, from m. 11.[48]

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[46] Douglass Green, *Form in Tonal Music*, 2nd ed. (New York: Holt, Rinehart and Winston, 1979), 58.

[47] Healey, 172.

[48] mm. 1-8 are repeated exactly as mm. 11-18; mm. 9-10 contain an extended dominant with an identical function to that in mm. 19-20, graphed in Figure 10.

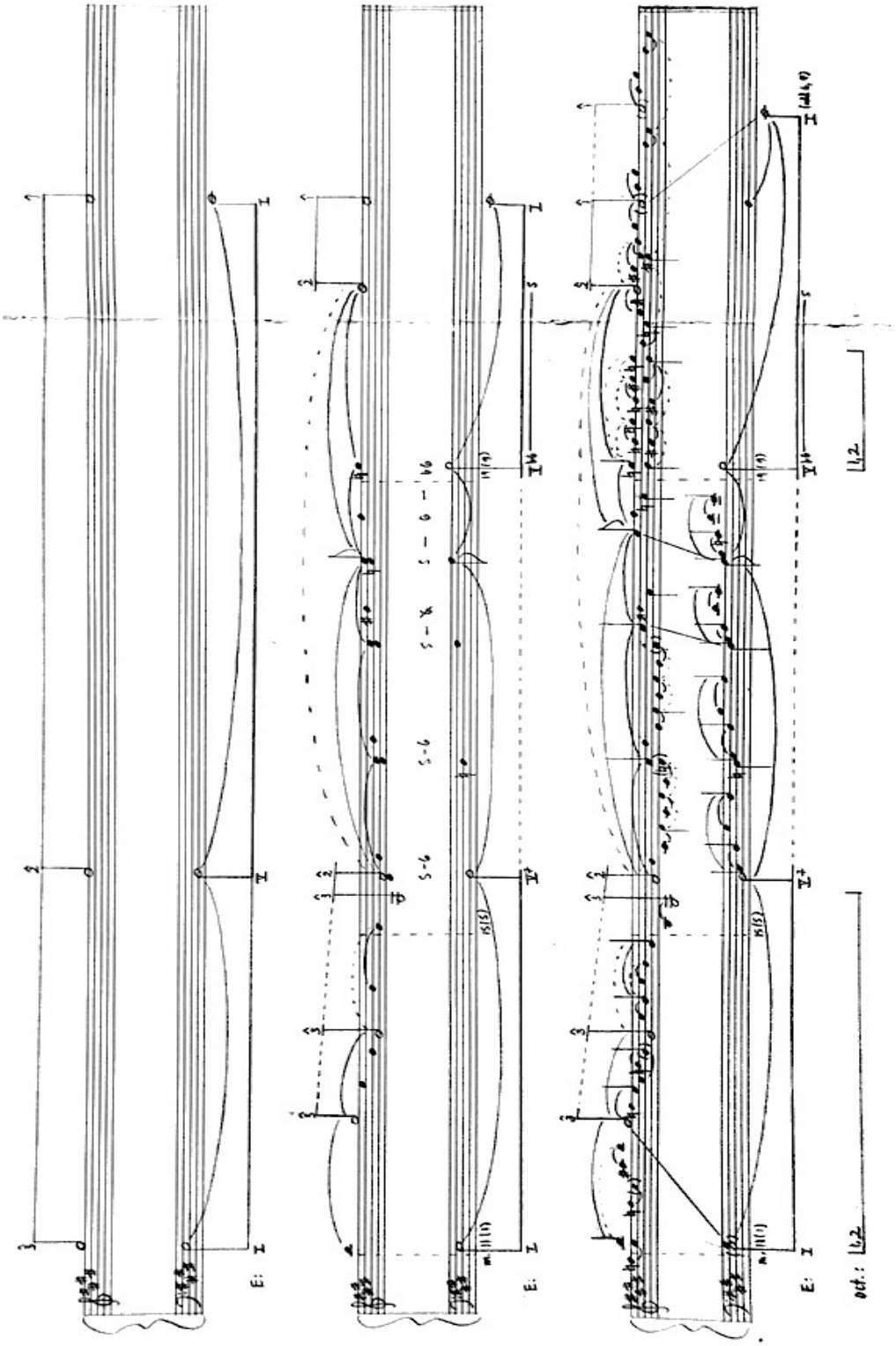
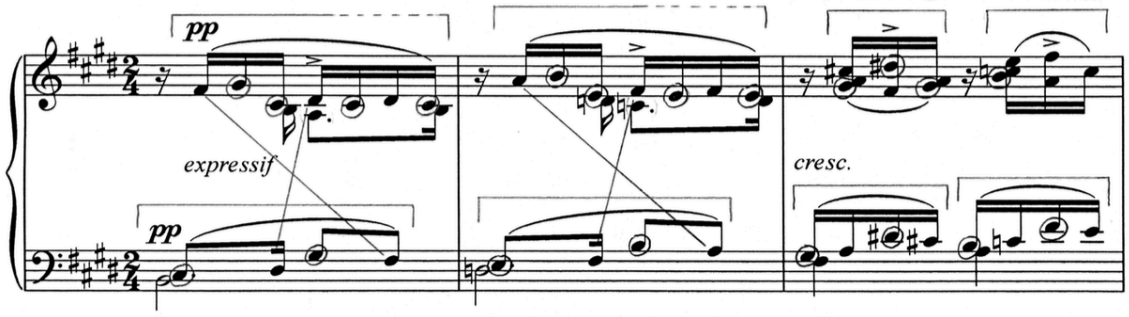


Figure 10: Linear reduction, “La colombe,” m. 11 – end.

Despite its many recognizably tonal features, the short piece differs from a "typical" tonal work in two deeper-level respects. First of all, lacking a discernible predominant *Stufe,* I show that the music proceeds directly to scale degree 5 in the bass from a prolonged tonic harmony. Secondly, the "dominant," first expressed in each section via bass arpeggiation (in mm. 6-8 and 16-18), includes a D natural rather than the leading tone D sharp, replacing the asymmetrical dominant seventh chord [0258] with the symmetrical minor seventh [0358]. Each member of the bass arpeggiation supports a triad or seventh chord as its root; mm. 6-8 and 16-18 consist of B7, D7, F#m, and Am. The lowered seventh scale degree, however, is "corrected" at the real dominant of each section (mm. 10 and 20), which permits a half cadence in the first section (m. 10) and an authentic cadence in the second (mm. 20-21). As shown in Figure 11, the modal D natural remains at the middleground and disappears at the background, as do the neighbor E and appoggiatura G in the top voice, and the neighbor A in the bottom voice. The surface parallel fifths that occur during the ascending dominant arpeggiation are mitigated by the passing tones that fill in the upper voice, so that instead of a 5-5-5 etc. interval pattern, 5-6-5-6 etc. emerges, continuing all the way to the upper voice's high point on the G natural (mm. 9 and 19).

Of course, the musical surface presents various other distinctive features. Referring back to Figure 9, Bernard explains the F natural prominently featured in mm. 1-3 and 11-13 as derived from both modes 3(2) and oct. 1,2, and the A sharp and D natural from the same measures as members of mode 2(2). Just as significantly, the final dominant harmonies of each section (mm. 21-23) are extended chords, featuring an added

major 9th (m. 10, beats 1 and 2) and added diatonic 9th, 11th, and 13th (m. 20, beats 3 and 4). Like the closing tonic of *O sacrum convivium,* the final chord here features an added 6th and an added 9th, both in the left hand sustained chord and in the decorative 16th notes in the middle staff (mm. 21-end). In a move of striking structural organicism, this embellishing 16th-note pitch pattern is an echo of the pattern found in the upper voice over the minor dominant arpeggiation (mm. 6-8, 16-18). In these instances, the motive also provides chordal extensions of the 9th and 13th. As shown in Example 3, the B7 chord at the beginning of each of these passages is decorated by G sharp and C sharp in the right-hand 16th notes. This motive continues through the next two measures, shortened to two beats in the third measure of each group (mm. 8, 18), and is presented in retrograde in the left hand under each right-hand presentation, creating a series of voice exchanges throughout the bass arpeggiation of the modified dominant.



Example 3: “La colombe,” mm. 6-8, 16-18.

Throughout the piece, members of the octatonic collection [1,2] on the lower two staves and the embellishing upper staff forms a "counter-structure" that interacts with the more readily experienced E major tonality. Clearly asserted in the beginning melody of each section (mm. 1-5, 11-15) through the replacement of F sharp, A natural, and D sharp with F natural, A sharp, and D natural, the mode disappears during the dominant arpeggiation discussed above and reappears for the first three beats of mm. 9 and 19 before the final structural dominant of each section. Within each of these dominant sonorities sounds several pitches of the E major diatonic collection (V9 contains 5 in m. 10, V13 states all 7 in m. 20), in contrast with the octatonic collection that comes before. Thus, it seems possible that Messiaen reintroduces the initial octatonic collection 1,2 specifically to highlight the diatonic, functional dominant of each section.

Set-Class and Harmonic Complexity Index

The harmonic complexity index provides yet another lens through which to view the work. While *O sacrum convivium,* in its almost complete homophony, presents a series of straightforward trichords and tetrachords, the measurement of HCI here requires the additional process of deciding which tones are chord members and which are not. Example 3 shows mm. 6-8 and 16-18, with non-harmonic tones circled. In this reading, I have taken all vertical sonorities (such as the extended dominants at mm. 10 and 20) as written, and have included the chordal extensions in mm. 6-8 and 16-18 (added 6^{th} and added 9^{th}) as proper chordal members rather than as non-harmonic tones. Of course,

including the chordal extensions in the set-class analysis (for example, G sharp and C sharp on the B7 in mm. 6 and 16) yields larger sets, and thus sets with a higher HCI.

Although I have only reproduced the inclusive reading in Figure 11, readings both with and without the added notes as chord tones show an increase in harmonic complexity index over the dominant in each section (beginning at mm. 6 and 16, extending through mm. 10 and 20); the reading given here simply shows a more dramatic increase. Both readings also demonstrate that the point of highest overall dissonance occurs at m. 20, on the two final expressions of the dominant (V13 with a flat 9^{th}, and V13), the latter of which states the full E major diatonic collection on beats 3 and 4. The final tonic chord, with its added 6^{th} and 9^{th}, is also somewhat dissonant, especially in comparison with the initial, straightforward tonic triad of each section. These more complete statements of the diatonic collection, at the end and, to a lesser extent, at the V9 in m. 10, explicitly contradict the octatonic collection 1,2 that has persisted throughout the work, allowing it to close comfortably in the realm of E major. Figure 11 presents a graph of HCI against sixteenth notes, as derived from a reading that includes the 6ths and 9ths in mm. 6-8 and 16-18 as members of the analyzed sets.

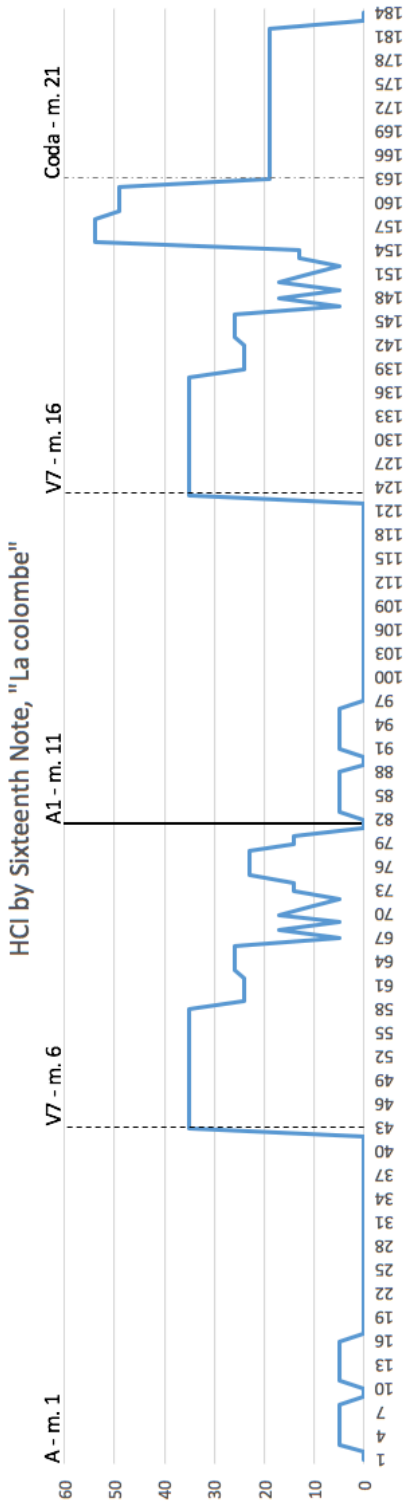


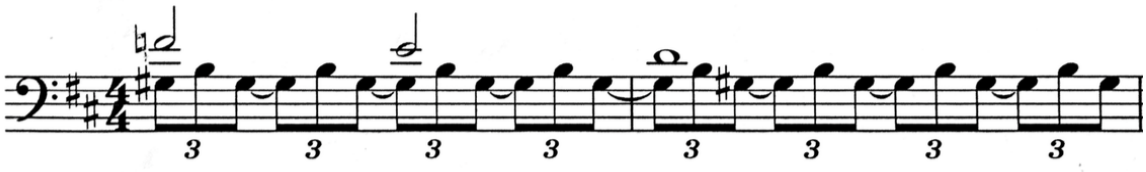
Figure 11: HCI in “La colombe.”

While the harmonic complexity index proved to carry significant interpretive weight in the more chromatic, harmonically dense landscape of *O sacrum convivium*, in "La colombe" its primary role is to supplement the more straightforward tonal reading. It serves to describe obvious harmonic tensions, like the fact that B7 is more dissonant than E major at mm. 6 and 16, and that the final V13, as the work's sole heptachord, is the largest and most dissonant verticality in the work, and thus the chord with the highest HCI. Since this work is the most tonal of all the music considered in this paper, it presents the fewest problems in graphing. As such, for this particularly tonal early work, linear-reductive analysis combined with octatonic identification is perhaps the more precise tool, in that it shows harmonic connections, surface motives, and voice-leading; however, as shown in Figure 13, HCI confirms the formal tensions revealed in the tonal analysis with another, separate analytic tool. Tension builds in tonal anticipation and in set-class complexity toward the unresolved end of the first section (mm. 9-10); the section is repeated and tension increases further the second time (mm. 19-20) toward the final resolution.

CHAPTER FOUR: ANALYSIS OF MM. 55-END OF "LA FIANCÉE PERDUE" FROM *TROIS MÉLODIES*

Set-Class and Harmonic Complexity Index

The closing section of "La Fiancée perdue" (mm. 55-end), from *Trois mélodies* (1930), features more triadic sonorities than *O sacrum convivium,* but arranged in a far less functional syntax than that in either the motet or the prelude. Primarily constructed from major and minor triads [037] and diminished triads [036], this concluding passage features octatonic writing throughout, within its mostly stepwise, chromatic descent, and a quasi-tonal ending. The smoothly descending bass line (in half steps until the last six measures) is aided by the accompaniment's thoroughly syncopated rhythmic setting in preventing the listener from experiencing any goal-directed motion (Example 4). Rather, through the slow, irregular harmonic rhythm, alternating placement of non-harmonic tones, and unpredictable series of different sonorities above the left-hand pattern of parallel minor thirds, the listener becomes accustomed to listening without definite expectation.



Example 4: Syncopation in the accompaniment to "La fiancée perdue," mm. 55-56.

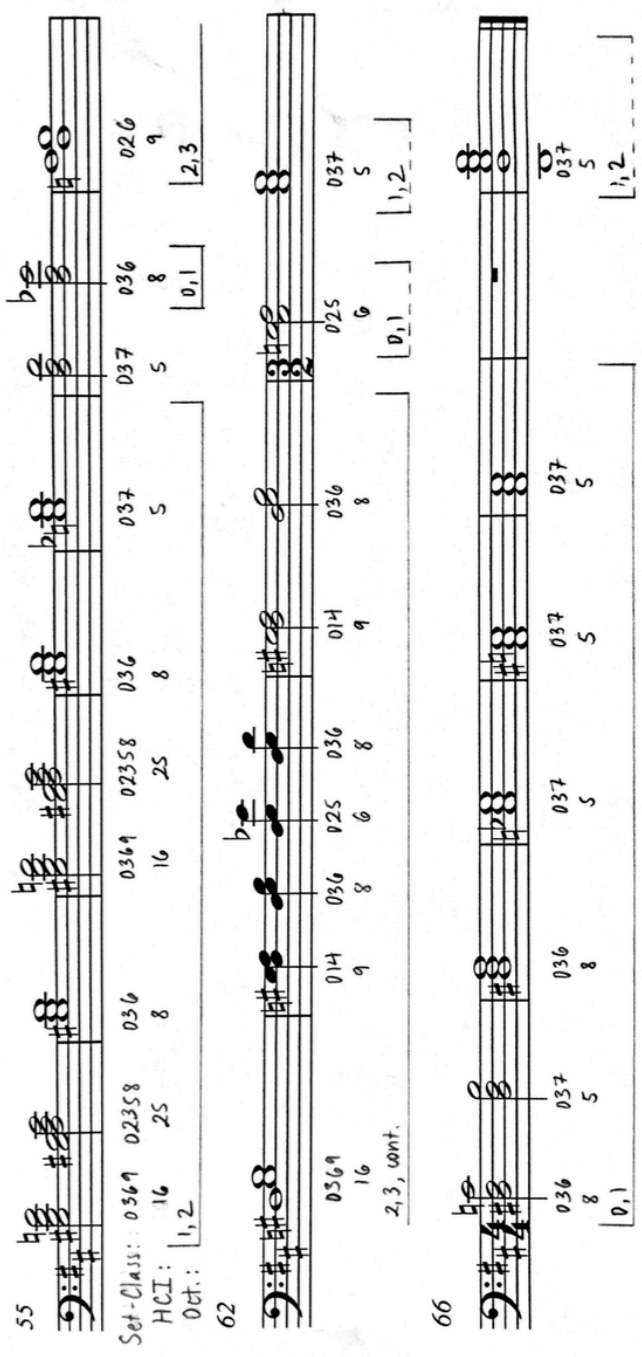


Figure 12: Chordal reduction of “La fiancée perdue,” mm. 55-end, with set-class, HCI, and octatonic labels.

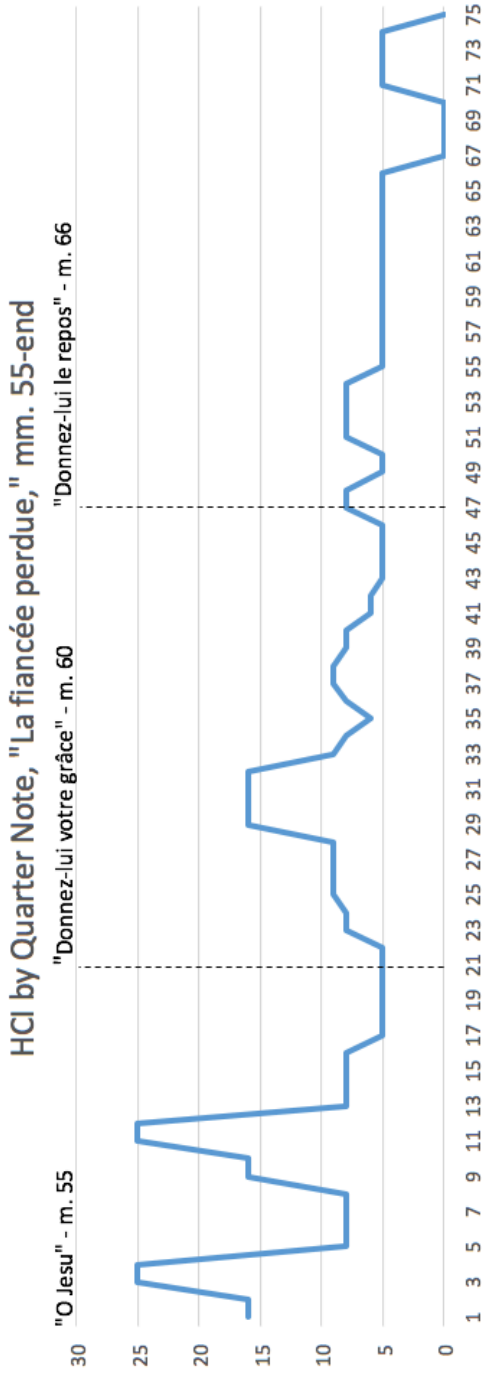


Figure 13: “La fiancée perdue,” mm. 55-end, HCI by quarter note

Compared with *O sacrum convivium* and "La colombe," the ending of this passage, though basically tonal, is less clear: though preceded by a straightforward major dominant triad (unlike the motet) and containing tonic D in the bass, the final chord is in second inversion and is thus somewhat destabilized. The musical material that precedes the ending, however, is even more puzzling, presenting several interpretive possibilities. While I have chosen to present linear analyses of the other two works before zooming in on set-class identity, in this passage it will be helpful to begin with smaller-scale observations about set-class and HCI, and then put forth several possible linear interpretations. The chordal reduction provided above (Figure 12), with pitch-class set and dissonance index labels, reflects a surface-level reading of the passage from which to begin.

This reduction, paired with Figure 13, allows for a few general observations. First, as stated above, the trichords [037] and [036] are the most frequently occurring, occupying 28 and 20 beats out of 70 beats (not including resting bars 71 and 73), respectively. [0369] takes eight beats, [0258] and [026] take four beats each, while [014] and [025] each take three beats. The prevalence of [037] and [036], though the triads are not arranged in a conventional syntax, permits glimpses of tonality within chromatic foreground linear motion. Another large-scale statement we might make is that, despite some variance, the overall harmonic complexity as measured by the HCI decreases over time, culminating in an extended series of [037] trichords (mm. 68-73). Of course, in a purely tonal context this observation would mean very little. However, emerging from the variety of more dissonant trichords and tetrachords in the previous bars, the three

consecutive [037] trichords create a quietude that matches the text: "[grant her] rest, Jesus." The whole text of the passage, written by Messiaen at the age of twenty-one, is as follows:

> *O Jésus, bénissez-la! Elle! Donnez-lui votre grâce puissante!*
> *Qu'elle ignore la souffrance, les larmes! Donnez-lui le repos Jésus!*
>
> *Oh Jesus, bless her! She! And to her grant your all-powerful grace.*
> *That she may know no suffering, no tears! Grant her rest, Jesus![49]*

The chordal reduction with prime-form labels and corresponding HCI also provides a new lens through which to define phrase structure more precisely. Within an overall lowering of range and decreasing of HCI, the music is phrased irregularly, as determined by changing harmonic rhythms and unique patterns of set-classes to reflect the prose-like text. Measures 55 through 58 set the initial appeal for Jesus' blessing upon the deceased fiancée. Each two-bar group moves lower in HCI with a spike in the middle (from 16 to 25 to 8), while the four bars remain the most dissonant section with respect to the rest of the passage. "Elle!", an outcry of "She!", is set by itself in m. 59, a brief respite on [037] before launching back into the speaker's series of pleas.

Measures 60-62 and mm. 63-65 are melodically parallel phrases; the latter vocal melody is embellished, and the harmonic rhythm is faster. The second phrase of this pair, on the text "Quelle ignore la souffrance, les larmes," begins with the sonority changing every beat in m. 63 (to match the voice) and decreases in harmonic complexity index, settling on [037] in m. 65. The final phrase (mm.66-73), as noted, concludes on three

[49] Translation by Sean McCutcheon, liner notes to *Messiaen: Chants de terre et de ciel,* Suzie Leblanc et al., ATMA Classique ACD2 2564, CD, 2008.

different iterations of [037] after the first two bars of [036]: C minor, A major, and G major over D in the bass. These closing bars mark a return to the longer note values and descending stepwise melodic motion of the first four measures. Messiaen also writes silence into the accompaniment here for the first time in the whole passage. The complete silence on the first three beats of m. 71 somewhat abruptly interrupts the continually flowing rhythm, dramatically setting the final word, "Jesus," which recalls the beginning cry of "O Jesus."

Linear-Reductive Reading

Though the set-class labels and harmonic complexity index describe the aural landscape of the work along with the role of harmonic complexity in phrase shape, they alone cannot provide any information about the linear structures underpinning the whole excerpt. A three-part graphic examination of this material, including linear motion, potential tonal function, set-class, and octatonic designation, yields a clearer picture of Messiaen's musical patterning than these atonal parameters alone. Taken together with contrasting linear reductions, however, set-class labels help to determine which chords are structural in a quasi-tonal context. Looking back at the chordal reduction in Figure 12, perhaps the most easily discernible pattern is parallel minor thirds in the lower two voices, descending by half-step through m. 67. The descent of the lowest voice continues to C, A, and D beginning at m. 68; the final two chords, however, are major rather than minor. Although, as mentioned above, the final chord is a second-inversion IV chord, the

bass motion from A to D refers to a tonal ending with clarity of motion not found elsewhere in the passage.

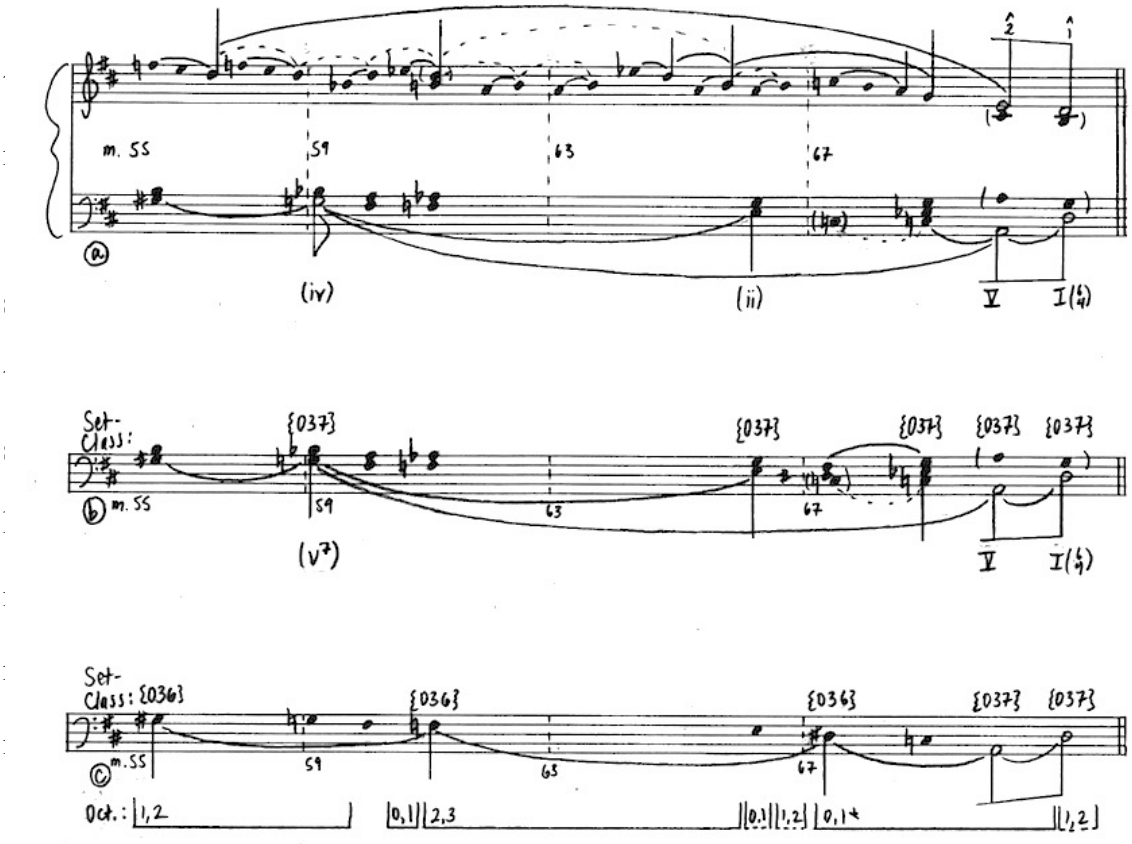


Figure 14: "La fiancée perdue," three interpretations, mm. 55-end.

By stemming all of the root-position major and minor triads, I have arrived at the quasi-functional bass patterns shown in the first two readings of Figure 14. Figure 14a provides a structural subdominant, while Figure 14b does not, favoring instead a prolonged, modified dominant 7th. The difference is somewhat subtle, as G, E, and A all remain stemmed and interconnected; however, each version represents a different formal conclusion. While both versions consider the first four measures to be an incomplete upper neighbor to the G minor chord in m. 59, Figure 14a divides the music that follows

by marking m. 65 as the end of the subdominant prolongational span and defining a new structural event at the final portion of the text (m. 66-end). This first reading also minimizes the importance of the C minor chord in m. 68 as an embellishing chordal skip in relation to the dominant that follows, while the same chord enjoys structural status as part of the arpeggiation in Figure 14b.

While 14a accounts for one more division of structure than does 14b, the latter perhaps more elegantly captures the passage's sense of one broad descending motion, and allows for the equal importance of every root-position major or minor triad rather than ranking them in relation to an expected tonal model. The resulting graph, however, still expresses a type of prolonged dominant, from the G in m. 59 through the A in mm. 69-70. Here, as in the first piano prelude, the underlying structural "dominant" is itself mixed, substituting a lowered 7^{th} scale degree for the leading tone. As we observed in the modified arpeggiated dominant of "La colombe," (mm. 6-8 and 16-18, Figure 10), this substitution transforms the asymmetrical dominant seventh chord [0258] into the symmetrical minor seventh chord [0358]. Also as in the prelude, each member of the arpeggiated structural dominant in this bass line supports a root-position tertian sonority.

Neither interpretation 14a nor 14b conveys a classical *Ursatz*, for several reasons. At the foreground, the bass tones, though chromatic, relate to each other through easily labeled passing and arpeggiating motion. The bass tones of the chromatic half-step descent, however, support chords that interact in non-functional ways. For instance, the G#° chord prolonged through the first four measures unexpectedly embellishes G minor in m. 59, and $B^{Ø7}$ (enharmonically) morphs into $B°^{7}$ in m. 62. While the modified

continuation of this sonority in m. 64, spelled as G#°, "resolves" (via non-traditional voice leading) to a semblance of Am7, the latter chord merely decorates the Em that follows, so in structural terms there is no functional resolution. In addition to the lack of functional motion between chords, there is no initial tonic *Stufe*, and the upper voice, which locally prolongs the motion D-B-G-E, creates a problematic series of parallel fifths with either of the first two interpretations shown in Figure 14.

Considering some of the problems posed by a tonal approach, Figure 14c uses stem-and-slur notation with the alternate aim of showing octatonic relationships. Brackets indicating octatonic membership are included below the graph; single and unembellished chords, which sound less distinctively octatonic in comparison with the surrounding material, are marked with dotted brackets. With this new focus, a completely different structure emerges, placing emphasis not on set-class [037], but on three diminished sonorities. The three stemmed bass notes in Figure 16c support diminished chords beginning at m. 55 (begins [0369]), m. 61 (begins [026] at the surface; aligned at the background to show A "resolving" to A-flat), and m. 66 (begins [036]). Each of these moments marks the beginning of a new octatonic collection: [1,2], [2,3], and [0,1], respectively. Thus, as shown in 14c, Messiaen spends considerable time in each distinct octatonic collection, with three short moments outside the prevailing collection.

At m. 60, the D/F# chord (with its decoration) on the first two beats has no octatonic membership, while the chord on beats 3 and 4 (considering its embellishment) belongs not to the previous [1,2] collection or the following [2,3], but to [0,1], which occupies the closing section of the passage. While the two chords in m. 65 also deviate

from the previous collection (belonging to [0,1] and [1,2], respectively), their tertian construction, free of non-harmonic tones, lacks the stronger octatonicism established by the upper-voice passing-tone figuration present above many other sonorities in the passage. Finally, the last chord, G major with D in the bass, belongs to [1,2], with only one tone (G) in common with the previous [0,1] collection. Thus, with this final harmony, Messiaen draws a longer-range connection back to the beginning of the excerpt, which also belongs to [1,2]. Notably, this connection would not be possible if Messiaen chose a conventional tonic triad for the ending, as D major belongs instead to [2,3].

Although the surface patterns of this passage from *Trois mélodies* are highly chromatic, and their relationships not immediately clear, a multifaceted analytical approach helps to reveal the music's inner workings, which may be classified using both a tonal approach, informed by set-class, and an octatonic approach. Meanwhile, a consideration of set-class identity and harmonic complexity index explains that, overall, the passage decreases in dissonance from the beginning to the end, mirroring its descent in vocal and piano range. The middle high point in dissonance occurs at m. 62 on the word "puissante," which serves as the point of departure into the second of two parallel phrases; the second ends on a consonant [037]. Set-class identity, applied in conjunction with linear-reductive analysis, displays a larger formal picture of the work. Taking the recurring root-position major and minor triads [037] as structurally significant, I observed through two related but contrasting analyses that the underlying composition of the passage could be read to consist of quasi-tonal relationships; the second of these analyses matches a pattern also found in the first piano prelude. Finally, a consideration of

octatonicism reveals Messiaen's preoccupation in this passage with expressing each octatonic collection, and makes apparent a connection from beginning to end through joint membership of mm. 55-59 and 71-73 in octatonic collection 1,2.

CHAPTER FIVE: CONCLUSION

It has been my aim in this paper to illuminate three early works of Olivier Messiaen with two methods of analysis. Each work explored above refers to tonality in some capacity, whether most convincingly at the final cadence, as in "La fiancée perdue," or throughout the work, pervading all levels of structure, as in "La colombe." Therefore, I have applied stem-and-slur notation and a considered a modified version of Schenkerian prolongation wherever reasonable. The extent to which tonality defines each work is reflected in the completeness of each corresponding graph and in the supplemental information provided. In the instance of "La fiancée," which arguably exhibits octatonic organization more strongly than tonal structure, I have provided three different linear interpretations, the last of which reflects the passage's octatonic construction.

Because each of these works comprises unique surface sonorities that operate alongside linear structures, I have also provided a set-class analysis for each composition. This second analytic method includes the harmonic complexity index, a tool intended to combine set-class cardinality and intervallic dissonance (through the ic-vector) to give a simple measure of harmonic complexity in works that merge tonal and atonal approaches to harmony. In addition to discussing each work's characteristic set-classes, I have provided line graphs, overlaid with formal labels, to illustrate the operation of HCI as a formal feature within the sections of each composition.

Among many other methods, many of which are cited at the beginning of this paper, the harmonic complexity index is an attempt to quantify harmonic complexity in terms of intervallic dissonance and set-class cardinality. The greatly increased variety of acceptable vertical sonorities in the post-tonal harmonic language have made such measures appealing tools for analysis. Especially in combination with other analytic tools, HCI reveals the nuances of a work's formal shape. In the repertoire studied here, HCI has allowed me to track harmonic complexity over time and relate it to more traditional expectations of harmonic tension; in both *O sacrum convivium* and "La colombe," for example, HCI is highest during dominant prolongations. In the excerpt from "La fiancée perdue," HCI corresponds closely with another, perhaps even more audible feature: as the passage descends in range, so does the overall HCI.

Of course, in its current form, this new method of analysis has several limitations. First, consistent HCI readings are only possible from a musical surface consisting of well-defined vertical sonorities. The tool is meant to describe the complexity of a particular moment in listening time; therefore, harmonies defined over a long stretch of time or those fleetingly implied by a polyphonic texture may not be represented accurately by HCI measurements. The essentially pure homophony of *O sacrum convivium* displays the HCI at its most powerful, while the pianistic textures of the other two works, while still voicing audible underlying harmonies, test the flexibility of the tool, requiring the analyst to make more decisions about chordal identity. Second, dissonance perception, an integral component of HCI is, of course, somewhat subjective. Though I have aimed to synthesize common-practice norms of consonance and

dissonance with the more "objective" rankings suggested by the harmonic series, the hearing of dissonance itself by any given individual may be influenced by a wide, unknowable variety of cultural and experiential factors. My scale of consonance to dissonance is partly informed by my specific (albeit widely shared) context of tonal hearing; that is, interval-classes ic3, 4, and 5, which make up major and minor triads, rank lower in dissonance than ic1, 2, and 6.

A third potential limitation of the HCI is its foundation in the interval-class vector, a measure which relies on pitch-class rather than pitch and therefore disregards spacing and presumes inversional equivalence. This dependence on ic-vector partly undercuts the use of the harmonic series in determining dissonance rankings, as the harmonic series demonstrates the mitigation of dissonance through wider spacing and shows certain intervals as far more "consonant" (closer to the fundamental) than their inversions (the perfect fifth, for instance, appears much lower in the series than the perfect fourth). The final drawback I will mention is the use of simple integers in calculating HCI. While Cook and Deliège have suggested more complex formulae deriving from the intricate mathematical relationships within the harmonic series, I have sought to provide a simpler analytic tool with which the analyst might quickly define the harmonic landscape of a sonority-focused post-tonal work.

Considering the above limitations on the HCI in its current state, some questions for future, related analyses include: How might the harmonic complexity index be modified to suit other musical textures? Should there be a systematic approach to deciding which pitches are chord members and which ones are not? Does the given

ranking of dissonance suit other repertoires? How might the integers provided be changed to account for other, non-Western musical systems? Should they be integers at all, or would more finely-tuned values provide a clearer picture? Should the integers or other multiples in the formula strictly abide by the harmonic series or by some other measure? How could the HCI better represent spacing and specific intervals (not interval-classes)? Might the HCI apply to tonal music, and especially the extended tonality of the late 19th and early 20th centuries? Might the HCI apply to more completely atonal music, with fewer "tonal vestiges" than the works studied here?

I believe that all of these considerations are valuable, and that they will help to point the way forward from this new approach to harmonic complexity. In devising the harmonic complexity index, I hope to have provided a starting point for discussion, modification, and further analysis. In particular, I think that the HCI as a measuring tool is especially powerful in combination with other musical considerations. In the repertoire examined here – *O sacrum convivium,* "La colombe," and the end of "La fiancée perdue" – linear-reductive analysis has served as a companion tool, highlighting the voice-leading patterns beneath the surface of each work while the HCI has considered the verticalities not fully appreciated by linear analysis. Like these compositions, many masterpieces of the modern literature feature passages of tonal or quasi-tonal writing while displaying a vast, colorful palette of expressive sonorities. Such works deserve to be loved and understood for their own musical language, and through my own small attempt to do so, I hope to have contributed something of interpretive value.

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