

**TRANSFORMATION AND GENERIC INTERACTION
IN THE EARLY SERIAL MUSIC OF IGOR STRAVINSKY**

by

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ABSTRACT

A characteristic of the early serial music of Igor Stravinsky is its incompatibility with the canonical twelve-tone model derived from the compositional practice described by Arnold Schoenberg. The idiosyncratic expressions of serial techniques intermixed with non-serial linear constructions, and the commingling of diatonic and non-diatonic pitch objects have presented a considerable analytic challenge to those who have encountered this repertoire from the perspective of classical serialism. This, in turn, has engendered a considerable amount of scholarship that acknowledges the limited explicative potential that serial theory holds for this repertoire.

This dissertation investigates the compositionally continuous and discontinuous serial and non-serial formations found at or near the musical surface in works selected from Stravinsky's early serial music, draws these formations into relationships through the analytical apparatus of an original *transformational system*, and explores their interactions through the *model of generic set-class space*. Ultimately, a dynamic model of the pitch structure for each of these works emerges that transcends order relationships embedded within the linear formations.

Chapters 1 and 2 of the dissertation identify the salient issues pertaining to the analysis of Stravinsky's early serial music, outline the analytical objectives, and develop the transformational system and the model of generic set-class space. The dissertation examines the group of functions that determines the symmetry transformations of a geometric figure and defines the music-theoretic analogues of canonical and non-canonical serial operations and operations in pitch-class set theory, and briefly explores the set-algebraic operations that underlie the combinational processes fundamental to pitch-class set theory. In doing so, the dissertation identifies a collection of transformations that coalesce into the transformational system, including the non-canonical transformations of *distortion* (stretching, shrinking, and substitution) and the

near-equivalency transformation (the latter developed from the ideas of Joseph Straus and Allen Forte).

Transformational analysis, operating within the context of the model of generic set-class space, elucidates relationships among pitch-class objects, explicates the transformational processes that act on these objects, and provides a means by which to gauge invariance and change among pc objects. Through local and global interactions of the mechanism of the transformational system and the generic model, the multifarious linear and vertical pitch-class objects discovered through analysis coalesce into a network of nodes and transformational pathways that link them together in set-class space. The formulation of the model of generic set-class space—shaped by the theories of Richard Chrisman, Allen Forte, Roberts Morris, and Richard Parks—is in response to the diverse generic models proposed by Arthur Berger, Henri Pousseur, Pieter van den Toorn, and Joseph Straus. The transformational network is based on the works of David Lewin.

The dissertation provides detailed analyses of works selected from Stravinsky's early serial repertoire: Chapter 3, the "serial" interludes from *Orpheus* (1947); Chapter 4, Ricercar II from the *Cantata* (1951-52); Chapter 5, "Musick to heare" from *Three Songs from William Shakespeare* (1953); Chapter 6, *In Memoriam Dylan Thomas* (1954). Chapter 7 reviews the transformational system and the model of generic set-class space. Although no single principle or device elucidates compositional or analytical unity among the works of this repertoire, the transformational system and the model of generic set-class space effects compositional and analytical unity at a highly abstract level.

KEYWORDS: transformation theory, symmetry, pitch-class set genera, near-equivalency, set-class space, pitch-class set theory, serial theory, Igor Stravinsky, Allen Forte, Joseph Straus, Richard Parks, Robert Morris.

To Caitlin, Pàdraig, and Tegan

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TERMS AND ABBREVIATIONS

Music-Theoretic Terms and Abbreviations in Common Use

ic (ics)	<i>Interval class (interval classes)</i> : An interval class is equivalent to an <i>unordered</i> pitch-class interval. (See Chapter 2.)
ICS	<i>Interval-class succession</i> : the succession of unordered pitch-class intervals (interval classes) derived from the <i>PCIS</i> formed by the pitch-class elements of an ordered set (pcseg) or an unordered set (pcset). (See Chapter 2.)
PCIS	<i>Ordered pitch-class interval succession</i> : the succession of ordered pitch-class intervals formed by the adjacent pitch-class elements of an ordered set (pcseg) or an unordered set (pcset). A PCIS is not the same as a successive-interval array (SIA). The difference between the PCIS and SIA for a given set is that a PCIS does not include the “wrapping” (or complementary) interval—that is, the interval (pc-int) formed between the last and the first elements of the set. (See Chapter 2.)
NE	<i>Near-Equivalency</i> . Two set classes of the same cardinality n are in the near-equivalency relationship if they share $n - 1$ elements (same as Forte’s relation of maximum pc similarity, R_p). (See Chapter 2.)
pc (pcs)	<i>Pitch class (pitch classes)</i> . Pitch-class integers are used herein in preference to note names (t and e represent $I0$ and $I1$, and are used consistently in pcsets and pcsegs, except for instances in the text where $pcI0$ and $pcI1$ replaces pct and pce).
p-int, p-interval	<i>Pitch interval</i> : the interval between two pitches in pitch space. P-interval integers with +/- are <i>ordered</i> or <i>directed</i> ; integers without +/- represent <i>unordered</i> p-ints (i.e., the absolute value of an interval in pitch space). (See Chapter 2.)

pc-int, pc-interval	<i>Pitch-class interval</i> : the interval between two pitch classes in pitch-class space. <i>Ordered</i> pc-ints are always positive integers in mod 12; <i>unordered</i> pc-ints are equivalent to interval classes. In the present study, pc-interval (pc-int) means <i>ordered</i> pc-int, and ic and <i>unordered</i> pc-int are synonymous. (See Chapter 2.)
pcseg	<i>Pitch-class segment</i> : an ordered succession (a series) of pcs.
pcset	<i>Pitch-class set</i> : a collection of pcs in normal order; an <i>unordered</i> set of pcs.
sc	<i>Set class</i> : a set of all T _n /T _n I equivalent pcsets.
SIA	<i>Successive interval array</i> : the <i>ordered pitch-class interval succession</i> (PCIS) of a pcset or pcseg <i>plus</i> the complementary interval. The sum value of all pc-ints including the complement of any SIA always equals 0 (in mod 12). (See Chapter 2).
T _n	<i>Transposition operator</i> ; <i>n</i> = <i>transposition</i> number. (See Chapter 2).
T _n I	<i>Inversion and transposition operator</i> ; <i>n</i> = <i>index</i> number. (See Chapter 2).
M	<i>Multiplicative function</i> (specifically, M ₅ and M ₇). (See Chapter 2).
<abc>	The <i>ordered</i> set of pcs a, b, c (i.e., a <i>pcseg</i>).
<a-b-c>	The <i>ordered</i> set of intervals a, b, c.
{abc}	The <i>unordered</i> set of pcs a, b, c (i.e., a <i>pcset</i>)
P _n ; In; RP _n ; RI _n	<i>P_n</i> : the transposition of the prime ordering of a serial unit by operator <i>n</i> . <i>In</i> : the inversion of <i>P_n</i> . <i>RP_n</i> and <i>RI_n</i> : the retrograde of a <i>P_n</i> or <i>In</i> form, respectively. In the present study, <i>P₀</i> always denotes the prime ordering of a series—that is, the original series (“moveable <i>do</i> ”). Thus, <i>I₀</i> denotes the inversion of <i>P₀</i> about the initial pc of <i>P₀</i> . (See Chapter 2.)
{P _n }; {In}	The <i>collection</i> of pcs (a pcset) derived from a specific serial unit.
t	The <i>pitch-class</i> 10 (B _b , A _#).
e	The <i>pitch-class</i> 11 (B).

$A \cap B$	<i>Intersection of sets A and B. (See Chapter 2.)</i>
$A \cup B$	<i>Union of sets A and B. (See Chapter 2.)</i>

Musical Instruments and Scores

Bsn.	Bassoon.
E.H.	English Horn.
Cl.	Clarinet.
D.B.	Double Bass.
Fl.	Flute.
Hn.	French Horn.
m. (mm.)	Measure (measures).
Ob.	Oboe.
R	Rehearsal number.
Tbn.	Trombone.
Tpt.	Trumpet.
Vc.	Violoncello ('cello).
Vn.	Violin.
Vla.	Viola

CHAPTER ONE

SHIFTING PERSPECTIVES ON THE ANALYSIS OF STRAVINSKY'S EARLY SERIAL MUSIC

OVERVIEW

The first studies of the early serial music of Igor Stravinsky proceed from the premise that the elucidation of serial and related ordered linear formations constitutes a satisfactory description of the structure of these works. A characteristic of this repertoire, however, is its poor analytical fit with the classical serial model—that is, the twelve-tone method of the second Viennese composers.¹ Thus, the non-conformity of Stravinsky's oeuvres circa 1951-1955 to the twelve-tone model has motivated generations of theorists to seek other avenues of investigation as means of modeling pitch structure and formal processes in this repertoire.

Stravinsky's early serial technique differs significantly from classical serialism. It represents a highly individualistic realization of the potential of serial procedures in a compositional environment in which serial technique is only one aspect of pitch structure. An analytic perspective biased to the classical serial model engenders negative attitudes towards these works. Thus, they are sometimes characterized as experimental or transitional, or deemed inferior essays in serialism.² Modeling these compositions solely

¹ Milton Babbitt, "Remarks on the Recent Stravinsky," *Perspectives of New Music* 2.2 (1964): 39-40. By "classical serial model," I am referring to a *simplified* model derived from the highly sophisticated and endlessly imaginative compositional method of Arnold Schoenberg and disseminated through some of his students such as Josef Rufer. In this model, a twelve-tone row comprising all twelve pitch-classes provides the basis of the pitch structure for an entire work, and the operations applied to the row are limited to the four canonic transformations of transposition, inversion, retrograde, and retrograde inversion. Josef Rufer, *Composition with Twelve Notes Related Only to One Another*. Trans. Humphrey Searle (London: Barrie & Jenkins, 1970. Originally published in Berlin by Max Hesse Verlag, 1952),

² For example: Roman Vlad, *Stravinsky*, trans. Frederick and Anne Fuller (London: Oxford University Press, 1960); David Ward-Steinman, "Serial Techniques in the Recent Music of Stravinsky" (D.M.A.

in the context of serial theory overlooks the interaction of serial and non-serial formations and the impact of this interaction on pitch structure. In contrast, an analytical approach that includes other post-tonal models allows non-serial aspects of the compositions to participate in important structural roles. Theories of pitch structure derived from this approach have the potential to obtain a rich analytical harvest from a compositional environment in which serial and non-serial formations interact.

In addition to the serial model, some theorists have incorporated various structural models derived from tonal theory as a means to explicate the presence of diatonic and tonal-like formations—such formations constitute another important characteristic of this repertoire.³ In response, other studies utilize unordered pitch-class set theory as a means to extricate this music from a tonal-analytic and serial-analytic bias. Recent studies have put forth theories of pitch structure that reveal organizational principles that transcend serial and tonal models.⁴ These studies suggest, tacitly or overtly, that these works are by no means indicative of the composer's inability to employ serial technique according to the standard of the second Viennese composers.⁵ Such studies accept that the apparent

thesis, University of Illinois, 1961); Pieter C. van den Toorn, *The Music of Igor Stravinsky* (New Haven: Yale University Press, 1983). Some Stravinsky scholars, including Roman Vlad, David Ward-Steinman, and Pieter van den Toorn, convey the attitude that Stravinsky's second (or late) serial period is the logical outcome of the first (or early) serial period. Stravinsky's compositions of the 1950s are often characterized as transitional or experimental—that is, they represent a sort of bridge between Stravinsky's pre-1952 compositions and those of the late 1950s and 1960s (sometimes called Stravinsky's "mature" serial period). There is a tendency among some scholars to orient discussions of their analyses in terms of a linear progression of compositional developments and "dead ends" that ultimately culminates in the twelve-tone music of Stravinsky's late career.

³ For example: Edwin Hantz, "What You Hear is What You Get," *In Theory Only* 2.1-2 (April-May 1976): 51-54; Charles Paul Wolterink, "Harmonic Structure and Organization in the Early Serial Works of Igor Stravinsky, 1952-57" (Ph.D. dissertation, Stanford University, 1978); Frank W. Hoogerwerf, "Tonal and Referential Aspects of the Set in Stravinsky's 'Septet,'" *Journal of Musicological Research* 4.1/2 (1982): 69-84.

⁴ For example: Allen Forte, *The Structure of Atonal Music* (New Haven and London: Yale University Press, 1973), 72-73; W. Ronald Clemmons, "The Coordination of Motivic and Harmonic Elements in the 'Dirge-Canons' of Stravinsky's 'In Memoriam Dylan Thomas,'" *In Theory Only* 3.1 (1977): 8-21; Joseph Straus, "A Principle of Voice Leading in the Music of Igor Stravinsky," *Music Theory Spectrum* 4 (1982): 106-24; van den Toorn, *The Music of Igor Stravinsky*, xviii.

⁵ For example: Akane Mori, "Proportional Construction in Relation to Formal Process in the Early Serial Music of Igor Stravinsky" (Ph.D. dissertation, Yale University, 1989); Roderick D. Moffitt, "Serialism and Unordered PC Sets in Stravinsky's 'Agon,'" (M.Mus. thesis, University of Western Ontario, 1991).

compositional discontinuities in this music are intrinsic to their expression, and place these works of art into the unique post-tonal environments to which they belong.⁶

The primary purpose of this dissertation is to address the compositional discontinuities that are the hallmark of Stravinsky's early serial music by investigating the interactions of serial and non-serial formations through the apparatus of *transformational analysis* in the context of a *model of generic set-class space*. This model holds the potential to elucidate an important conceptual reference from which Stravinsky derives precompositional resources, develops essential aspects of his compositional designs,⁷ and coordinates pitch formations at various structural levels.

The present chapter examines several important dissertations, journal articles, and other theoretical works that exemplify the divergent theoretic-analytic attitudes underlying explanations of pitch relations and structure in this repertoire. In doing so, certain theoretical and methodological shortfalls are identified, which in turn reveal the lacuna that this dissertation addresses. Chapter 2 presents the theoretical models underlying the methodological basis of the analytical chapters. Each of the four analytical chapters addresses one work: Chapter 3, the "serial" interludes from *Orpheus* (1947); Chapter 4, *Ricercar II* from the *Cantata* (1951-52); Chapter 5, "Musick to heare," from *Three Songs from William Shakespeare* (1953); Chapter 6, *In Memoriam Dylan Thomas* (1954). Chapter 7 will review the salient aspects of the transformational system and the model of generic set-class space, and evaluate the conclusions drawn from the analytical chapters. Ultimately, it is the author's hope that the theoretical and methodological models put forth in this dissertation will suggest to the reader ways of developing similar

⁶ Joseph N. Straus, *Stravinsky's Late Music* (Cambridge: Cambridge University Press, 2001), xv. This attitude is clearly expressed throughout Straus's book.

⁷ Robert D. Morris, *Composition with Pitch-Classes: A Theory of Compositional Design* (New Haven: Yale University Press, 1987), 3-4. "The term *compositional design* denotes an abstract, uninterpreted composition of pitch-classes (or time-point classes). Such designs are not identical to or substitutes for "precompositional plans" or sketches although they may play a part in the early planning of a composition before one begins the first draft. Compositional designs are more akin to figured bass in Baroque continuo parts or the chord symbols used in lead sheets in jazz, in that such notations guide both composition and improvisation but, once mastered, do not, directly or indirectly, influence stylistic and personal choices."

models in response to the exigencies of *analyzing and creating* music that engages post-tonal and neo-tonal pitch structures.⁸

CHANGING ANALYTICAL ATTITUDES TOWARDS IGOR STRAVINSKY'S EARLY SERIAL MUSIC

The corpus of analytical literature pertaining to Igor Stravinsky's serial music inevitably reflects the changing epistemological attitudes of the academic music community. Sufficient time has passed since the publication of the first studies of Stravinsky's early serial music to allow for several significant developments in music theory, particularly in the realm of pitch-class relations. The dissemination of these developments influences the assumptions that direct the process of analysis. Thus, the methods of inquiry and the types of questions are constantly changing.

The purpose of this review is to identify and appraise specific analytical attitudes towards this repertoire by briefly examining selected writings on Stravinsky's works, focusing primarily on those that deal with the analysis of his early serial music (circa 1952-57). The study considers aspects of each inquiry such as the theoretical premise from which the inquiry proceeds and the methodology employed, as well as the kinds of statements made about the works under investigation. In addition, other theoretical works considered herein do not necessarily directly address Stravinsky's serial music but do inform—or are informed by—analyses of this repertoire.

Orthodox Serial Theory and Stravinsky's Early Serial Repertoire

Stravinsky's serial career falls into two periods: his early serial period, 1952(1)-57, and his late serial period, 1957(8)-66.⁹ Works composed before 1958 do not have a good analytical "fit" with Schoenberg's twelve-tone method. Rows typical of Stravinsky's

⁸ By "neo-tonal," I mean the endlessly imaginative tonal and quasi-tonal linear and vertical formations that have become currency in jazz improvisation and composition.

⁹ This division is a compromise between the different dates given in the literature. Stravinsky began composing the *Cantata* shortly after Arnold Schoenberg's death in 1951.

early serial period are generally nondodecaphonic. Some rows comprise contiguous and non-contiguous repetitions of elements (pitch classes or pitch-class segments), contain more than twelve pitch events, and evince diatonic characteristics. Moreover, serial techniques are not the only means of pitch organization used in these works and the extent to which serial techniques are employed varies considerably from section to section and from work to work.¹⁰ In contrast, a major characteristic of Stravinsky's late serial works (beginning with *Threni* of 1958) is their better analytical "fit" with Schoenberg's twelve-tone method since the rows employed in these works are twelve-tone (i.e., twelve elements and twelve discrete pitch classes).

The problem of a poor analytical fit of Stravinsky's early serial music with the Schoenbergian twelve-tone model is one that results not from the works in question, but from the theory itself. Orthodox serial theory—that is, the compositional theory derived from Schoenberg's twelve-tone method—is too prescriptive to permit a meaningful reading of Stravinsky's non-twelve-tone works. Analysis restricted to this theory inadvertently trivializes salient structural formations in deference to those features that are perceived to be congruent with Schoenberg's twelve-tone method. In the ensuing discussions, we will trace a trend in the literature that seeks to understand Stravinsky's early serial works within the context of a flexible serial model in which certain tenets of the orthodox serial model are marginalized. This emerging attitude, extricated from the restrictions of the a priori orthodox model, allows the composer to integrate serial techniques and other modes of pitch organization as suits the internal logic established through the precompositional and compositional processes of artistic creation, which in turn allows the analyst to detect the unique post-tonal environments each of these works presents.

Several authors, including Ernst Krenek, Josef Rufer, Reginald Smith Brindle, and George Perle have undertaken comprehensive studies of Schoenberg's twelve-tone

¹⁰ See, for example, Joseph Nathan Straus, "A Theory of Harmony and Voice Leading in the Music of Igor Stravinsky" (Ph.D. dissertation, Yale University, 1981). A label such as "early serial," like any label attached to any repertoire, cannot adequately describe the diverse qualities of this particular repertoire. Other adjectives are often used by scholars in the literature of the 1960s and early 1970s in connection to specific works. For example, in his dissertation, Straus uses the adjectives "proto-serial," "quasi-serial" and "strictly-serial" for *Three Songs from William Shakespeare*, *Canticum Sacrum*, and *In Memoriam Dylan Thomas*, respectively.

method. These works constitute important contributions to the corpus of music-theoretic literature but are by no means definitive. Nonetheless, the present study adopts these studies as exemplary of the orthodox attitude towards serial compositional theory. In particular, the present study exploits statements made by Smith Brindle about Stravinsky's serial music in order to point up the analytical bias that puts these works into a negative light.

The Aggregate and the Twelve-Tone Row

Reginald Smith Brindle defines the tenets of orthodox serial theory in his influential book, *Serial Composition* (1966):

As serial technique is designed to exploit the possibilities of the total chromatic, it is usual to form a series from a succession of the twelve different notes [pitch classes] within an octave. In this way, none of the twelve notes is omitted.¹¹

Smith Brindle assumes that certain characteristics of the second Viennese school such as aggregate completion—that is, the regular circulation of twelve pitch classes—are universal attributes of serial music. Thus, in his opinion, the five-note “short” series used in Stravinsky's *In Memoriam Dylan Thomas* lacks the potential to exploit continuously the “total chromatic”:

But with the short series, the total chromatic cannot be used evenly. . . [The] music can therefore only be truly dodecaphonic (i.e. music which exploits continuously the possibilities of the twelve semitones of the chromatic scale) if care is taken to use many transpositions [of the short series], avoiding the excessive recurrence of any note or notes and the omission of others.¹²

In light of Smith Brindle's conception of Schoenberg's serial technique, Stravinsky's early serial works fail on two critical points: the periodic, systematic completion of the aggregate is not an operative principle of localized pitch organization in Stravinsky's early serial works, and most of his pre-*Threni* rows are not modeled on the orthodox twelve-tone design.¹³ Frank Hoogerwerf, however, demonstrates an important

¹¹ Reginald Smith Brindle, *Serial Composition* (London: Oxford University Press, 1966), 4.

¹² *Ibid.*, 16.

¹³ See Chapter 6. The periodic completion of the aggregate (sc 12-1) occurs at a demonstrably slower rate than do periodic expressions of pcsets with cardinalities ranging from 8-10. See also Clemmons, “The Coordination of Motivic and Harmonic Elements”: 10-11. Clemmons illustrates how it is possible to

relationship between localized pitch-class deployment and row-form deployment in the *Septet*, which indicates that a system of *non-dodecaphonic rotations* establishes a linear-vertical continuity similar in function to the orthodox aggregate-completion model:

Tetrachordal and hexachordal invariance . . . are the exclusive criteria for determining set simultaneity in the third movement [Gigue], where each of the four fugues develops its own cyclic extensions of the prime set [series].¹⁴

Octave Doublings

The use of octave doublings represents another serious digression from the norms of orthodox serialism. Schoenberg's reason for excluding octave doubling from the twelve-tone method is to avoid over-emphasizing a particular pitch class. Octave doubling, therefore, is antithetical to the basic premises of twelve-tone composition:

To double is to emphasize, and an emphasized tone could be interpreted as a root, or even a tonic; the consequences of such an interpretation must be avoided.¹⁵

Stravinsky's early serial music is replete with sonorities that employ octave doublings. This technique is part of his pre-serial compositional vocabulary, and—as will become clear in the ensuing analytical chapters—its synthesis with serial technique instantiates Stravinsky's idiosyncratic approach to serial composition. Henri Pousseur is adamant about this point when he addresses a well-known critic of Stravinsky with regard to octave doublings in *Agon*:

Do not make the attempt, Pierre Boulez: correct these so-called “wrong notes”; you will see that *everything* changes, and not for the better!¹⁶

In Pousseur's opinion, octave doublings are integral to the compositional design:

The octaves which *result* from [the “stratified generation” of a “total harmonic universe which has ‘one (or some) interval(s) of definition other than the

assemble three successive overlapping row-forms so that all twelve pcs are represented only once in a symmetrical row construction, a possibility Stravinsky does not exploit. Clemmons argues that, in actuality, there is a “lack of total chromatic circulation in the ‘Dirge Canons’.” The present study does not concur with this last statement.

¹⁴ Frank W. Hoogerwerf, “Tonal and Referential Aspects of the Set”: 69-84; Milton Babbitt also makes this observation in “Remarks on the Recent Stravinsky”: 43.

¹⁵ Rufer, *Composition with Twelve Notes*, 90.

¹⁶ Henri Pousseur, “Stravinsky by Way of Webern: The Consistency of a Syntax (II),” trans. by Marcelle Clements, *Perspectives of New Music* 11.1 (1972): 139.

octave”] . . . have a nature (a function) which is entirely different from that which is imparted to them when they *govern* the acoustic space as absolute masters.¹⁷

Pousseur posits that octave doubling in *Agon* does not create unwanted emphasis on a particular pitch class. Rather, Pousseur argues that octave function is audible:

The “ear” does in fact perfectly realize that the two notes which constitute such octaves have different *functions*, as a result of their disparate insertions into the scalar context to which they belong.¹⁸

Serial Disorders

Charles Wolterink notes instances in Stravinsky’s twelve-tone *Epitaphium* of 1959 in which serial ordering is ignored.¹⁹ This “serial disorder” would seem to break the fundamental rule of serial music—that is, order relations, the essence of serialism, must hold precedence over other compositional considerations. As will become evident in the analytical chapters of the present study, “serial disorders” are replete in Stravinsky’s works of the early 1950s.

Smith Brindle observes that some composers, *including* Schoenberg (String Trio Op. 45), have composed with series of more than twelve pitches using all twelve pitch classes (“long series”):

This procedure has been frowned on by some theorists, because it breaks one of the principal laws in serial techniques—that no note [pc] should recur in a series before all the other eleven have been sounded.²⁰

Smith Brindle acknowledges, however, “the artistic quality of music to be immeasurably more important than constructional principles.” Josef Rufer finds support for this in Schoenberg’s essay, “Style and Idea”:

[Schoenberg cited:] Sometimes a set (series) will not fit every condition an experienced composer can foresee, especially in those ideal cases where the set appears at once in the form, character, and phrasing of a theme. Rectification in the order of tones may then become necessary.²¹

¹⁷ Pousseur, “Stravinsky by Way of Webern (II):” 139.

¹⁸ Ibid.

¹⁹ Wolterink, “Harmonic Structure and Organization,” 75.

²⁰ Smith Brindle, *Serial Composition*, 17.

²¹ Rufer, *Composition with Twelve Notes*, 96-97. See also Arnold Schoenberg “Composition with Twelve Tones (I),” in *Style and Idea: Selected Writings of Arnold Schoenberg*, 214-45; and Smith Brindle, *Serial Composition*, 51-60.

According to Wolterink, Stravinsky found justification for the flexible treatment of the row in Ernst Krenek's *Studies in Counterpoint* (1940):

The justification for this practice may be found in Krenek's brief text on twelve-tone technique, which, according to Stravinsky, "was the first work I read on that subject." Krenek writes, "slight *anticipations* are permissible when required by the logical progression of the parts."²²

In fact, Krenek devotes an entire section of his treatise to how the composer might bend the rules of serial ordering without "infringing upon the principles of a technique to which he professed allegiance." The principle he propounds allows the composer flexibility through repetitions and interpolations, but restricts the composer from creating serious serial disorder:

Generally speaking, *interpolation of new material between an element* (chord or tone) *and its repetition is permissible in so far as the repetition can reasonably be expected to be felt as such.*²³

Thus, the proponents of the orthodox technique acknowledge that the linear aspect of a serial composition can be treated flexibly as long as the overall order relations are maintained. Nonetheless, "serial disorders" in Stravinsky have been interpreted by some analysts as poor serial constructions or mistakes. Early critiques of Stravinsky's serial works would most likely perceive such disorders as evidence of Stravinsky's alleged "sub-standard" serial technique, which is as much a comment on their own lack of understanding of the flexibility of the orthodox technique as it is a lack of understanding of the works.

David Ward-Steinman believes that he has detected a mistake in the ordering of the vocal part of "Musick to heare."²⁴ Although the present study will present an alternative

²² Wolterink, "Harmonic Structure and Organization," 75; Ernst Krenek, *Studies In Counterpoint based on the Twelve-Tone Technique* (New York: G. Schirmer, Inc., 1940), 16; Straus, *Stravinsky's Late Music*, 26-33. Straus agrees that Krenek's treatise of 1940 had a significant impact on Stravinsky's serial technique of the early 1950s. Straus also comments on how some of Krenek's compositions and his lecture at Princeton (1959) had influenced Stravinsky's late serial style. Krenek's lecture, later published as "Extent and Limits of Serial Techniques," includes an explication of the hexachord rotation technique, a technique that Stravinsky incorporates into his late serial style. Ernst Krenek, "Extent and Limits of Serial Techniques," *Musical Quarterly* 46 (1968): 210-32.

²³ Krenek, *Studies In Counterpoint*, 26-27.

²⁴ David Ward-Steinman, "Serial Techniques," 27-28. The mistake Ward-Steinman detects is found in the vocal part after rehearsal 5. The present study offers a corrective to this view in Chapter 5.

to this interpretation, it also acknowledges the possibility that Stravinsky unintentionally deviated from serial ordering. This issue is discussed at length by Joseph Straus in his recent book *Stravinsky's Late Music*.²⁵ Serial “mistakes”—as Straus calls them—may happen during the precompositional and sketch stages of a work, or result from a copying error in the final realization of the composition. Straus notes that it is difficult to determine which serial disorders arise from compositional intention and which are actually mistakes. According to Straus, Stravinsky seemed to portray “a cavalier attitude toward serial charts [i.e., his precompositional sketches] and their musical realizations, preferring to rely on his ear.”²⁶ Nonetheless, Straus presents evidence that Stravinsky did indeed create serial “mistakes,” although it remains unclear how many of these errors actually found their way into the published scores. With respect to Stravinsky’s late serial music, Straus says:

It is clear that Stravinsky himself placed a high value on serial consistency. That is the irrefutable sense of the elaborate charts he constructed, of the careful self-analyses he provides on so many sketches and drafts, and of the near-perfect serial accountability of the published scores themselves.²⁷

Because serial formations freely interact with non-serial formations in Stravinsky’s early serial works, the issues of serial disorders, compositional mistakes, and compositional intention are more clouded. Given the diverse compositional environments in which Stravinsky’s linear formations unfold and the nature of their constructions, and Stravinsky’s artistic integrity and his commitment to the craft, the analyst is in no position to judge a serial disorder as a mistake. Instead, the analyst may assume that the score is the result of compositional intention and proceed to explore the various pitch formations and their interactions in terms of their unique constructions and transformational relationships.

²⁵ Straus, *Stravinsky's Late Music*, 71-80,

²⁶ *Ibid.*, 74.

²⁷ *Ibid.*, 77.

A Revised Serial Theory and Stravinsky's Early Serial Repertoire

In response to the analytical incompatibility of Stravinsky's early serial works and orthodox serial theory, the music-theoretic community of the mid-1960s was introduced to a *general* theory of serial composition that subsumes the orthodox twelve-tone theory as a *special* theory. Milton Babbitt's seminal essay "Remarks on the Recent Stravinsky" (1964) is among the first to offer a corrective to the early critical responses to Stravinsky's serial works.²⁸ Babbitt explains that part of the problem lies in the misunderstanding of the basic tenets of serial composition. That is, serialism and dodecaphony are two different concepts:

[A] serial relation is one which induces on a collection of objects a strict, simple ordering; . . . The term "serial" designates nothing with regard to the number of elements in the collection, to the relations among these elements, or the operations—if any—applicable to the elements or the relations among them. . . A twelve-tone set is a serially ordered collection of the twelve familiar pitch classes, but the fact that each pitch class occurs exactly once in the collection and that the systematic transformations of this set are the similarly familiar ones of transposition, inversion, retrogression, and their combinations, are over and beyond the conditions of mere serialism.²⁹

Babbitt's serial theory significantly changed the context in which Stravinsky's works were understood by removing the analytical limitations of orthodox serial theory. The fact that Stravinsky's compositions of 1952-57 are now generally referred to as *serial* is as much a statement about the inclusion of serial techniques as a compositional device in these works as it is a reflection of changing analytical attitudes towards the potentialities of serial composition and an acceptance of a broader definition of "serialism."

Stephen Walsh, writing in the late 1980s, implicitly shares Babbitt's analytical attitude towards Stravinsky's early serial music, but is far more restrictive in his interpretation of what constitutes a serial composition. Walsh includes the *Septet* in his discussion of Stravinsky's music of the 1950s. Although he points out features of the work that, in his opinion, reveal the influence of Schoenberg, Walsh argues that the work is not serial:

²⁸ See also Ward-Steinman, "Serial Techniques," v.

²⁹ Babbitt, "Remarks on the Recent Stravinsky": 39-40.

The one relevant technique not used in the Gigue [third movement] of the Septet . . . is serialism; the only ordering of pitches is that of the fugue subject itself, which is copied by the other entries and by the later repeats and inversions, which is no more serialism than what happens in any baroque double fugue. Similarly the Passacaglia second movement is hardly more serial than Bach's great C minor work in that form.³⁰

Babbitt discusses these same traditional contrapuntal procedures employed by Stravinsky in these same movements of the *Septet*. He attributes to serial procedure the design of the subject (series), the deployment of its transformations in the Gigue, and the treatment of its pitch contour in the Passacaglia. Babbitt explains:

This motivation of traditional procedures by nontraditionally determined criteria is deeply Stravinskyian, in both the technical domain and in the historical domain . . . ³¹

In Babbitt's opinion, these movements are serial—the serial compositional aesthetic motivates the traditional contrapuntal procedures in these movements.

Serial Analysis and Stravinsky's "Pre-Serial" Repertoire

The analytical criteria used for differentiating serial procedures from traditional contrapuntal procedures that employ post-tonal pitch resources has not been clearly defined. Joseph Straus, like Stephen Walsh, rejects the notion that all of Stravinsky's works from the 1950s are serial, although for very different reasons. Straus posits that "pattern-completion," an organizational technique that resembles serial technique, is the principle behind Stravinsky's linear conception in these works as well as in several works before 1952 (Straus suggests the *Symphony of Psalms* as an example).³² Babbitt posits that serialism "made its first appearance in Stravinsky's music [pre-1951] under a sonic surface . . . "³³ Roman Vlad suggests similar possibilities. These attitudes, in turn, engender investigations into Stravinsky's pre-serial compositions that are motivated by the search for evidence of serial organization.

³⁰ Stephen Walsh, *The Music of Stravinsky* (Routledge: London and New York, 1988), 223-24.

³¹ Babbitt, "Remarks on the Recent Stravinsky": 43.

³² Straus, "A Principle of Voice Leading": 112. See also Straus, *A Theory of Harmony and Voice Leading*, 146f.

³³ Babbitt, "Remarks on the Recent Stravinsky": 40.

Merton Shatzkin cites Vlad's theory of "secret germination," which proposes that Stravinsky's compositional techniques "matured unseen," to support his claim that, in 1958, he "discovered an unmistakable use of row techniques" in two movements of Stravinsky's *Orpheus* of 1947. In his essay, "A Pre-Cantata Serialism in Stravinsky," Shatzkin describes a nondodecaphonic series made up of ten pitches, seven of which are unique pitch classes.³⁴ Shatzkin adopts the criteria given in George Perle's analysis of *Ricercar II* from the *Cantata* for identifying linear formations as serial rather than motivic in the traditional sense: "1) the pitch factor in the set is invariant, but not the rhythmic; 2) transpositions are literal (there are no transformations [inversions]); and 3) octave displacements distort the motivic contour."³⁵

Charles Burkhart proposes that the subject of the second movement of Stravinsky's *Sonata for Two Pianos* of 1944, which comprises a theme and four variations, "exhibits a type of mirror canon unique in the literature of tonal music." Burkhart and Shatzkin—following Donald Johns's research—agree that the 16-measure theme comprises a five-bar long 29-note nondodecaphonic "row," which is repeated three times (RH of Piano I).³⁶ Shatzkin reports that the series "occurs and recurs in a strictly linear mode, undergoes some displacement, and is surrounded by extraserial tones."³⁷

Joseph Straus suggests that the negative reaction by contemporary critics towards Stravinsky's serial music motivates more recent revisionist accounts that hold "that the serial music of Stravinsky actually behaves much like his pre-serial music."³⁸ The revisionist attitude is inextricably connected to the attitude that all of Stravinsky's music possesses "a certain unique but persistent, or stereotypical, quality . . . which one may

³⁴ Merton Shatzkin, "A Pre-Cantata Serialism in Stravinsky," *Perspectives of New Music* 16 (1977): 140. Shatzkin's article motivates the present study to explore these serial interludes in depth. Thus, these two movements are the subjects of Chapter 3.

³⁵ *Ibid.*, 141. Shatzkin is referring to third edition of George Perle's *Serial Composition and Atonality* (Berkeley and Los Angeles: University of California Press, 1972), 54. Notice that Shatzkin does not consider transposition a type of transformation.

³⁶ Charles Burkhart, "Stravinsky's Revolving Canon," *Music Review* 29 (1968): 161. See also Shatzkin, "A Pre-Cantata Serialism in Stravinsky": 142-43; Donald C. Johns, "An Early Serial Idea of Stravinsky," *Music Review*, 23.4 (1962).

³⁷ Shatzkin, "A Pre-Cantata Serialism in Stravinsky": 143. It is significant that, of the twenty-nine pitches of this series, only the seven pitch classes of the diatonic collection, set-class 7-35, are represented.

³⁸ Straus, "A Principle of Voice Leading": 177.

call the ‘Stravinsky sound’.”³⁹ Revisionists argue in favor of a Stravinsky who has cultivated his own serial method before Schoenberg’s death, and that Stravinsky’s overt use of serial techniques in early 1950s was not such a radical departure from his pre-1952 style as some would claim.⁴⁰ Furthermore, studies that demonstrate instances of quasi-serialism in Stravinsky’s pre-serial repertoire support arguments that the change of methodological focus to serial composition was not simply an act of appropriation, as Robert Craft suggests,⁴¹ nor was it an act of homage or capitulation to the “dead master,” Schoenberg, as early critics might believe.

In order to show “that the pre-serial music of Stravinsky actually makes use of organizational principles which are not far removed from the organizational principles of serial composition,” Straus proposes his “theory of pattern-completion.”⁴² Straus approaches the analysis of Stravinsky’s early serial music with the attitude that serial formations typical of *Agon* and the first of the *Three Songs*, “Musick to heare,” are only serial in appearance. The pattern-completion hypothesis proceeds from a principle of voice leading Straus detects throughout much of Stravinsky’s music:

According to this principle, a certain *unordered* collection or set of notes (generally a tetrachord) is established as a structural norm for the composition, pervading the surface of the music (both melodic and harmonic) and governing the tonal motion at all levels of structure.⁴³ [Italics mine]

Straus explains that pattern-completion “consists of two fundamental aspects” that clearly differentiate it from serial procedure: “(1) establishment of a single collection-type or pattern as the normative unit for a composition and (2) exploitation of the listener’s desire for the completion of that unit.”⁴⁴ The normative unit in pattern-completion can be subjected to the transformations typical of serial procedure and can be applied

³⁹ J.A. Huff, “Linear Structures and Their Relation to Style in Selected Compositions by Igor Stravinsky” (Ph.D. dissertation, Northwestern University, 1965), 1-2.

⁴⁰ Jeremy Noble, *The New Grove Dictionary of Music and Musicians* 1980 ed., s.v. “Stravinsky, Igor (Fyodorovich),” §6.ii (Works). In Noble’s opinion, this event represented “the most profound change in Stravinsky’s musical vocabulary that it had undergone in thirty years.”

⁴¹ Robert Craft, *Stravinsky: Glimpses of a Life* (New York: St. Martin’s Press, 1993), 6. Craft claims that Stravinsky “did not keep abreast of developments in academic serial theory but simply borrowed what he required in order to write masterpieces.”

⁴² Straus, “A Principle of Voice Leading”: 117.

⁴³ *Ibid.*, 106.

⁴⁴ *Ibid.*

systematically “at all levels of structure,” which enables Stravinsky “to achieve a high degree of musical coherence.”⁴⁵ Straus’s theory of pattern-completion allows him to examine linear structures in relationship to ordered and unordered sets through the elucidation of the normative unit at various structural levels without the analytical filtering of serial theory. Because the theory of pattern-completion fully extricates linear formations from serial models, Straus can realize his ultimate analytic objective:

If *Agon* (and other compositions from the 1950s) can be shown, despite their serial manifestations, to be organized, like *Symphonies of Wind Instruments*, by means of pattern-completion, a more unified view of Stravinsky’s compositional language may emerge.⁴⁶

The Influence of the Second Viennese Composers

David Ward-Steinman describes the musical public’s initial reception of serial Stravinsky in the late 1950s:

Long considered diametrically opposed to the Schoenbergian school, when Stravinsky a few years ago was discovered to have adopted serial techniques, the musical world, for the most part, reacted with shock and incredulity on one hand, and with cynicism and amusement on the other.⁴⁷

The attitude towards Stravinsky’s serial music once held by the musical academic community has since turned positive; what had been perceived as serial anomalies and inconsistencies are now portrayed as idiosyncratic realizations of serial procedure. Nevertheless, Stravinsky’s use of serial techniques has engendered several inquiries regarding the influence of the second Viennese school.

The view that Stravinsky’s early serial music work is derivative of the second Viennese school is overly simplistic. Nonetheless, the influence of these composers is considerable. According to Robert Craft, Stravinsky “had already been exposed to a considerable amount of serial music”⁴⁸ before 1950, but “did not know a single measure

⁴⁵ Ibid., 107.

⁴⁶ Ibid., 112.

⁴⁷ Ward-Steinman, “Serial Techniques,” v.

⁴⁸ Robert Craft, “A Personal Preface,” *The Score* XX (1957): 12-13.

of music by Schoenberg, Berg, or Webern, had no copy in his library of any of their pieces, and did not understand the meaning of the word ‘tone-row’.”⁴⁹ Stravinsky was not directly involved with the serialist movement in 1950s Europe that began in Darmstadt, yet his aesthetics are similar to the aesthetics of that movement, such as his rejection of Schoenberg’s 12-tone techniques and his admiration of Webern’s.⁵⁰

Babbitt detects Webern’s influence in “Musick to heare,” the first of the *Three Songs from William Shakespeare*. Babbitt observes that the juxtaposition of the first statement of the four-note serial unit and the first two notes of its subsequent transformation forms a hexachord, which can be also described as deriving from the first three notes of the unit by applying the operation of retrogression. According to Babbitt, the application of this operation to a three-note segment is characteristically Webernian.⁵¹

Henri Pousseur’s seminal essay “Stravinsky by Way of Webern: The Consistency of a Syntax” (1972) entails extensive analysis of selected linear segments from *Agon* which demonstrates interval usage, row constructions, and pitch resources consistent with Webern’s serialism. Pousseur avoids explaining the means of Stravinsky’s acquisition of Webern’s techniques. Rather, Pousseur comments on features of *Agon* that are apparently Webernian and infers that the presence of these techniques clearly represents a Webernian influence. Pousseur even proposes that Stravinsky’s fundamental compositional conception—to compose using an economy of means—is essentially the same as Webern’s:

Stravinsky thus takes on Webern’s concern (which found one of its models in the *Pflanzenlehre* of Goethe) to deduce all of his materials, as diverse as they might be, from one single cell . . . But he adds to the Webernian “genetic” system new and very important axes of variation, with which all of his previous experience,

⁴⁹ Craft, *Glimpses*, 45.

⁵⁰ Ibid. According to Craft, Stravinsky spent considerable time “in the years between 1952 and 1957” familiarizing himself with the works of Anton Webern, including the Cantatas.

Also see van den Toorn, *The Music of Igor Stravinsky*, 382-3; Vlad, *Stravinsky*, 176-224; Elliott Antokoletz, *Twentieth-Century Music* (Englewood Cliffs, New Jersey: Prentice Hall, 1992), 402-407. Van den Toorn discusses Webern’s influence on Stravinsky’s work in terms of texture and symmetry. Vlad and Antokoletz make several connections between Stravinsky’s non-twelve-tone serial works and Webern’s serial compositions.

⁵¹ Babbitt, “Remarks on the Recent Stravinsky”: 44. Chapter 5 of the present study examines “Musick to heare” in depth.

and particularly his exploration (critical, inventive) of many former musical systems, had familiarized him.⁵²

Stravinsky's *generative variation*, as Pousseur calls it, operates at various interacting levels "in a very *organic* way." *Generative variation* operates as scales (unordered collections), as ordered intervals in the horizontal dimension ("possible and recognizable permutations"), as "vertical structures, 'registered' but not ordered in the 'horizontal dimension'," and as "structures which are definitely registered and ordered in time."⁵³

Akane Mori, in accordance with Pousseur, also makes several statements regarding the overt and concealed presence of Webernian techniques in *Agon* and other of Stravinsky's early serial works in her recent dissertation. Mori elucidates Webernian features such as symmetrical row forms, inversional symmetries, cellular row constructions, palindromic formations (at various formal levels), and interval usage.⁵⁴ Moreover, Mori demonstrates that Webern and Stravinsky share similar spatial and linear conceptions of formal process. The use of palindromes, cellular row construction, references to the octatonic scale, particular interval spacings and textures, and canonic deployment of the series do not represent a radical break from Stravinsky's pre-1951 compositional vocabulary. Rather, the way in which they are employed reflects a Webernesque sensibility.⁵⁵

Serial Models and Analytical Bias

Studies of Stravinsky's serial music generally incorporate models of relationships derived from Schoenberg's twelve-tone system—that is, the classical serialism of the

⁵² Pousseur, "Stravinsky by Way of Webern (II)": 117.

⁵³ *Ibid.*, 119.

⁵⁴ Akane Mori, "Proportional Construction," 16-17, 60f.

⁵⁵ Joseph N. Straus, "Stravinsky and the Serialists," *Stravinsky's Late Music*, 1-41. Straus's recent book offers a synopsis on the influence of the music and style of Arnold Schoenberg, Anton Webern, Ernst Krenek, and Milton Babbitt, as well as an overview of Robert Craft's role in introducing Stravinsky to serial compositional techniques.

second Viennese school.⁵⁶ Once extricated from the limitations of orthodox serial theory, models vary from study to study as do the extent to which they are used and the questions to which they are applied. Serial-based models hold the potential to segment the musical surface into isomorphic and non-isomorphic pitch-class objects, which, in turn, reveal meaningful information about the organization and relationship of pitch materials, and elucidate compositional continuities and discontinuities. A model of pitch structure limited to order relations, however, cannot draw non-serial formations into relationships with serial formations; thus, discontinuities tend to become marginalized or rejected. Furthermore, such models by their very nature tend to disregard vertical interactions and the role of sonority in this repertoire.

The aesthetic value attached to classical serialism resonates throughout the Stravinsky literature, in spite of the correctives to the early mainstream conception of serial theory such as those offered by Babbitt. Moreover, the less the pitch organization of a particular work fits the twelve-tone model the more likely the work in question will receive only marginal treatment from those who model Stravinsky's early serial music mainly in these terms.⁵⁷ This attitude, manifested in the teleological narratives of Roman Vlad and David Ward-Steinman, is expressed in literature as recent as Pieter van den Toorn's *The Music of Igor Stravinsky*.

David Ward-Steinman's dissertation of 1961 employs row tracing as the primary means of determining pitch relations in Stravinsky's serial works circa 1952-59. Using evidence uncovered through this approach, Ward-Steinman makes statements about pitch organization and musical structure in which serial formations take precedence over all other pitch formations. The attitude behind this endeavor accepts that a hierarchical model of pitch relations based on the four row-form transformations characteristic of classical serialism can provide an adequate means of explanation. In this approach, linear formations that do not map onto the series have less analytical status than those that do.

In response to the question of serial organization, compositional discontinuity, and the dynamics of interactions among serial and non-serial formations, theorists have

⁵⁶ "Classical serialism" refers to Schoenberg's mature twelve-tone compositional system.

⁵⁷ For example, in *The Music of Igor Stravinsky*, Van den Toorn chooses to omit the *Septet* and the *Three Songs from William Shakespeare* in his discussions of Stravinsky's early serial music.

explored other modes of analysis that subsume serial analysis within a broader analytic framework. The apparent compositional discontinuities that are a hallmark of Stravinsky's early serial repertoire require theories that transcend order relationships for their explanation. Thus, the serial model cannot dominate the analytic approach, which, in turn, leads the analyst into a realm of possibilities in which isomorphic and non-isomorphic, linear and vertical formations participate—rather than compete—as expressive, musical gestures.

Frank Hoogerwerf proposes a model for a theory of hierarchical set transformations that explains pitch structure in the second and third movements of the *Septet*. The model employs two primary criteria for hierarchization: invariance between row-forms (“an arbiter of similarity and hierarchization”⁵⁸) and “segmental invariance”—that is, George Perle's notion of invariance among ordered subsets (pitch-class segments).⁵⁹ Hoogerwerf's theory proceeds from Babbitt's essay of 1964, in which Babbitt identifies “combinational serialism” as a special property of the nondodecaphonic series used in *Ricercar II*.⁶⁰ Hoogerwerf attributes this property to the series of the *Septet*, thus meeting the conditions for extending Babbitt's invariance measure to his own theory. Babbitt proposes that “the number of pitch classes shared between and among [ordered] set forms” provides a “significant criterion of similarity, of hierarchization, among such serial forms.”⁶¹ Hoogerwerf's hierarchical model, then, transcends Babbitt's corrected serial model since its precepts transcend the domain of ordered pitch-class relations in serial theory. By relating ordered set forms through intersecting pitch classes, unordered sets (pcsets) derived from pcsegs and serial units are elevated to a higher structural status.

The transformation of an ordered set (a serial formation or a pcseg) into an unordered set (a pcset) is another level of abstraction, one that is driven by the assumptions that

⁵⁸ Hoogerwerf, “Tonal and Referential Aspects of the Set”: 73-74.

⁵⁹ *Ibid.*, 74.

⁶⁰ Babbitt, “Remarks on the Recent Stravinsky”: 41. Babbitt clarifies this: “Here, then, is combinational rather than permutational serialism, since each form of the serial unit represents a selection from the twelve pitch classes rather than a particular ordering of these classes.”

⁶¹ *Ibid.*

underlie pitch-class set theory.⁶² That is, inclusion, similarity, and other transformational relationships provide an effective means of understanding associations among the pitch objects of an atonal surface. Yet, for Hoogerwerf, the notion that a pcset not only contains the pitch classes derived from a serial formation but also represents that serial formation comes from Stravinsky himself. In the third movement of the score for the *Septet* (Gigue), Stravinsky indicates the row form (serial unit) above the staff for each instrumental voice by spelling-out the *pcset* derived from that serial unit in scale-form rather than writing out the actual serial unit.⁶³ In other words, Stravinsky acknowledges the important connection between pcset and serial unit that establishes crucial structural relationships among the serial and non-serial formations that seem to compete at musical surface in this work.

George Perle discusses dodecaphonic and nondodecaphonic serialism in his book, *Serial Composition and Atonality*. In his theory of serialism, Perle posits that the series is a structural determinant. The series defines order relations among linear pitch successions but it does not control all intervallic relations among simultaneous linear formations.⁶⁴ Perle's conception of serial technique is rooted in Schoenberg's twelve-tone method in which "all the tone relations that govern a given musical context are referable to a specific linear ordering of the twelve notes of the semitonal scale." According to Perle, Schoenberg's compositional method affirms "the availability of twelve notes [although the method does not restrict the number of pitches used in a series to twelve] while denying a priori functional precedence to any one of them."⁶⁵ Perle argues that the series is analogous to the ostinato in post-tonal music, which functions as "a primary structural device where tonal functions are undeveloped or ambiguous." The series, then, performs a similar function, but at a deeper structural level.

In serial composition, however, the ostinato is no longer a constantly perceptible surface phenomena but the musical substructure, the groundwork.⁶⁶

⁶² *Pcseg*: pitch-class segment—an ordered succession of pcs (a series or an ordered subset of a series). *Pcset*: pitch-class set—a collection of pitch classes in normal order; an unordered set of pitch classes.

⁶³ Igor Stravinsky [Stravinsky], *Septet* (New York: Boosey and Hawkes Music Publishers Limited, 1953), 20-29.

⁶⁴ Perle, *Serial Composition*, 2.

⁶⁵ *Ibid.*, 2-3.

⁶⁶ *Ibid.*, 40.

Segmentation of the musical surface based on domains other than ordered pitch-class relations might produce alternate hearings of events.⁶⁷ For example, segmentation of the vocal part in Stravinsky's *In Memoriam Dylan Thomas* based on the domains of pitch, silence, duration, metric placement, and text often points up a subtle conflict with segmentation based entirely on the unfolding of the serial unit.⁶⁸ The analytical attitude behind Ward-Steinman's monograph and Perle's theory prohibits the elucidation of such a conflict because both theorists assign higher structural status to serial formations. Although textual structure and word setting in Stravinsky's early serial music influences serial unit deployment, there are sections in which text and serial unit deployment are not closely coordinated, and sections where the vocal pitch formations are non-serial. This does not mean that compositional cohesion is compromised; rather, this indicates that extraserial principles of organization are engaged.

Mori points out that Stravinsky employs three compositional methods in the last section of the ballet, *Agon* ("Pas-de-Deux," mm. 411-519): "the serial, the non-serial, and a method which strongly intimates serialism but whose basic unit is too small and too unrestrictively ordered to be called a tone row." Mori argues that formal process in this section is not a function of serial ordering; there are too many serially discontinuous sections. Rather, compositional congruence is achieved through the "correspondence of proportional and intervallic construction."⁶⁹ It is "the interaction of rhythm and pitch construction [that] contributes in an important way to the composer's innovation in structural framework."⁷⁰ An investigation into this same music biased towards the serial model could not possibly elucidate these subtle, but audible and structurally crucial relationships.

A theory of pitch structure derived from an analysis of linear formations biased towards serial technique does not necessarily have to consider the vertical dimension in order to present an insightful reading of the work under investigation. Analysis based

⁶⁷ Christopher Hasty, "Segmentation and Process in Post-Tonal Music," *Music Theory Spectrum* 3 (1981): 73. Hasty presents a theory of segmentation and an analytic method that can be applied to a wide range of twentieth-century works.

⁶⁸ See Chapter 6.

⁶⁹ Mori, "Proportional Construction," 25.

⁷⁰ *Ibid.*, 59.

primarily on a serial model, however, fosters the attitude that simultaneity and linear harmony in serial Stravinsky are by-products of linear process. This is certainly implicit in Ward-Steinman's dissertation as it is in Roman Vlad's important monograph, *Stravinsky*.⁷¹

J. A. Huff defends this attitude in the introduction to his dissertation, *Linear Structures and Their Relation to Style in Selected Compositions by Igor Stravinsky*, in which he asks the question:

What is the relation between the shifting stylistic orientation in Stravinsky's work and the maintenance of its aesthetic individuality?⁷²

Huff proposes an analytical model with which he illustrates stylistic continuity in Stravinsky's repertoire (from *L'Histoire du Soldat*, 1919, to *The Flood*, 1962). The model elucidates linear structures called *micro-* and *macro-series* (micro- and macro-series are differentiated by the durations of time spans). The model also proposes three levels of *time patterns: external duration, macro-duration, and micro-duration*. Huff explains:

[It] was necessary to fix upon that aspect of writing most fundamental to the organization of all the compositions of the group. Linear patterns are such, although the decision to center attention upon them is necessarily arbitrary, antecedently, since it can be verified only by the study itself that unity of style in this group of works is a derivative of Stravinsky's continuing and basic concept of part writing as inherently a horizontal kind of activity.⁷³

Thus, according to Huff, the use of these primarily "horizontal" compositional procedures justifies analytical bias towards linear formations—this attitude generally underlies serial-based analyses.

The issues of structure and hierarchization are inextricably related to the elucidation of compositional procedure. This is true in tonal analysis as it is in serial analysis.⁷⁴ However, a theory of musical structure is not necessarily a theory of compositional practice. Of course, compositional techniques should be considered throughout the

⁷¹ See Ward-Steinman, "Serial Techniques," 24-34; and Vlad, *Stravinsky*. These are only a few examples (see especially Ward-Steinman's analysis of *Three Songs from William Shakespeare*). Books of the more general type such as undergraduate textbooks are replete with discussions on row forms and techniques, but offer very little in way of explanations of Stravinsky's harmonic vocabulary.

⁷² Huff, "Linear Structures," 1-2.

⁷³ *Ibid.*, 5.

⁷⁴ By *tonal analysis*, I mean Schenkerian analysis.

analytical process; in fact, analysis may reveal the intentional use of certain compositional practices. Questions of composer intention and compositional process, however, will never be fully answered through analysis or by any other investigative method. In serial music, ordered relationships determined by pre-compositional and compositional procedures are essential to the understanding of the musical structure of a work. Nevertheless, the analyst cannot make any claim of a priori structural hierarchization of a series without considering the entire pitch-class complex in which the series is presented. Nor can the analyst necessarily assume that the persistence of a certain compositional device represents evidence of structural formations.

The decision to grant structural priority to the serial unit is arbitrary unless the constituents of a deeper structural level hold a demonstrable association with the ordered elements of the series. Thus, Perle's proposition that the series is the "primary structural device" that establishes the "musical substructure, the groundwork" cannot be applied universally. Hoogerwerf's model, on the other hand, suggests that structural relationships between serial and non-serial linear formations can be determined by allowing *unordered* sets to represent *ordered* sets. By extending this hypothesis to the question of vertical adjacencies in Stravinsky's early serial music, a rich universe of associations between the unordered pitch classes of simultaneities and pitch-class sets derived from the serial units is revealed.

Simultaneity

Regarding linear interactions in *Canticum Sacrum*, Smith Brindle says:

We are given the impression that it is not the composer [Stravinsky] who has controlled the harmony, but that it is just a chance-born child of contrapuntal circumstances.⁷⁵

This attitude is untenable to many Stravinsky scholars who base their inquiries into the relationship of simultaneity and line on the assumption that the former is not simply the by-product of the latter. Smith Brindle evaluates simultaneity in Stravinsky's *Canticum Sacrum* and Anton Webern's *Three Songs* Op.23, and concludes that the vertical language of *Canticum* is replete with discontinuities:

⁷⁵ Smith Brindle, *Serial Composition*, 85.

. . . Webern's writing here contains none of the defects we have just observed in [*Canticum*]. The harmony maintains the same atonal equilibrium throughout. The tension flow is even and not disrupted by any successive contrasts of consonance and dissonance.⁷⁶

Seen in the negative, the expressive potential of Stravinsky's sonorities is marginalized in deference to Smith Brindle's restrictive consonance-dissonance model of serial "harmony."⁷⁷

As pitch-class set theory becomes established during the 1970s, studies of Stravinsky's early serial works investigate the vertical interactions among simultaneous linear formations in an attempt to model the relationship of line and sonority in non-qualitative terms. In these studies, serial models interact with pitch-class set theory as well as theories that are outside the realm of post-tonal theory such as Schenkerian theory.

Ronald Clemmons undertakes an analysis of the Dirge Canons from *In Memoriam Dylan Thomas* in order to determine:

. . . how Stravinsky has solved certain problems relating to the coordination of motivic and harmonic elements in a serial-canonic texture, and to suggest the extent to which any of these structural forces may be conditioned at a given point by either (or both) of the others.⁷⁸

Clemmons examines certain aspects of pitch organization including "serial ordering and chromatic circulation of pitches" and "motivic identity in contrapuntal operations," and determines that Stravinsky has succeeded in coordinating motivic and harmonic units. In essence, Clemmons's analytical approach elucidates set classes, but his interpretation restricts the kinds of associations they can be drawn into. Similarity relationships between simultaneities are rendered solely in relativistic terms based on the highly subjective premise of Smith Brindle's consonance-dissonance model. Fortunately,

⁷⁶ Ibid., 87.

⁷⁷ Ibid., 70-72. Smith Brindle evaluates "harmonic tension" in twelve-tone compositions according to "degrees of tension," which is a grading system based on consonance and dissonance.

⁷⁸ Clemmons, "The Coordination of Motivic and Harmonic Elements": 9, 12-13. Clemmons employs Howard Hanson's system of labeling interval classes as a means of "classifying harmonic units according to their intervallic structures." Each vertical adjacency is represented by an inventory of its concomitant interval classes (analogous to the interval vector in pitch-class set theory).

Clemmons's analytic objective goes beyond harmonic succession and engages questions of deeper structural relationships.

In Clemmons's analysis of the Dirge Canons, expressions of the series are the primary structural features at the musical surface, but pitch-class sets derived from the serial units become significant at a deeper structural level.⁷⁹ Clemmons observes that the pcset derived from the series, {01234} is symmetrical about pc2 (D). Using a reductive analytic approach, Clemmons demonstrates that two forms of the set—the original set {01234} and its transposition {23456}—dominate the structure of two “regions” of the Dirge Canons (regions are defined in part by the pitch-class content created through specific row-form deployments).⁸⁰ Clemmons concludes:

Important structural points have been related by means of a process of resolving the duality of two juxtaposed centric hierarchies in favor of one of them. The principal unity of the composition results from the fact that the pitch series which unifies motivic elements is identical in content to the centric pitch hierarchies which regulates the larger harmonic structure.⁸¹

This hypothesis marks a significant change in the analytical attitude towards Stravinsky's early serial repertoire. In addition, Clemmons's analytic objective invites other explanations of the relationships between linear formations and simultaneities.

Charles Wolterink, in his dissertation *Harmonic Structure and Organization in the Early Serial Works of Igor Stravinsky* (1978), presents extensive analyses of six of Stravinsky's early serial works—*Cantata*, *Septet*, *Three Songs*, *In Memoriam*, *Canticum*, *Agon*—in which harmonic structure and organization are the primary focus of the inquiry. Wolterink explains:

The weight of this study is placed on the identification of the various kinds of chordal structures Stravinsky prefers, and on the role they play in the large-scale organization of the works examined.⁸²

Wolterink integrates orthodox serial analysis, pitch-class set theory, and tonal theory in order to elucidate relationships between linear and vertical structures and model

⁷⁹ See Chapter 2, “The Serial Unit.”

⁸⁰ Clemmons, “The Coordination of Motivic and Harmonic Elements”: 15-16. This synopsis of Clemmons's work employs pc integers in place of pc letters.

⁸¹ *Ibid.*, 17.

⁸² Wolterink, “Harmonic Structure and Organization,” 2.

harmonic process in Stravinsky's early serial music. Wolterink recognizes the significant analytic consequences of rendering disparate linear and vertical formations as pitch-class sets. Wolterink employs his own method of set labeling, which is similar in some respects to Allen Forte's method of listing the prime form of a set class, but the integers in Wolterink's method represent ordered pitch-class intervals instead of pitch classes.⁸³ Moreover, Wolterink assigns a root to each pcset so that pcsets are drawn simultaneously into tonal-theoretic relationships.⁸⁴ This leads Wolterink to an interpretation of these sets in terms of the chords and scales of the tonal system and an explanation of harmonic succession and linear process in Stravinsky's early serial music that is analogized to tonal syntactical relationships.⁸⁵

The advantage of a pitch-class set-theoretic system such as Allen Forte's or Richard Chrisman's over that of Wolterink's is that it presents the analyst with a method to objectify diatonic formations and other tonal "semblances" or "allusions" (see below) in post-tonal music in the same terms as non-diatonic formations. In Wolterink's theories of pitch structure for Stravinsky's early serial works, tonal-based analysis competes with the other modes of analysis he employs, which in turn impedes the realization of his analytical objective. A theory of pitch-class relations once extricated from tonal theory,

⁸³ Ibid., 20, 32-35, 335.

⁸⁴ Ibid. 13-31. In Wolterink's dissertation, a pcset is represented by a pc letter (a note name) followed by a string of integers—that is, an "integer sequence"—arranged from lowest to highest values (normal order). A set class, then, is represented by a succession of intervals rather than a pcset. The prime form of a set class in Wolterink's method is easily translated into the prime form of a set class in Forte's system simply by assigning pc0 (C) as the "root." For example, Wolterink's pcset A: 27 is equivalent to pcset {9e4}; Wolterink's set-class 27 is equivalent to Forte's set-class 3-9, prime form {027}. In Wolterink's system, a second pc letter included at the end of the string means that the intervals are to be calculated from this pc rather than from the leading pc. The leading pc, then, is the "root" of the pcset and of the sonority (vertical and/or horizontal). For example, the pcset E: 27(A) is {9e4}—pc E (pc4) is the root of the set.

⁸⁵ In an earlier article, Richard Chrisman, in "Describing Structural Aspects of Pitch-Sets using Successive-Interval Arrays," *Journal of Music Theory* 21.1 (1977): 1-7, proposes a method similar to Wolterink's for identifying pcsets. Chrisman reviews and synthesizes aspects of contemporary approaches to the determination of intervallic and pitch relationships that contribute to the understanding of "the harmonic properties of *non-serial* atonal music [*italics mine*]." By providing means for describing the intervallic structure of any collection of pitches and for describing the intervallic nature of transformations and of their effect on those collections, the specific conditions under which total or partial pitch-class invariance can occur may be determined. These means can then serve as a useful tool for analyzing and understanding relationships among pitch-class objects in serial and non-serial "atonal" music. Chrisman's approach is influenced by the theories of Milton Babbitt, Donald Martino, George Perle, Allen Forte (specifically, *The Structure of Atonal Music*), David Lewin, and Hubert S. Howe, Jr. Wolterink does not cite this important article in his bibliography.

however, produces a very different explanation for the linear processes and vertical interactions in a post-tonal work than does one in which tonal theory plays an important role.

Diatonicism, Serialism, Atonality, Tonality, and Centricity

Among the statements regarding Stravinsky's early serial music, there is a rather cryptic one the composer himself made to Robert Craft in the late 1950s:

I hear certain possibilities and I choose. I can create my choice in serial composition just as I can in any tonal contrapuntal form. I hear harmonically, of course, and I compose in the same way I always have.⁸⁶

This statement has been interpreted by many scholars to mean that Stravinsky employs tonal harmonic techniques in these works, which in turn validates analyses such as Wolterink's in which tonal theory plays a significant role.

Just as the serial formations in Stravinsky's early serial music engender analytic misreadings biased towards the orthodox serial model, the diatonic attributes of Stravinsky's works from this early period invite analytical misreadings that are biased towards a tonal explanation.⁸⁷ In these analyses, pitch-class privilege or centricity is often confused with tonal function.⁸⁸ Pitch deployment in this repertoire, however, is not organized by the structural background common to works of the tonal tradition, nor does it conform to the functional progressions and voice leadings of the tonal tradition. Thus,

⁸⁶ Igor Stravinsky and Robert Craft, *Conversations with Igor Stravinsky* (London: Faber and Faber, 1959 [1958?]), 24-25.

⁸⁷ In Joseph Straus, *Remaking the Past: Musical Modernism and the Influence of the Tonal Tradition* (Cambridge, Massachusetts: Harvard University Press, 1990), 27, the author explores the analytical and theoretical prose of Arnold Schoenberg, Alban Berg, Anton Webern, Bela Bartók and Igor Stravinsky and systematically reveals instances of analytical misreadings in which these composers "look in earlier music for the same kinds of complex motivic relations that they compose and identify in their own works." Similarly, the act of any musical analysis necessarily entails analytic misreading as each reading is shaped by the reader's current epistemological attitudes.

⁸⁸ Straus, *Introduction to Post-Tonal Theory* 2d. ed. (Upper Saddle River, New Jersey: Prentice Hall, 2000), 112. Straus posits that a non-tonal piece can have pitch or pitch-class centers. He explains that "a sense of centricity often emerges from the use of stable, referential collections" such as the diatonic collection.

assigning structural status to a pitch-class or pitch-classes according to the tonal model is inappropriate.

In some Stravinsky studies, the terms “diatonic” and “serial,” and “diatonic” and atonal” are simply—and incorrectly—put into opposition to one another. Any set of pitch classes whose characteristics evince diatonicism (that is, the qualities of a diatonic formation such as a scale or chord) can be arranged as a series, which in turn can be subjected to twelve-tone operations. Such a series may include segments that have tonal connotations, but it is order relationships, not tonal resemblances, that determines syntax and directs linear processes. The term “atonality” is frequently misinterpreted as arbitrarily excluding diatonic collections because of their tonal connotations. A tonal work is generally recognized as one by its high level of conformity with the Schenkerian model. Diatonicism provides the pitch resources of the model, but not the syntax. Without tonal syntax, diatonic formations are non-tonal. This is the fundamental difference between a *tonal diatonic work* and a *non-tonal diatonic work*.

It is apparent that certain diatonic collections are important referential collections in Stravinsky’s early serial music. Although the music is non-tonal, the presence of certain vertical and linear formations characteristic of this music (as well as much of Stravinsky’s pre-1952 works) evokes a strong sense of connection to the tonal tradition.

Edwin Hantz discusses the first of the *Three Songs from William Shakespeare* in terms of tonal and serial models, claiming that:

[“Musick to heare”] is an interesting example of a piece which is at the same time serial and tonal. It can be heard “about” a three-interval-class pattern . . . and “about” some kind of C orientation.⁸⁹

As will become clear in Chapter 5 of the present study, this movement is not tonal: there is no harmonic-syntactic conformity to the Schenkerian model of tonality.

Similarly, Frank Hoogerwerf posits that the series used in the *Septet* “displays both tonal and referential functions.” Using Schenkerian reductive techniques, Hoogerwerf demonstrates that the original form of the series is organized at the structural middleground through the prolongation of “V” (in the key of A), which resolves to “I.”⁹⁰

⁸⁹ Edwin Hantz, “What You Hear is What You Get”: 51.

⁹⁰ Hoogerwerf, “Tonal and Referential Aspects of the Set”: 70-71. Compare Examples 2a and 2b.

Hoogerwerf's example, however, also reveals non-conformity with the "V – I" model. Hantz and Hoogerwerf both attempt to explain the coincidence of diatonic formations and the establishment of prominent or privileged pitch-classes. For reasons discussed above, however, such explanations are untenable.

In contrast, Clemmons's reductive approach to the Dirge Canons of the *In Memoriam*, avoids tonal interpretation. Clemmons identifies three classes of "triadic harmonic units" but he notes that these units "do not express functional relationships which are associated with traditional tonality"⁹¹ and therefore are not assigned special status. Rather, pitch classes gain structural status through collectional associations and their position in the *unordered* set (see above). Thus, Clemmons successfully elucidates pitch-class centrality by marginalizing the role of the tonal model and elevating the pcset to a higher structural status.

In his seminal monograph "Problems of Pitch Organization in Stravinsky" (1963), Arthur Berger confronts the analytical issue of non-tonal diatonicism in twentieth-century music "that is centric (i.e., organized in terms of tone center) but not tonally functional."⁹² Berger challenges traditional terminology and its associated meanings, and defines terms and concepts that are neutral with respect to tonal principles. Concepts associated with modal and tonal theory such as *mode*, *major* or *minor scale*, *hybrid minor formations* and *diatonic scale* which are replete in the Stravinsky literature do not, in Berger's opinion, adequately describe centric pitch collections and how they function.⁹³ Moreover, Berger proposes that all of these scalar constructs can be reduced to two basic, interacting collections—*diatonic* and *octatonic*—that influence pitch structure in Stravinsky's music.

Given his analytical approach and the current state of music theory, Berger claims that one cannot determine whether pitch-class objects in this repertoire are related through tonal functions or if they are merely "semblances"—that is, they have "an

⁹¹ Clemmons, "The Coordination of Motivic and Harmonic Elements": 15.

⁹² Arthur Berger, "Problems of Pitch Organization in Stravinsky," *Perspectives of New Music* 2.1 (1963): 11.

⁹³ *Ibid.*, 12, 17-20.

appearance or outward seeming of” a tonal entity.⁹⁴ Berger suggests that the analytical conflict in Stravinsky’s works that arises from “an intervallic, incipiently serial, ‘non-tonal’ interpretation of this music and the tonal bias that obviously governed its conception” cannot be resolved by way of the “imperatives of tonal functionality.” Even though “what tonal implications do present themselves are distinctly parenthetical,” this conflict cannot be resolved simply by ignoring these tonal “semblances.”⁹⁵ Berger explains:

Stravinsky, for all his genuine independence and original musical outlook, was born into a generation that had, in a manner of speaking, a “congenital” orientation toward those concepts of “traditional harmony” that are now being questioned.⁹⁶

Because of Stravinsky’s connection to the tonal tradition, Berger argues:

[the tonal “residuum” in his music must be accounted for] both in the light of our total theoretical knowledge and in the light of interval relationships, whether of the basic cell, independent pitch-class formations, or the diatonic and symmetrical scales.⁹⁷

In his remarkable book, *Remaking the Past: Musical Modernism and the Influence of the Tonal Tradition*, Joseph Straus propounds a theory of influence that provides an explanation for the prevalence of overt and/or concealed “allusions to traditional tonal music” in the early twentieth-century post-tonal repertoire. Straus’s “influence as anxiety” model draws from Schenkerian theory and pitch-class set theory, Berger’s referential model, and from literary theory (specifically, Harold Bloom’s theory of influence). Straus posits that, in the post-tonal repertoire, tonal-like formations—or *tonal allusions*—“exist side by side with musical structures which are clearly post-tonal in nature.”⁹⁸ In accordance with Berger, Straus states that tonal allusions are fully integrated into the structures of post-tonal works, which results in an “irreconcilable structural

⁹⁴ Ibid., 42, and fn.17 (42).

⁹⁵ Ibid., 41.

⁹⁶ Ibid., 42.

⁹⁷ Ibid.

⁹⁸ Straus, *Remaking the Past*, 184.

conflict.”⁹⁹ Since there is no tonal background in these works, tonal allusions occur at the structural surface and middleground. According to Straus, this conflict can only be resolved at deeper structural levels where tonal allusions are subsumed into post-tonal pitch structures.

The Octatonic-Diatonic Binarism and the Diatonic-Chromatic Dichotomy

Pieter van den Toorn, in his seminal book *The Music of Igor Stravinsky*, examines works selected from Stravinsky’s entire career. Van den Toorn’s study proceeds from Berger’s hypothesis that pitch organization in this music can be explained in terms of their relationship to the octatonic and diatonic referential collections.¹⁰⁰ In van den Toorn’s theory, pitch formations in complete works or sections of works fall into four main categories: sections in which octatonic references are explicit, sections in which octatonic references are inferable (including sections comprising interacting or interpenetrating octatonic and diatonic collections), sections which display explicit diatonic references, and sections in which neither diatonic nor octatonic references are evident.¹⁰¹ Although van den Toorn admits that not all of Stravinsky’s music can be modeled according to these four categories, it is his analytic objective to make these exceptional instances fit his octatonic model.

It is . . . inevitable that certain works or passages will be found to have been ignored (or overlooked), and some of those listed found to be questionable—at least at this stage—as to their octatonic credentials. [*Italics mine*]¹⁰²

Joseph Straus, Akane Mori, and Dmitri Tymoczko challenge van den Toorn’s octatonic model. While they acknowledge that the octatonic scale is an important referential collection in some of Stravinsky’s music, the global significance van den Toorn places on it distorts his analyses of Stravinsky’s works, which in turn obfuscates

⁹⁹ Joseph N. Straus, “Post-structuralism and Music Theory (A Response to Adam Krims),” *Music Theory Online* 1.1 (January, 1995): para. 3.

¹⁰⁰ van den Toorn, *The Music of Igor Stravinsky*, 43.

¹⁰¹ *Ibid.*, 42-48, 73f.

¹⁰² *Ibid.*, 47.

other interpretations that allow non-octatonic collections to participate in important structural roles. In Mori's opinion, van den Toorn's model creates an analytic impasse that results from having to select among four potential tone centers, "which are too many to be true tone centers." Instead, Mori endorses Straus's hypothesis of the "'tonal axis,' which must consist of 'overlapping major and minor triads' and must be 'the essential harmonic generator of the piece'." ¹⁰³

In his recent article "Stravinsky and the Octatonic" (2002), Dmitri Tymoczko challenges the extent to which the octatonic model explains pitch organization in Stravinsky's music, and suggests that analytic instances of octatonicism "actually result from two other techniques: *modal use of non-diatonic minor scales, and superimpositions of elements belonging to different scales* [italics mine]." ¹⁰⁴ Given Tymoczko's well-argued objection to van den Toorn's octatonic model, one concludes that the analytical attitude towards pitch formations in Stravinsky's music has apparently returned to the state of impasse that motivated Berger to propose the octatonic-diatonic model in the first place.

In his recent book *Stravinsky's Late Music*, Joseph Straus offers a corrective to the model of pitch organization in Stravinsky's music that is sympathetic to the octatonic-diatonic models put forth by Berger and van den Toorn, but establishes the interaction of chromatic and diatonic resources as central to Stravinsky's music:

The contrast of diatonic and chromatic elements as an expressive device has its roots in Stravinsky's earliest music, and in the music of his Russian forebears. ¹⁰⁵

Straus proposes that the diatonic-chromatic dichotomy represents a "significant dramatic resource" throughout Stravinsky's career. The interaction of diatonic and chromatic elements ("often octatonic") expresses the dramatic/programmatic aspect of Stravinsky's music:

Its symbolic resonance generally associates diatonic elements with simplicity, nostalgic dreams, a time before life begins and after it ends, a cessation of striving and seeking, a bright, undifferentiated blankness, and associates chromatic/serial

¹⁰³ Mori, "Proportional Construction," 5; Straus, "A Theory of Harmony and Voice Leading," 15-20.

¹⁰⁴ Dmitri Tymoczko, "Stravinsky and the Octatonic: A Reconsideration," *Music Theory Spectrum* 24.1 (Spring, 2002): 68-102.

¹⁰⁵ Straus, *Stravinsky's Late Music*, 221.

elements with complexity, intricate reality, yearning and striving, a dark and richly differentiated life.¹⁰⁶

Schenkerian Theory and Reductive Analysis

The attraction of the Schenkerian-analytical approach to the analysis of linear processes in post-tonal music is that it holds the potential to explain serial and non-serial formations in terms of a single structural model, providing the analyst extricates the model from its basic Schenkerian tenets.¹⁰⁷ Robert Morgan develops a “contextual” Schenkerian analytic technique—the *dissonant prolongation model*—that he applies to the analysis of several post-tonal works. In addition to the theories of Heinrich Schenker, Morgan’s model draws from the ideas of Milton Babbitt (specifically, his concept of non-triadic harmonic regions circa 1948), Felix Salzer, Allen Forte (specifically, *Contemporary Tone Structures*) and Roy Travis.¹⁰⁸ Essentially, Morgan extends Schenkerian theory to the post-tonal repertoire by excluding fundamental structure (tonal background) and functional harmony from his model. Furthermore, prolongation is no longer restricted to functionally referential triadic harmonies so that any simultaneity, including “dissonant” chords, can be prolonged.

Joseph Straus, among others, has argued convincingly against Schenkerian-driven theories such as those proposed by Morgan (dissonant prolongation model) and Travis (directed motion theory).¹⁰⁹ Consequently, this attitude completely extricates reductive analytic techniques currently applied to post-tonal music from Schenkerian tonal theory. In Allen Forte’s opinion, Van den Toorn’s analysis of the *Rite of Spring* exemplifies a successful synthesis of Schenkerian and pitch-class set analysis that circumvents

¹⁰⁶ Ibid., 221.

¹⁰⁷ See Felix Salzer, *Structural Hearing: Tonal Coherence in Music* (New York: Dover Publications, 1952). Before 1980, Salzer’s work was a primary vehicle for the dissemination of Schenkerian theory; thus, many analytical works that apply “Schenkerian” analysis to post-tonal works are influenced by Salzer’s interpretation.

¹⁰⁸ Robert P. Morgan, “Dissonant Prolongation: Theoretical and Compositional Precedents,” *Journal of Music Theory* 20 (1976): 49-91.

¹⁰⁹ For example, see Joseph N. Straus, “The Problem of Prolongation in Post-Tonal Music,” in *Journal of Music Theory* 31 (1987).

Morgan's dissonant prolongational model in its explication of linear structure as a dynamic interaction of two pitch-class sets.¹¹⁰ Straus, like Forte and van den Toorn, adopts the Schenkerian-derived principle of "composing-out." In Schenkerian theory, *Auskomponierung* or "composing out" describes:

the articulation and elaboration of the structural basis of a tonal piece, namely its tonic triad; the piece may thus be characterized as the final 'composing-out' or 'compositional unfolding' of this chord.¹¹¹

In post-tonal music, says Straus:

[any pitch-class set can] extend over large stretches of music. In fact, one of the most potent means of assuring large-scale coherence in post-tonal music involves projecting pitch-class sets over large musical spans.¹¹²

This statement encapsulates the premise underlying Straus's *associational model* for the analysis of atonal voice leading. Fully extricated from the prolongational model, the associational model employs reductive analytic techniques but is not explicitly Schenkerian. This approach to the linear analysis of post-tonal music allows pitches "separated in time" to be "associated by any contextual means." so that they "may form coherent linear structures."¹¹³

Symmetry

Thomas Clifton's monograph "Types of Symmetrical Relations in Stravinsky's *A Sermon, A Narrative, and A Prayer*" (1970) explores the role of symmetry in Stravinsky's serial music. Clifton identifies several "morphological and syntactical expressions" of symmetry and defines two types of temporal symmetries—translatory

¹¹⁰ Allen Forte, "New Approaches to Linear Analysis," in *Journal of the American Musicological Society*, XLI, no.2 (Summer, 1988): 316.

¹¹¹ William Drabkin, "A Glossary of Analytical Terms" in *Analysis*, edited by Ian Bent (New York: W.W. Norton & Company, 1987), 112.

¹¹² Joseph N. Straus, *Introduction to Post-Tonal Theory* (Englewood Cliffs, New Jersey: Prentice Hall, 1990), 72-73. The first edition of Straus's book is cited here to point up an early instance of Straus's articulation of the associational model.

¹¹³ Joseph N. Straus, "Voice Leading in Atonal Music," in *Music Theory in Concept and Practice*, ed. James M. Baker, David W. Beach, and Jonathon W. Bernard (University of Rochester Press, 1997): 241; Joseph N. Straus, *Introduction to Post-Tonal Theory* (2d ed.), 89-90.

and reflective—that are often found in conjunction with five types of spatial symmetries.¹¹⁴ Temporal symmetries are, in essence, indicative of ordered relations, including pitch events such as palindromic structures, row form deployments, and cellular row constructions as well as non-pitch events such as tempo and metric groupings and large-scale events such as arch forms. Spatial symmetries are non-linear in conception—they are unrelated to ordered unfolding.¹¹⁵ Although Clifton is addressing a work from Stravinsky's late serial period, these models are applicable—with some modification—to Stravinsky's early serial works.¹¹⁶

Marianne Kielian-Gilbert suggests a means of investigating pitch relationships, compositional practice, and formal process through the “dynamic interaction of a pair of equivalent structures” in her essay “Relationships of Symmetrical Pitch-Class Sets and Stravinsky's Metaphor of Polarity” (1983).¹¹⁷ Kielian-Gilbert posits that, “in the context of his works this idea of poles of attraction, or polarity, may be correlated with relationships of paired, transpositionally-related pitch-class structures.”¹¹⁸

Kielian-Gilbert defines *complementation* as “the process of pairing entities on either side of a center of symmetry”; the “*complementary* subsets of a symmetrical set are corresponding, inversionally-related subsets that balance each other about an axis of symmetry.” The axial treatment of symmetrical sets is “associated with the compositional procedures of Bartók, Schoenberg, and Berg.” Stravinsky, however, offers an alternative that is “non-complementary in nature in that transpositional, rather than inversional relationships are emphasized musically.”¹¹⁹ Kielian-Gilbert's analytic method is based on a segmentation process that elucidates certain trichordal and tetrachordal symmetrical sets, including sets that can be generated through interval cycles of one or two

¹¹⁴ Thomas Clifton, “Types of Symmetrical Relations in Stravinsky's *A Sermon, a Narrative, and a Prayer*,” *Perspectives of New Music* 9.1 (1970): 96-97.

¹¹⁵ *Ibid.*, 98-108.

¹¹⁶ See Chapter 2.

¹¹⁷ Marianne Kielian-Gilbert, “Relationships of Symmetrical Pitch-Class Sets and Stravinsky's Metaphor of Polarity,” *Perspectives of New Music* 21.1 (1983): 209, 219. The examples that Kielian-Gilbert selects include excerpts from Stravinsky's Russian and neo-classic works: *Three Pieces for String Quartet*; *Rite of Spring*: “Introduction”; *Octet for Winds*: “Tema con Variazioni.”

¹¹⁸ *Ibid.*, 209.

¹¹⁹ *Ibid.*, 210.

elements—segmentation includes both vertical and horizontal pitch arrangements.

Through this process, she demonstrates that:

By employing symmetrical sets that contain paired interval-classes, Stravinsky creates situations in which the pcs of paired structures are in “intervallic equilibrium” within their respective sets yet vary in priority within the surrounding musical context.¹²⁰

The analytical attitude behind both Clifton’s and Kielian-Gilbert’s works conveys a richer understanding of the compositional and analytical potentials of ordered and unordered symmetrical sets. Although the works these authors investigate represent only a narrow albeit diverse sample of Stravinsky’s compositional output, the notions conveyed through their monographs are applicable to a wide range of his works. Some of the more attractive attributes of these studies have been discussed above in the context of other analytical works, such as the ability to draw ordered and unordered, vertical and linear pitch structures in abstract associations through pitch-class set theory. Kielian-Gilbert’s analyses is exemplary of the judicious use of the “compositional unfolding” model described by Straus as an analytical tool. Moreover, both Clifton and Kielian-Gilbert address symmetrical collections in terms that are independent of Berger’s octatonic model or Pousseur’s description of pitch resources via Messiaen’s “symmetrical” modes.

The analytical literature in which the serial model plays a significant role in the explanation of form tends to overlook other modes of the explication of formal processes in Stravinsky’s early serial music. This prompts Akane Mori to investigate “problems of form” in her dissertation *Proportional Construction in Relation to Formal Process in the Early Serial Music of Igor Stravinsky* (1989). As form “is one of the manifestations of musical rhythm,” then the “consideration of form is directly related to the rhythmic aspect of music.” Rhythm, in turn, is subjected to organization on three hierarchical categories.¹²¹ Mori submits that the analytical literature to date tends to address only the first two hierarchical categories of “small-scale” and middle-scale” rhythm:

¹²⁰ Ibid.

¹²¹ Mori, “Proportional Construction,” 1. Also see: Akane Mori, “Proportional Exchange in Stravinsky’s Early Serial Music,” *Journal of Music Theory* 41.2 (1997): 227-259. The salient aspects of Mori’s dissertation have been refined and presented in this article.

the investigation of the third category, formal process, has been relatively neglected, especially as it relates to the first and second categories of rhythm.¹²²

Mori marginalizes the role of the serial unit in the compositional and analytical processes and extends analytic privilege to a model of interaction between proportion and interval.¹²³ Two types of exchanges, *voice exchange* and *proportional exchange*, function at various structural levels to articulate formal divisions; these exchanges also represent expressions of symmetry.¹²⁴ Voice exchange functions at the musical surface and middleground, creating stability, reinforcing cadential successions, or effecting a sense of change in motion such as acceleration.¹²⁵ Mori defines “‘proportional exchange’ as a situation in which the proportion of two large segments in a voice appears in inversion in two segments of another voice.” While voice exchange is local event, “proportional exchange not only affects the form of Stravinsky’s music, but . . . it is also one of the fundamental aspects of his compositional procedure.”¹²⁶

Mori, like Clifton and Kielian-Gilbert, uses the concept of symmetry to elucidate formal aspects of Stravinsky’s music. Unlike Kielian-Gilbert, however, Mori’s formalistic approach does not prioritize pitch over other aspects of musical space. Mori’s analyses reveals that the analytical attitude towards Stravinsky’s early serial music has undergone significant if not radical changes since the attempt to address this repertoire in objective, analytical terms was first undertaken in the 1950s. In Mori’s model of formal process, pitch, and therefore serial formations are assigned a lower hierarchical status than that of rhythm, duration, interval, and proportion—such an analytical approach would most likely be perceived as untenable by the academic music community circa 1960.

¹²² Ibid.

¹²³ Ibid., 11.

¹²⁴ Ibid., 97, 148-49.

¹²⁵ Ibid., 104.

¹²⁶ Ibid., 105.

CONCLUSION

The foregoing discussion necessarily entailed some critical evaluation of the hypotheses and theories put forth by several generations of music scholars who have offered perceptive, imaginative, and insightful ways of coming to terms with and understanding a repertoire that—because of its originality, apparent compositional discontinuities, and divergent modes of expression—present a formidable analytic challenge. Of course, this review was by no means exhaustive, nor could it be given the incredible amount of scholarship directed towards the music of Igor Stravinsky.

The present study recognizes that Stravinsky's serial technique differs significantly from classical serialism, and posits that these differences are the result of idiosyncratic realizations of serial procedure that interact with other compositional procedures in response to the exigencies of creating musical artworks. Thus, the present study adopts the position that Stravinsky's early serial compositions are aesthetically complete entities—none of these works should be viewed as inferior or arbitrarily composed essays in serialism. Furthermore, the present study holds that Stravinsky's second (or late) serial period is not the logical outcome of the first (or early) serial period, although there may be demonstrable stylistic and compositional continuities between the two periods. The implementation of a twelve-tone approach by the composer over that of his nondodecaphonic serial method may simply be the result of his realization that he could express his musical visions through dodecaphonicism without compromising or suspending his traditional aesthetic values. Devices found in Stravinsky's late serial music such as hexachord rotation, hexachord partitioning (in which diatonic and non-diatonic linear formations interact), and symmetrical constructions resonate in his earlier music, serial and pre-serial, in terms of sound and concept.

Although several scholars have offered models that suggest means for exploring the interaction of serial and non-serial formations, these models are by no means definitive. Thus, the present study continues the ongoing investigation of musical structure in these works. Since a description of these works based solely on serial formations is inadequate and inappropriate, the analytical weight of the serial models used in the present study varies according to the singularities in linear design and sonority that each work

expresses. Because the tonal model fails as an explanation of the structures and formal processes in these works, the theoretical and methodological basis of present study is completely extricated from such an approach. In Stravinsky's early serial works, the "irreconcilable structural conflict" that Straus describes can only be resolved through analysis in which both the serial and tonal models are marginalized. The diatonic-octatonic binarism proposed by Berger and van den Toorn cannot model pitch structure in these works, while the diatonic-chromatic dichotomy described by Straus points up important collectional interactions and interpenetrations that play significant roles in the pitch organization of this repertoire. Thus, the present study replaces these competing models with the *model of generic set-class space*.

The works that constitute the focus of the present study are *Orpheus* (the "serial interludes"), *Ricercar II*, from the *Cantata*, "Musick to heare," from *Three Songs from William Shakespeare*, and *In Memoriam Dylan Thomas*. Irrespective of the close temporal proximity of these compositions, each of these works presents a unique and engaging analytic challenge. The present study adopts the attitude that there are certain transformational principles that place the pitch materials of this repertoire into a network of relationships. Although no single principle or device elucidates compositional or analytical unity within a work (or movement) or among works of this repertoire, a system of transformational processes that functions within the context of the model of generic set-class space effects compositional and analytical unity at a highly abstract level.

CHAPTER TWO

THEORY AND METHODOLOGY

INTRODUCTION

Chapter 2 sets forth the theoretical and methodological basis of the present study and proposes a special model of pitch organization based on pitch-class set and set-class transformations, and pitch-class set genera. A theory based on transformations informs the analytical approach that draws relationships among significant pitch-class sets and set classes identified through the analysis of the works considered in this dissertation.¹ The various types of transformations defined herein form a closed system of transformational processes called a *transformational system*. Materials derived through analysis, once filtered through the transformational system, form into local and large-scale *transformational networks*.²

Three referential collections, or *genera*—diatonic, chromatic, and octatonic—provide the context in which the various pitch-class objects discovered through analysis interact. Each of these pitch-class objects evinces characteristics of at least one of the three genera. The diatonic, chromatic, and octatonic genera participate in a *model of generic set-class space*, which represents the primary source of pitch materials used in each of the works considered in this dissertation. The union and interaction of the diatonic, chromatic, and octatonic genera creates a large, yet limited assemblage of pitch objects (pitch-class sets, pitch-class segments, set classes) from which Stravinsky often selects

¹ The rationale for the works selected for analysis was presented in Chapter 1. The analytical chapters address two movements from *Orpheus* (1947), “Ricercar II” from the *Cantata* (1951-52), “Musick to heare,” no.1 of *Three Songs from William Shakespeare* (1953), and *In Memoriam Dylan Thomas* (1954).

² David Lewin, *Generalized Musical Intervals and Transformations* (New Haven and London: Yale University Press, 1987). The *transformational network* is an iconic model of transformational relationships among musical objects. This will be discussed below in the present chapter (see “Methodology”).

structures that are most suited to his compositional needs. Rather than confronting the totality of set classes engendered by the system of twelve pitch classes (the aggregate), Stravinsky generates, through transformational processes, formations that proceed from a predilection for diatonicism—that is, for pitch objects that hold affinity to the diatonic genus.³

Since every set class instantiates a genus, the set class that best embodies the unique characteristics of each constituent genus of the model of set-class space represents that genus: set-classes 7-35 (diatonic), 7-1 (chromatic), and 8-28 (octatonic).⁴ Other set classes discussed herein relate to these primary genera through inclusion relationships and/or other transformational processes. Transformational processes also draw each of the three genera into a relationship, which in turn makes this model of set-class space more compelling as an analytical frame of reference towards the formation of appropriate theories of pitch structure for each of these works. A comprehensive explication of the model of set-class space and the rationale for the selection of the diatonic, chromatic, and octatonic genera as primary constituents appear later in this chapter.

Two issues are central to this dissertation. The first is concerned with the structure and role of the serial unit in works selected from Stravinsky's early serial period. The second is concerned with how these units interact with linear (horizontal and vertical) formations found at the musical surface. As post-tonal compositional theory and analysis undergoes change, so does the analyst's point of view regarding the structure and role of the serial unit in this repertoire—the discussions in Chapter 1 addressed this at length. Nonetheless, a general description is necessary of Stravinsky's idiosyncratic approach to serial technique as represented in his early serial works in the context of the terminology used in the present study.

The interaction of serial and non-serial formations in this repertoire, the second central issue, can be partially explained through the elucidation of literal and abstract inclusion relationships among associated ordered (and unordered) sets. A more

³ Stravinsky's predilection for diatonicism is documented. See, for example, Arthur Berger, "Problems of Pitch Organization in Stravinsky": 11-42.

⁴ The decision to select set-class 7-1 instead of 12-1 (the aggregate) as the set class that best represents the chromatic genus is partly based on cardinality (the number of elements in the set class). Thus, the set-classes representing each of the three genera—7-35, 7-1, 8-28—are of equal or nearly equal size.

comprehensive approach to the explanation of pitch structure in this repertoire, however, depends on a theory of transformational relationships. Several transformational processes, including inclusion, are operative within these works.

THE SERIAL UNIT

The terms *row*, *series*, and *serial unit* are often nearly interchangeable within the corpus of literature pertaining to twelve-tone and serial music. In the present study, the terms *series* and *row* represent the prime ordering of the row (the original series). The terms *row form* and *serial unit* apply to any transformation of the original series, including the series itself.

In terms of classical serialism, Stravinsky's early serial method is unorthodox. A row, in classical serial music, contains the twelve pcs of the aggregate arranged in a series of pitch classes.⁵ Each of the twelve pcs appears only once, which means there is a one-to-one mapping between the twelve pcs and the twelve order positions of a twelve-tone row. Thus, each expression of the row exhausts the aggregate.

The rows in Stravinsky's early serial repertoire (that is, before *Canticum Sacrum*) are nondodecaphonic, containing as few as four ordered elements and as many as ten elements.⁶ In addition to aggregate non-completion, Stravinsky's idiosyncratic approach to row construction includes the non-contiguous repetition of a pc or pcs, the interpolation and appending of serial or non-serial material to a serial unit, and diatonic references.

Consistent with classical serial composition, Stravinsky treats the row as a series of pitch classes and concomitant ordered pitch-class intervals (pc-ints), which transforms through the classical serial operations of transposition (T), inversion (I), retrograde (R), and retrograde inversion (RI).⁷ Contour, pitch, and rhythm and duration in the realization

⁵ By "classical serial music," or "twelve-tone music," I mean the twelve-tone method of composition described by Schoenberg.

⁶ Some authors consider the row in "Musick to heare" to be a unit comprising four pcs and four pitch events.

⁷ Straus, *Post-Tonal Theory*, 6-10. In this dissertation, the abbreviation "pc-int" represents an *ordered*

of the row are, of course, variable. The ordered pcs that comprise the series undergo transformation while the succession of ordered pitch-class intervals—that is, the ordered pitch-class-interval succession (PCIS)—derived from the ordered pcs remains invariant under transposition (P form), or reverses order under retrograde (R form). The *complement* of each element of the PCIS produces the inversion (I form), or the retrograde-inversion (RI form). The *succession of interval classes*—that is, the interval-class succession (ICS)—derived from the PCIS, remains invariant under transposition and inversion, or reverses order in R forms and RI forms. These processes, which undergo further explication below, are essential techniques of classical serial compositional procedure.

Stravinsky creates post-tonal environments in which serial and non-serial formations interact. Some rows express pitch-class successions that resemble tonal formations by membership in the diatonic genus of set classes (for example, *Three Songs from William Shakespeare*: “Full fadom five” and “When Dasies pied”). Although these formations evoke affinity with the tonal tradition, it will become apparent in the following analytical chapters that such formations exist in compositional environments in which tonal harmonic support and common-practice voice leading is absent.⁸ Since linear formations in these works (serial and non-serial) interact in a non-tonal environment, modeling these formations in terms of post-tonal theories has the potential to reveal a rich universe of structural relations.

Even though the fixed-0 system is used to identify pitch classes, the *moveable-0* system is used herein for serial unit labeling, which is a reflection of Stravinsky’s penchant for non-dodecaphonic rows (some of these express pc0 as a structurally significant pitch class: for example, “Ricercar II” and *In Memoriam Dylan Thomas*). Thus, for P₀, the integer 0 in the label refers to the first pc of the prime ordering of the series (the first, or referential, form of the serial unit). The integer in the label for all transpositions of P₀ (P forms) derives from the ordered pitch-class interval formed by the

pitch-class interval; that is, the interval between any two pitches in modular space (modulo 12). An interval class (ic), on the other hand, is the same as an *unordered pitch-class interval*.

⁸ See the discussion in Chapter 1 regarding Joseph Straus’s theory of influence, which provides an explanation for the presence of tonal-like formations in post-tonal environments. The present study adopts the analytic position put forward by Straus that such formations are *tonal allusions*.

first pc of P_0 and the first pc of the transposed serial unit. The integer in the label for the inversions of a P form (that is, an I form) is the same as that in P form that produced that I form (for example, I_2 is the inversion of P_2).

TRANSFORMATIONAL PROCESSES

Transformational processes that relate the multifarious pitch-class segments, pitch-class sets, and set classes fall into two general types: *symmetry transformations* and *combinational transformations*. In many instances, attributes of these transformational processes intersect with one another. Symmetry transformations include *rotation*, *translation*, and *reflection*.⁹ These processes, which form a mathematical group, relate directly to the pc-set theoretic group of *mappings*. Mappings, which are also related to the mathematical group, include the canonical 48 twelve-tone operators (TTOs) defined by Robert Morris. Three other processes, called *stretching*, *shrinking*, and *substitution* hold relationships with the symmetry and mapping groups but are not, by definition, members of these groups (see below). Combinational transformations include the set-theoretic relations of *union*, *intersection*, and *complement* or *difference*.¹⁰ A special transformational process related to both intersection and mapping, called *near-equivalency* (NE), plays a significant role in the analytic apparatus used in the present study.

⁹ Thomas Clifton, "Types of Symmetrical Relations in Stravinsky's *A Sermon*, *A Narrative*, and *A Prayer*": 96-112. Although Clifton is specifically addressing a work from Stravinsky's late serial period, the conceptual models of symmetrical expressions he enumerates are easily applicable—with some modification—to Stravinsky's early serial works.

¹⁰ William H. Richardson, *Finite Mathematics* (New York: Harper & Row, Publishers, 1968), 44-47.

Symmetry, Groups, Functions, Mapping, and Patterns in Mathematics

Michio Kaku explains that symmetry, a natural phenomenon, is “the preservation of the shape of an object even after we rotate or deform it.”¹¹ Kaku points out that artists and poets, as well as mathematicians and physicists, share an interest in symmetry.¹² Keith Devlin explains that mathematicians approach the study of symmetry by examining transformations of objects: “rotations, translations, reflections, stretchings, or shrinkings of an object” are all examples of transformations. The study of symmetry, then, involves investigating the symmetry transformations of a single object or figure that “leaves the figure invariant, in the sense that, taken as a whole, it looks the same as it did before, although individual points of the figure may be moved by the transformation.”¹³ The study of symmetry also investigates relationships among objects. A collection of objects related through symmetry transformations means that the members of the collection represent symmetry transformations of a single, original object—that is, the member objects of the collection are *images* of the original object.

Kaku cites examples of familiar objects that exhibit symmetry in their structure and places symmetry into the referential dimensions of space and time, suggesting that the study of symmetry applies to many classes of objects, and that these objects “exist” in theoretical spatial, planar, and/or temporal states:

. . . a snowflake remains the same if we rotate it by 60 degrees. The symmetry of a kaleidoscope, a flower, or a starfish is of this type. We call these space-time symmetries, which are created by rotating the object through a dimension of space or time.¹⁴

Precise definitions for symmetry and the symmetry transformations of rotation, translation, and reflection belong to the province of mathematics. David Farmer provides definitions of these concepts:

¹¹ Michio Kaku, *Hyperspace: A Scientific Odyssey Through Parallel Dimensions, Time Warps, and the 10th Dimension* (New York: Oxford University Press Inc., 1994), 125.

¹² *Ibid.*, 124.

¹³ Keith Devlin, *Mathematics: The Science of Patterns* (New York: Scientific American Library, 1997), 146.

¹⁴ Kaku, *Hyperspace*, 125.

A *symmetry* of a figure is a rigid motion which leaves that figure unchanged. [In other words, a] symmetry is a rigid motion [that] leaves that figure looking exactly the way it started.¹⁵

A *rigid motion* of the plane is any way of moving all the points in the plane such that [the] relative distance between points stays the same [and] the relative position of the points stays the same.¹⁶

A *rotation* [a type of rigid motion] fixes one point, and everything rotates by the same amount around that point. . . . The fixed point, called the *rotocenter*, acts like an axle . . .¹⁷

A *translation* [a type of rigid motion, means that] everything is moved by the same amount and in the same direction.¹⁸

A *reflection* [a type of rigid motion] is determined by a *mirror line*. . . Points on the mirror are unchanged by the reflection. The distance from a point to the mirror is the same as the distance from the image of that point to the mirror.¹⁹

A collection of symmetry transformations (such as rotations, translations, and/or reflections) applied to a given figure forms a mathematical group of functions called a *symmetry group* for that figure if a “transformation in the symmetry group leaves the figure looking exactly the same, in shape, position, and orientation, as it did before.”²⁰ For example, consider the symmetry group for the circle:

The symmetry group of the circle consists of all possible combinations of rotations about the center (through any angle, in either direction) and reflections in any diameter. Invariance of the circle under rotations about the center is referred to as rotational symmetry; invariance with respect to reflection in a diameter is called reflectional symmetry.²¹

According to Devlin’s definition of a symmetry group, the collection of symmetry transformations that leaves a figure invariant forms a group because they satisfy the three conditions of a group: the properties of associativity, identity, and inverse. Farmer adds a fourth condition to this listing: the property of closure.²² Since any two transformations

¹⁵ David W. Farmer, *Groups and Symmetries: A Guide to Discovering Mathematics* (American Mathematical Society, 1996), 27. Italics replace words that originally appeared in bold typeface.

¹⁶ Ibid., 15. Italics replace words that appeared in bold typeface.

¹⁷ Ibid., 16. Italics replace words that appeared in bold typeface.

¹⁸ Ibid., 15. Italics replace words that appeared in bold typeface.

¹⁹ Ibid., 19-20. Italics replace words that appeared in bold typeface.

²⁰ Devlin, *Mathematics*, 146.

²¹ Ibid.

²² Devlin, *Mathematics*, 146-47; Farmer, *Groups and Symmetries*, 53. Farmer says that associativity is

(S and T) in the symmetry group of a figure leaves the figure invariant, then the combined application of S and T yields a third transformation, W , that also leaves the figure invariant. Devlin calls this the *combination operation*—this also describes the property of closure.²³ Thus, given a “set, G , of entities and an operation $*$ that combines any two elements [operators] x and y in G to give a further element $x * y$,” the collection G forms a *group* if the four conditions listed above are met.²⁴ The following are the definitions of the four conditions for a symmetry group and the general case for any mathematical group (the combination operation for the transformations of a symmetry group is “ $\circ$ ”; the combination or *composition* operator for any mathematical group is “ $*$ ”).²⁵

1. Closure Property²⁶

For a collection of symmetry transformations (SG):

If S and T are members of the set SG , then $T \circ S$ is also a member of SG

For all x, y in a set (G):

If x and y are members of G , then $x * y$ is a member of G

2. Associative Property²⁷

For a collection of symmetry transformations (SG):

If S, T , and W are members of the set SG , then

$$(S \circ T) \circ W = S \circ (T \circ W)$$

For all x, y, z in a set (G):

$$(x * y) * z = x * (y * z)$$

3. The Identity Operator (I)²⁸

For a collection of symmetry transformations (SG), the “combination operation has an identity element that leaves unchanged any transformation it is combined with”:

a non-essential condition in the definition of a symmetry group, but *closure* is an essential condition. Farmer explains that associativity is a usual condition in the definition of a group, but “associativity is automatic” as a condition because “symmetries are functions, and function composition is associative.” Devlin, on the other hand, assumes that the condition of closure is automatic.

²³ Devlin, *Mathematics*, 146.

²⁴ Ibid., 147.

²⁵ Ibid., 149. “In group theory, it does not matter, for the most part, *what* the elements of a group are, or *what* the group operation is. Their nature plays no role. The elements could be numbers, transformations, or other kinds of entities, and the operation could be addition, multiplications, composition of transformations, or whatever.”

²⁶ Devlin, *Mathematics*, 146-47; Farmer, *Groups and Symmetries*, 53.

²⁷ Devlin, *Mathematics*, 146-47.

²⁸ Ibid.

$$T \circ I = I \circ T = T$$

For all x in a set (G), “there is an element e in G such that

$$x * e = e * x = x$$

4. The Inverse Operator²⁹

For a collection of symmetry transformations (SG), “every transformation has an inverse: if T is any transformation, there is another transformation S such that”:

$$T \circ S = S \circ T = I \text{ (that is, } S \text{ is the inverse of } T, S = T^{-1})$$

For all x in a set (G): “there is an element y in G such that”:

$$x * y = y * x = e \text{ (that is, } y \text{ is the inverse of } x, y = x^{-1})$$

Devlin explains that, in mathematics, “a transformation is special kind of function.” In simple terms, “a function is a rule that, given one number, allows you to calculate another.”³⁰ An elementary definition of a mathematical function points up the close relationship of *function* and *mapping*:

A function is a mapping from one set A to another set B . By mapping we mean that to each element x in A , there is associated a uniquely determined y in B .³¹

Expressions of *rules* (functions) include simple and complex mathematical formulae, or quasi-mathematical procedures that regulate mappings of elements between any two well-defined sets.³² Thus, in the “classical definition” of function, a function is the same as a mapping:

Let A and B be any two nonempty sets, and let x represent an element from A , and let y represent an element from B . We say that a rule (method or procedure) f is a function from A to B if f associates with each x in A a unique y in B . A function is also called a mapping from A to B .³³

Any function or mapping can be represented symbolically as a rule, $f: A \rightarrow B$, or as an equation, $y = f(x)$.³⁴

²⁹ Devlin, *Mathematics*, 146–47.

³⁰ *Ibid.*, 80, 146..

³¹ A.W. Goodman and J.S. Pratt, *Finite Mathematics with Applications* (New York: The Macmillan Company, 1971), 400.

³² *Ibid.*, 401.

³³ *Ibid.*, 401, 411. Goodman and Pratt present two equivalent definitions for *function*—the *classical* and the *modern*.

³⁴ *Ibid.*, 401.

The study of symmetry transformations and mappings is intrinsic to the elucidation of patterns, whether mathematical or geometrical. Given any figure, a *strip pattern* forms if that figure undergoes repetition through symmetry transformation (or a combination of symmetry transformations) in one direction (that is, in one dimension). If the figure undergoes repetition in two directions (that is, in the two dimensions of a plane), the result is a *wallpaper pattern*, or *wallpattern*.³⁵ In general, the study of patterns means engaging the analytical apparatus of symmetry transformation. In many cases, one may be able to determine that the basic unit of a pattern from which the symmetry transformations proceed is unsymmetrical, or asymmetric—that is, the basic unit is a figure that does not possess symmetry. Such a figure or object “will have a symmetry group that consists only of a single transformation, the identity (or ‘do nothing’) transformation.”³⁶ Yet, that figure may participate as the *primitive* in a complex pattern generated through symmetry transformations.³⁷ Thus, the study of symmetry transformations becomes a powerful music-analytic tool: it has the potential to reveal the structure of patterned events in terms of both *invariance* and *change*.

Symmetry Transformations and Mappings as Music-Theoretic Processes

In the present study, symmetry transformations describe three things: (1) properties of a single object (symmetrical and asymmetrical objects); (2) the relationship of two objects in terms of mapping (objects in symmetry relationship); and (3) the compositional processes by which the transformation of one object generates another object so that both objects are in a symmetry relationship. The transformations that result from applying symmetry processes to pitch objects are familiar to many musicians. For example, experienced musicians understand the process of transposition: although they may not know that the transposition is an expression of a symmetry transformation, they do recognize that this processes not only transforms a pitch object, but also defines a

³⁵ Farmer, *Groups and Symmetries*, 39, 43; Devlin, *Mathematics*, 163f.

³⁶ Devlin, *Mathematics*, 148.

³⁷ Goodman and Pratt, *Finite Mathematics*, 402.

relationship between the original object and its transformation. Furthermore, musicians who have had instruction in the compositional techniques derived from the twelve-tone music of the second Viennese school understand that the music-theoretic processes of transposition, inversion, retrograde, and retrograde inversion define the relationship of an original series to the various serial formations that participate in a twelve-tone composition.

Symmetry transformations—the mathematical underpinnings of twelve-tone transformational processes—apply to many classes of musical objects, including objects in pitch space (non-modular space: pitches, ordered and unordered pitch intervals, pitch successions, ordered and unordered pitch-interval successions), and objects in pitch-class space (modular space: pitch classes, pitch-class segments, pitch-class sets, set classes, ordered pitch-class intervals, interval classes, pc-int and ic successions). Symmetry transformations apply to objects in linear temporal relationships and objects in non-linear extemporal relationships.

The definitions of symmetry transformations applied to the mathematically imprecise world of music can only be analogous to the logically defined mathematical concepts. Thus, when mathematicians speak of *planes*, *distances*, and *points on a plane*, the present study posits that the appropriate music-theoretic analogies are *spaces*, *intervals*, and *pitches*, respectively. When mathematicians speak of *lines*, *objects*, and *figures*, the music-theoretic equivalents are *pitch objects* (objects in pitch-space, such as sonorities and vertical adjacencies, and pitch-segments), and *pitch-class objects* (objects in pitch-class space, such as pcsegs and pcsets).

Mappings: The Twelve-Tone Operators (TTOs)

Mappings—functions that transform one object into another—and symmetry transformations are directly related because, as functions, they both preserve distances or ratios of distance, and form into mathematical groups. The “canonical twelve-tone operators,” or *TTOs*, form a mathematical group of functions (mappings); that is, they are rules (methods or procedures) that regulate the transformation of elements from one well-defined set to the elements of another well-defined set; and, they fulfill the four conditions required to form a group. In the music-theoretic sense, well-defined sets are

sets comprising any number of pcs; that is, they are objects in pc-space, either pcsets or pcsegs.³⁸ Thus, for a set A , there is function f that maps the elements of A to the elements of another set B ($f: A \rightarrow B$). If there is a one-to-one correspondence (or, one-to-one mapping) between the elements of the two sets, then the two sets *map onto* each other.³⁹ If there is a one-to-one correspondence between *all* of the elements of one set and *some* of the elements of the other, then the two sets *map into* each other.⁴⁰ *Mapping into* is the essence of inclusion relationships, which will be discussed below.

Some sets are related through a function f that maps elements from one set A *onto* the elements of another set B , but another function g can only map the elements of B *into* A . For example, the conversion of pitches (in p-space) into pitch-classes (pc-space) is a mapping of all the elements of the set comprising all pitches (set A) *onto* the universal set of all pitch-classes (set B); the conversion of pcs into pitches maps the universal set of all pcs (set B) *into* the set comprising all pitches (set A).⁴¹

The three *basic* TTOs are T_n (transposition), I (inversion), and M (the multiplicative function—specifically, M_5).⁴² Since the functions T_n , I , and M form a mathematical group, they can combine into composite functions in addition to the basic T_n function. In fact, the inversion and multiplicative functions always combine with, at least, the transposition function, resulting in four general types of functions (herein called *operations*): T_n , T_nI , T_nM , and T_nMI (or T_nIM).⁴³ Following Morris's and Straus's works, the definitions of the three basic and the three composite types of TTOs are as follows:

BASIC TTO TYPES:

$$(1) T_n, \text{ for a pc } a: T_n(a) = (n + a) \bmod 12$$

³⁸ Morris, *Composition with Pitch-Classes*, 65-67. Morris implies that the TTOs could only exist as a group of functions in pc-space.

³⁹ Goodman and Pratt, *Finite Mathematics*, 402.

⁴⁰ *Ibid.*, 402.

⁴¹ *Ibid.*, 401-02. "For each x in A , we imagine an arrow drawn from x to its associated y [in B]. Two arrows cannot begin at the same x , but two arrows may end at the same y ."

⁴² Morris, *Composition with Pitch-Classes*, 65-66.

⁴³ *Ibid.*, 66. Morris provided the rationale for M , without subscript, representing M_5 . Notice that, according to Morris, M_{11} is also inversion ($M_{11} = I$). Since there are twelve possible values for n , there are forty-eight operations in the TTO group: 12 T_n , 12 T_nI , 12 T_nM , and 12 T_nMI .

(Transposition by pc-int, n , called the *transposition number*)⁴⁴

(2) I, for a pc a : $I(a) = (12 - a) \bmod 12$

(Inversion around pc0)

(3) M, for a pc a : $M(a) = (5 \times a) \bmod 12$

COMPOSITE TTO TYPES:

(1) TnI, for a pc a : $TnI(a) = [(12 - a) + n] \bmod 12$

(n , a pc-int, is called the *index number*)⁴⁵

(2) TnM, for a pc a : $TnM(a) = [(5 \times a) + n] \bmod 12$

(3) TnMI, for a pc a : $TnMI(a) = [(12 - a) \times 5] + n \bmod 12$

Rotational Symmetry: Transposition, Circular Permutation, and “LV” Transformation

Rotational symmetry describes three general types of music-theoretic processes that function primarily in the modular space of pitch class (that is, pc-space represented by mod 12): (1) pcset transposition; (2) circular permutation (rotation) of the elements of a pcseg or an ordered set of intervals; and (3) linear-vertical transformation, or *T-LV*.

The process of transposition in pc-space as a music-theoretic analogy to rotation invokes the visualization of the twelve pcs arranged on the circumference of a circle—like a clock face—with the center of the circle acting as the rotocenter. This “twelve-tone clock,” then, represents the modulo-12 system of pc-space, where the pc integer 0 occupies the “twelve o’clock” position. The ic1 defines the interval—the basic unit of distance—between the successive integers of the clock.

A *successive-interval array* (SIA) describes the succession of ordered pc intervals (pc-ints) derived from the successive pcs of a pcset.⁴⁶ Since rotational symmetry preserves the distances (measured in pc-ints) between points (rendered as pitch classes), the interval succession remains invariant under rotation, but the pcs may change. The

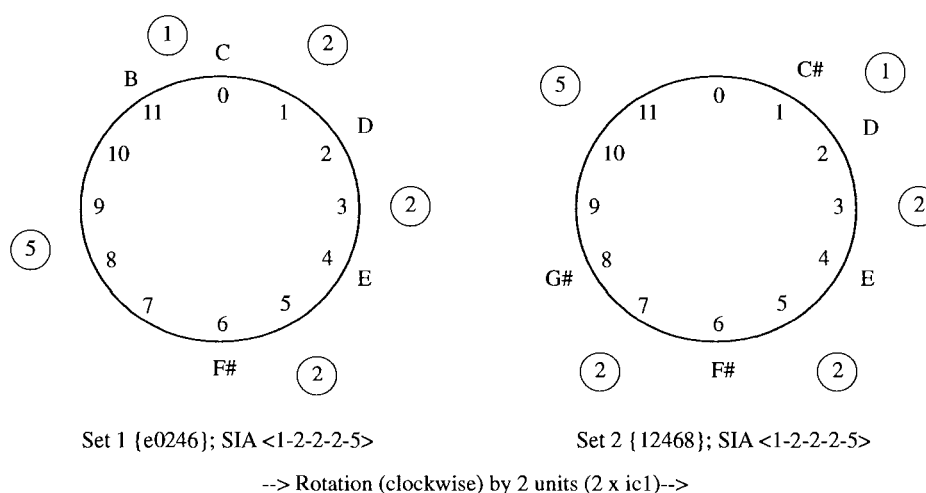
⁴⁴ Straus, *Post-Tonal Theory*, 35.

⁴⁵ Ibid., 43.

⁴⁶ Chrisman, “Describing Structural Aspects of Pitch-Sets using Successive-Interval Arrays”: 1-28. The successive-interval array (SIA) is the ordered pitch-class interval succession (herein abbreviated as PCIS) of a pcset or pcseg plus the complementary interval. The sum value of all pc-ints including the complement of any SIA always equals 0 (in mod 12).

clockwise rotation of a pcset around the rotocenter by n positions (where each position represents one of the 12 pc integers) will result in a transformation of the pcset of the original set (i.e., transposition, T_n) if the value for $n \leq 12$ or $n \neq 0$,⁴⁷ or if the pcset does not possess the property of *transpositional symmetry* (see below). Figure 2.1 provides an illustration of transposition through rotation. The SIA of pcset 1 {BCDEF#}, or {e0246}, is <1-2-2-2-5>.⁴⁸ Pcset 2 {C#DEF#G#}, or {12468}, is the result of rotating pcset 1 clockwise by two positions ($n = 2$).⁴⁹ Thus, pcset 2 is a transposition of pcset 1 at T_2 since the SIA of pcset 2 <1-2-2-2-5> is identical to the SIA of pcset 1.

Figure 2.1. Rotational symmetry in modular space (pc space: mod 12)



Circular permutation (C-sym), which is the same as rotational symmetry, describes the process by which the elements of a given set undergo transformation by shifting the elements to the *left* (i.e., *left-to-right*) by n positions (where n represents the number of elements in the set).⁵⁰ These elements can be the pcs of a pcseg, or the succession of

⁴⁷ The result of rotation by $n = 12$ is total invariance; that is, a “do nothing” or identity operation.

⁴⁸ Hyphens are used herein to separate the elements of interval successions in order to differentiate interval successions from pcsegs since both are contained within angled brackets.

⁴⁹ The representation of pitch classes as pc integers instead of pc letters is preferred in the present study.

⁵⁰ The terms “rotation,” “circular permutation” and *cyclic permutation* are analogous, and are often used interchangeably in the corpus of set-theoretic literature (music theory and mathematics). The operation of circular permutation, as it applies to the linear disposition of pcsets and pcsegs, invokes the

intervals derived from a pcset or pseg. A pseg that undergoes circular permutation results in a change in position of the ordered elements while leaving the pc content invariant (no transformation in terms of the pcset). For example, there are five circular permutations of the pseg <15834>, including the trivial case $n = 0$ (5): <15834>, <58341>, <83415>, <34158>, and <41583>.

Circular permutations (or rotations) of an *ordered pitch-class interval succession* (PCIS) yield several results—depending on the intervallic characteristics of the pcset or pseg from which the PCIS derives—including transformations of the basic pcset or pseg such as T_n or T_nI , and/or *set-class transformations*.⁵¹ A set-class transformation occurs when there is some transformational process that not only changes the pc content of the set, but also changes the set class to which the original pcset belongs. For example, tables 2.1a and 2.1b illustrate the rotational arrays—that is, the circular permutations of the PCIS—derived from two different pentachordal set-classes: table 2.1a, pcset {01357}, a member of 5-24, PCIS <1-2-2-2>; table 2.1b, {01257}, a member of 5-14, PCIS <1-1-3-2>. In both cases, rotation to the left yields four permutations, including the trivial case $n = 0$ (or, $n = 5$).

Circular permutations of an SIA derived from a pcset or pseg leaves the sc of that set invariant, while pc content may undergo transformation through T_n . The derivation of the diatonic modes, parallel to one pitch class, is a common example of SIA rotation and pcset transformations. Table 2.2 illustrates the rotational array of the SIA derived from the diatonic set-class 7-35, SIA <1-2-2-1-2-2-2>, beginning with the prime form {013568t} and the T_n transformation of {013568t} produced by each rotation.

visual image of a line, whereas rotational symmetry invokes the visual image of a circle. Ultimately, there is no real conceptual difference between the two, since the two ends of the line are understood to join, making it into a circle. Thus, in the present study, rotational symmetry and circular permutation represent the same transformational process, and the abbreviation *C-sym* (rather than *R-sym*, which stands for *reflectional symmetry*) represents rotational symmetry and circular permutation.

⁵¹ *Ordered pitch-class interval succession* (PCIS): the succession of pc-ints (ordered pitch-class intervals) derived from a pcset or a pseg. A PCIS is not the same as a successive-interval array (SIA). The difference between the PCIS and SIA for a given set is that a PCIS does not include the “wrapping” (or complementary) interval—that is, the interval (pc-int) formed between the last and the first elements of the set. For example, the SIA of 4-3 {0134} is <1-2-1-8>; the PCIS of the same set is <1-2-1>. Thus, the PCIS of a pcset or pseg is a sub-segment of the SIA.

Table 2.1. Circular permutations of the PCISs derived from scs 5-24 and 5-14

Table 2.1a. 5-24 {01357}, rotations of PCIS <1-2-2-2>

PCIS	<1-2-2-2>	<2-2-2-1>	<2-2-1-2>	<2-1-2-2>
PCSET	{01357}	{02467}	{02457}	{02357}
SC	5-24	5-24	5-23	5-23
TRANSFORMATION	→ T ₇ I → SC TRANSFORMATION → T ₇ I			

Table 2.1b. 5-14 {01257}, rotations of PCIS <1-1-3-2>

PCIS	<1-1-3-2>	<1-3-2-1>	<3-2-1-1>	<2-1-1-3>
PCSET	{01257}	{01467}	{03567}	{02347}
SC	5-14	5-19	5-236	5-11
TRANSFORMATION	ALL SC TRANSFORMATIONS			

Table 2.2. Circular permutations of the SIA derived from 7-35

SIA	PCSET*	SUCCESSIVE TRANSFORMATIONS	MODE
<1-2-2-1-2-2-2>	{013568t}	T ₀	LOCRAN
<2-2-1-2-2-2-1>	{024579e}	T ₁₁	IONIAN
<2-1-2-2-2-1-2>	{023579t}	T ₁₀	DORIAN
<1-2-2-2-1-2-2>	{013578t}	T ₁₀	PHRYGIAN
<2-2-2-1-2-2-1>	{024679e}	T ₁₁	LYDIAN
<2-2-1-2-2-1-2>	{024579t}	T ₁₀	MIXOLYDIAN
<2-1-2-2-1-2-2>	{023578t}	T ₁₀	AEOLIAN

* NOT ALL PCSETS ARE IN NORMAL ORDER

The circular permutations of the SIA of 7-35 resulting in the derivation of the seven diatonic modes points toward the technique of *rotational arrays* employed by Stravinsky in the works of his late serial period, including *Movements* (1960), *A Sermon*, *A Narrative*, and *A Prayer* (1961), *Abraham and Isaac* (1963), *Variations: Aldous Huxley in Memoriam* (1964), and *Requiem Canticles* (1966).⁵² In Stravinsky's method, the rotational array technique entails the SIA rotation of a hexachord or an entire row form.

⁵² Joel Lester, *Analytic Approaches to Twentieth-Century Music* (New York: W.W. Norton & Company, Inc., 1989), 246; Straus, *Post-Tonal Theory*, 193. Although Ernst Krenek is the first to describe the rotation technique, he posits that the basis of the idea is Arnold Schoenberg's. Krenek 's influence on Stravinsky's technique was discussed in Chapter 1. Krenek, "Extents and Limits of Serial Techniques": 211-16; n.2.

Depending on the specific work, the rotational array is either oriented to the first pc of the hexachord (or row form) or to each successive pc of the hexachord (or row form). Both methods create *multiple orderings* of a particular row form or hexachord derived from that row form.⁵³

Examples 2.1 and 2.2 illustrate rotational arrays derived from the first hexachord of *P₀, Abraham and Isaac*, and the first hexachord of *I₀, A Sermon, A Narrative, and A Prayer*, respectively.⁵⁴ In example 2.1, the method used is, simply, the rotation of the pcs of the original hexachord, resulting in the transformation of the hexachordal pcseg through circular permutation without transposing the pc content of the hexachord. Thus, the pitch classes of the first hexachordal pcseg, 6-z23 {789t01}, remains invariant for all rotations. In example 2.2, the pcsegs resulting from each successive rotation of the SIA are transposed to the first pc of the original hexachordal pcseg. Thus, the pcset representing first hexachordal pcseg, {234568}, undergoes transposition while the set-class (6-2) remains unchanged:

T_0 {234568}, T_1 {345679}, T_8 {e01235}, T_2 {123457}, T_{11} {012346}, T_9 {9te013}

Each of the hexachordal pcsegs derived through the rotational arrays shown in examples 2.1 and 2.2 is assigned a Roman numeral, which is reminiscent of the method of labeling the diatonic modes in tonal theory.⁵⁵ Furthermore, each of the methods employed towards the derivation of the rotational array are analogous to the methods used towards the derivation of the diatonic modes in tonal theory (example 2.1 represents the relative system; example 2.2 represents the parallel system). Thus, the rotational array technique in serial composition is simply an extension of the familiar transformational processes that interconnect the modal system within the broader diatonic system.

⁵³ Lester, *Analytic Approaches*, 235f.

⁵⁴ Lester, *Analytic Approaches*, 247; Straus, *Post-Tonal Theory*, 193. These are derived from the examples given in Lester's *Analytic Approaches* and Straus's *Post-Tonal Theory*, respectively. The pitch expression of the hexachord and its rotations in Example 2.1 follows Lester's example. The pitch expression of the hexachord and its rotations in Example 2.2 are the author's; the contours are arbitrary.

⁵⁵ This method of labeling is taken from Straus, *Post-Tonal Theory*, 193.

Example 2.1. The rotational array (without transposition) of P_0 , first hexachord, from *Abraham and Isaac*

The rotational array is presented as follows:

Staff	SIA	order position
I	1 1 2 2 3 2 4 1 5 8 6 (10)	1 2 3 4 5 6 7 8 9 10
II	2 2 3 2 4 1 5 8 6 10 1 (1)	1 2 3 4 5 6 7 8 9 10
III	3 2 4 1 5 8 6 10 1 1 2 (2)	1 2 3 4 5 6 7 8 9 10
IV	4 1 5 8 6 10 1 1 2 2 3 (2)	1 2 3 4 5 6 7 8 9 10
V	5 8 6 10 1 1 2 2 3 2 4 (1)	1 2 3 4 5 6 7 8 9 10
VI	6 10 1 1 2 2 3 2 4 1 5 (8)	1 2 3 4 5 6 7 8 9 10

Linear-vertical transformation (T-LV) is the process that describes, in a general way, the conversion of line into simultaneity, or simultaneity into line. In terms of the linear (horizontal) and vertical disposition of pitches in a score, the conversion of a pcseg into a vertical adjacency (that is, simultaneity), or vice versa, is analogous to rotational symmetry. In other words, the rotation of an object such as a pcseg (represented by a pcset) by 90° transforms that object into a vertical adjacency or simultaneity (represented by a pcset); conversely, rotation by 90° transforms that simultaneity into a pcseg (both represented by a pcset). The ensuing analytical chapters are replete with examples of this type of transformation (see, for example, the expression of the sub-serial pcseg <402> as a sonority in Chapter 6, *In Memoriam Dylan Thomas*).

Example 2.2. The rotational array (with transposition) of I_0 , first hexachord, from *A Sermon, A Narrative, and A Prayer*

The image displays a rotational array of the first hexachord I_0 from the piece *A Sermon, A Narrative, and A Prayer*. It consists of six staves, labeled I through VI, each showing a musical staff with notes and a sequence of numbers above it. The numbers are organized into two rows: 'SIA:' and 'order position:'. The sequences are as follows:

- Staff I:** SIA: 1 11 2 4 3 10 4 1 5 3 6 (7); order position: 1 2 3 4 5 6 7 8 9 10 11
- Staff II:** SIA: 2 4 3 10 4 1 5 3 6 7 1 (11); order position: 2 3 4 5 6 7 8 9 10 11 1
- Staff III:** SIA: 3 10 4 1 5 3 6 7 1 11 2 (4); order position: 3 4 5 6 7 8 9 10 11 1 2
- Staff IV:** SIA: 4 1 5 3 6 7 1 11 2 4 3 (10); order position: 4 5 6 7 8 9 10 11 1 2 3
- Staff V:** SIA: 5 3 6 7 1 11 2 4 3 10 4 (1); order position: 5 6 7 8 9 10 11 1 2 3 4
- Staff VI:** SIA: 6 7 1 11 2 4 3 10 4 1 5 (3); order position: 6 7 8 9 10 11 1 2 3 4 5

Curved arrows on the right side of the staves indicate transpositions: T1 from I to II, T8 from II to III, T2 from III to IV, T11 from IV to V, and T9 from V to VI.

Translational symmetry (T-sym)

The music-theoretic analogies to translational symmetry are transposition of a pcset or pcseg (T_n in pc-space, mod 12) and transposition of a pitch set or pitch segment (T_n in p-space, non-modular).⁵⁶ Translational symmetry preserves the pc-ints between pcs in pc-space. Thus, with respect to pcsets, translation-symmetric transformations yield the same results as rotation-symmetric transformations. Examples 2.3 and 2.4 illustrate translation-symmetric transformations of a pcset, 6-z3 {e02345}, and the series P_0 from “Ricercar II” <4024532402e>, respectively— $\{P_0\} = 6\text{-z3 } \{e02345\}$.⁵⁷ In example 2.3,

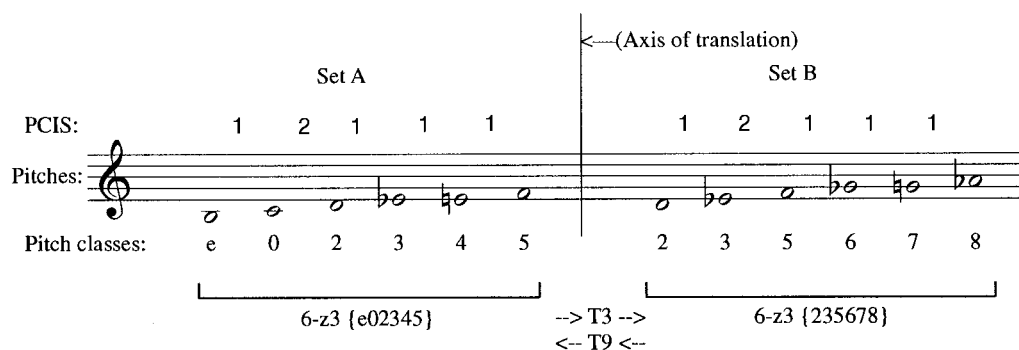
⁵⁶ The concepts of modular space, *pitch space* (p-space) and *pitch-class space* (pc-space) are from Morris, *Composition with Pitch-Classes*, 23-26.

⁵⁷ Igor Stravinsky, “Ricercar II,” *Cantata* (New York: Boosey & Hawkes Music Publishers Limited,

Set A—pcset {e02345}—transforms by T_3 into Set B—{235678}; T_9 , the inverse operation, transforms {235678} into {e02345}. In example 2.4, P_0 transforms by T_3 into P_3 ; the inverse operation (T_9) transforms P_3 into P_0 .⁵⁸

In examples 2.3 and 2.4, the respective pcsets and psegsg are represented in pc-space as pcs, scs, and successions of pc-ints (PCIS), and in p-space as pitches (example 2.4 reproduces the pitches as they appear in the score). In p-space, translation-symmetric transformations preserve the ordered intervals between pitches so that the contour of the pitch object is preserved (for example, the transposition of a piece of tonal music from one key to another). In example 2.4, there is a slight difference in contour between the last two pitches of P_0 and P_3 affected through octave displacement. Since the repertoire under investigation employs serial and other post-tonal compositional techniques, the preservation of contour in p-space is a non-essential aspect of equivalency among pitch objects. The mapping (or non-mapping) of objects in pc-space provides the context for evaluating invariance and change.

Example 2.3. Translational symmetry as transposition of a pcset in p-space



1952), 16, after R6 (P_0 , oboe 2; P_3 , oboe 1). In the present study, a serial-unit label in this style of parenthesis represents the pcset derived from that unit. Thus, $\{P_0\}$ is the pcset {e02345}.

⁵⁸ The reader is reminded of the conventions for labeling serial units used in the present study (see "The Serial Unit," above).

significant if the symmetry constitutes the boundaries of that set—that is, if they create a symmetrical frame for the set (they *frame-in* the set). For example, the PCIS of set class 6-z25 <1-2-2-1-2> expresses translation-symmetric boundary components comprising the interval pair <1-2> (example 2.7). In this instance, pc-int2 constitutes the axis of symmetry.

Example 2.5. Translational symmetries of the SIA derived from sc 8-28

Translations of <1-2-1-2>

Translations of <1-2>

Interval succession: 1 2 | 1 2 | 1 2 | 1 (2)

Pitch classes: 0 1 3 4 6 7 9 t

Example 2.6. Translational symmetries of the PCIS derived from sc 7-35

Translations of <1-2-2>

Interval succession: 1 2 2 | 1 2 2

Pitch classes: 0 1 3 5 6 8 t

Example 2.7. Translational symmetry as boundary events of the PCIS derived from sc 6-z25

Translations of <1-2>

Interval succession: 1 2 | 2 1 2

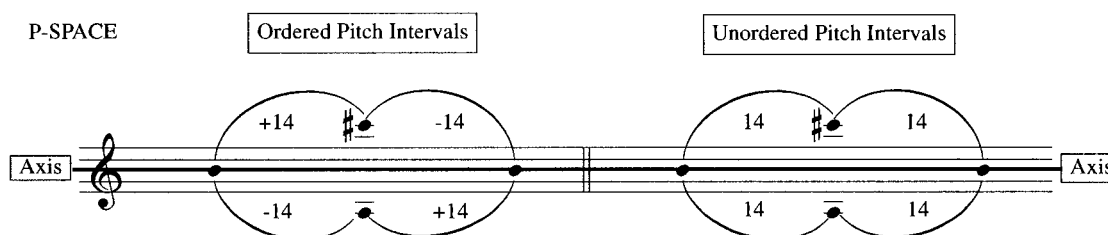
Pitch classes: 0 1 3 5 6 8

Reflectional symmetry (R-sym)

Reflectional symmetry is an aspect of several music-theoretic processes, including inversion and retrograde transformations. The axis of symmetry is an object around which the other objects in the entity balance. The axis can be a pitch (or a pair of semitone-related pitches) in p-space, a pitch class (or a pair of semitone-related pcs) in pc-space, or an interval (a pitch interval in p-space, or a pc-int in pc-space). Any object comprising pitches or pitch-classes, p-ints, pc-ints, or ics can be transformed through reflection-symmetric processes. Depending on the reflection-symmetric transformation type, the object, and the space in which the object “exists,” the axis may be horizontal (R-sym180°) or vertical (R-sym90°), or else cannot be defined as either. As will become clear in the ensuing discussions, the use of horizontal and vertical axes in the present study parallels the familiar graphic representation of pitch deployment used in standard musical notation.

Example 2.8 illustrates the inversion (mirror reflection, R-sym180°) of ordered and unordered p-ints around an axis in p-space defined by the pitch B above middle C (b').⁶⁰ The *ordered* (directed) p-ints +14 and -14 are examples of R-sym transformations: p-int +14 describes the intervals between b' — c#'' and a — b'; p-int -14 describes the intervals between c#'' — b' and b' — a. The p-int 14 describes the *unordered* (non-directed) intervals between b' — c#'', a — b', c#'' — b', and b' — a.

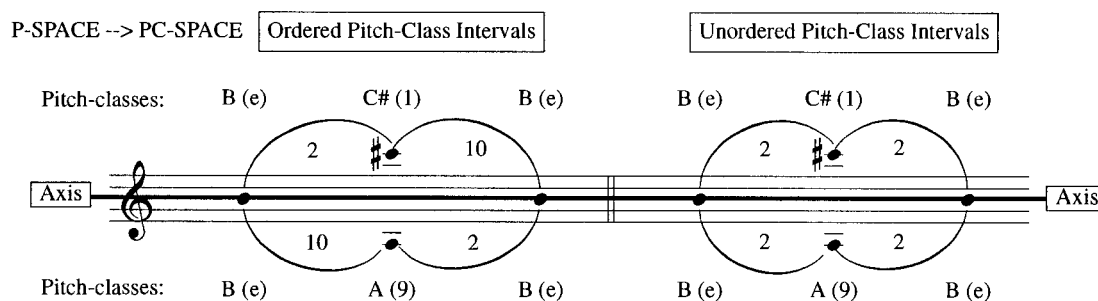
Example 2.8. Inversion of ordered and unordered pitch intervals in p-space



⁶⁰ Ordered p-ints have a direction in p-space, either ascending (+) or descending (-); unordered p-ints do not have direction in p-space—they only represent the distance between two pitches (the absolute value of an ordered p-int).

Example 2.9 illustrates the pcs and the ordered and unordered pc-ints (pc-ints and ics, respectively) derived from the pitches and p-ints in example 2.8.⁶¹ Together, examples 2.8 and 2.9 represent the transformation of objects from p-space to pc-space, since there is a mapping between objects of p-space and pc-space. Symmetry in p-space will exhibit a single, clear axis of symmetry as example 2.8 shows. The axis of symmetry defined by the pitch b' in example 2.8 is retained in example 2.9 in order to illustrate the mapping from the p-space of example 2.8 to the pc-space of example 2.9. Since objects in pc-space, however, do not have registral status, the axis of symmetry defined at b' and the registral disposition of the pitches in example 2.9 become meaningless.

Example 2.9. Inversion of ordered and unordered pitch-class intervals derived from p-space in pc-space



In pc-space, the axis of symmetry for interval inversion and for pc inversion is 0 (mod 12)—this is an example of an axis that cannot be defined as vertical or horizontal but still functions as a “mirror line.” The inversion of these objects can be represented algebraically as:

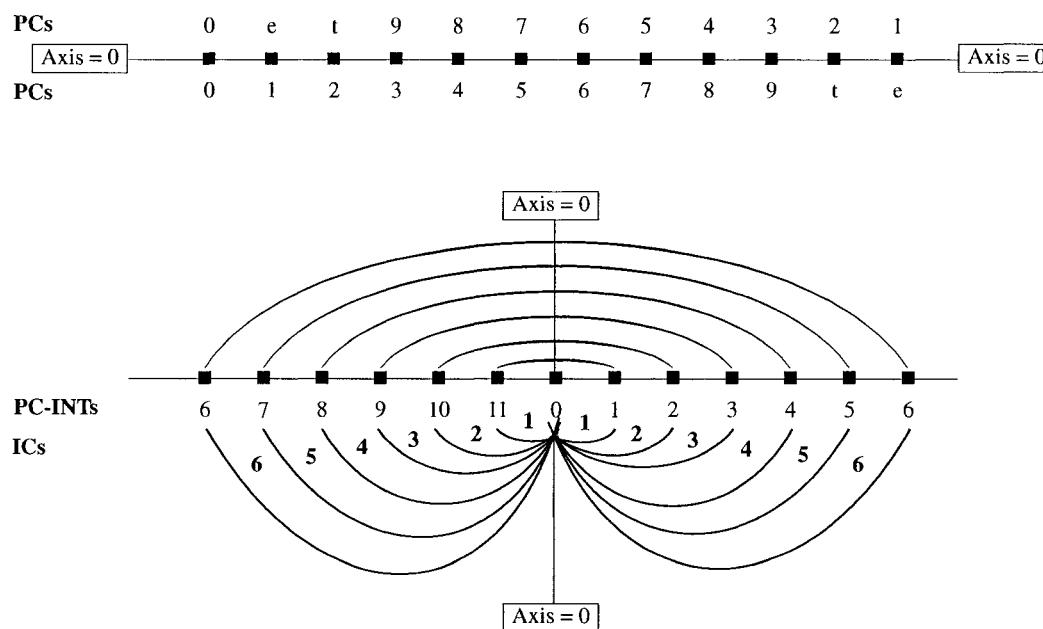
$$12 - x = y, \text{ where } x \text{ is the object and } y \text{ is its inversion.}$$

Example 2.10 illustrates inversion of the twelve pcs and pc-ints (i.e., ordered pitch-class intervals), and the symmetry of the ics (i.e., unordered pitch-class intervals) derived from

⁶¹ The reader is reminded that, in the present study, pc-int is used as an abbreviation for *ordered pitch-class interval*. The term *interval class* (ic) is analogous to *unordered pitch-class interval*.

the pc-ints. The axis of symmetry for pcs at 0 is shown as a horizontal line; the axis of symmetry for pc-ints and ics at 0 is shown as a vertical line.

Example 2.10. Inversion of pcs and pc-ints



When the PCIS of a pcset (pcset A) undergoes reflection-symmetric transformation in which the axis is vertical (R-sym90°), the result is a new pcset (pcset B) that is in a TnI relationship with pcset A—the pcset transforms, but the sc remains unchanged.⁶² As example 2.11 shows (below), the R-sym90° of the PCIS <1-2-2-2> derived from 5-24 {01357} is <2-2-2-1>, which yields 5-24 {02467}, the T₇I transformation of pcset {01357}. Similarly, the R-sym90° of the PCIS <1-1-2-1-3> derived from 6-15 {012458} is <3-1-2-1-1>, which yields 6-15 {034678}, the T_gI transformation of pcset {012458}.

The twelve-tone operation of retrograde employs R-sym90°. For any pcseg (including serial units), the retrograde transformation (R) is the reverse ordering of the pitch-class succession, which has an effect on its concomitant intervals. Example 2.12 (below) illustrates the transformation of a pcseg <3165te8> through the retrograde operations of

⁶² The value for *n* (the index number—see above) equals the sum of the integers representing the pc-ints provided the pc realization of both pcsets A and B begins with the same pc.

RT_0 (top staff) and RT_3 (lower staff). The pc succession—in reverse order—remains invariant under retrograde transformation (at T_0), but not when the retrograde transformation combines with T-sym (T_n , $n \neq 0$).⁶³ For any RT_n , the pc-int succession (PCIS) is reversed so that each pc-int of the prograde form is replaced by its inversion (its complement, mod 12) in the retrograde form. The *interval class succession* (ICS)—that is, the succession of unordered pitch-class intervals derived from the PCIS—remains invariant in reverse order. Thus, the prograde form of pcseg <3165te8> or any of its transpositions yields the PCIS <10-5-11-5-1-9>, its retrograde form <8et5613> or any of its transpositions yields PCIS <3-11-7-1-7-2>, and its prograde and retrograde forms yield ICS <2-5-1-5-1-3> and <3-1-5-1-5-2>, respectively.

Example 2.11. Inversion of 5-24 {01357} and 6-15 {012458} by R-sym 90° of the PCIS

The diagram illustrates the inversion of two pcsets, 5-24 {01357} and 6-15 {012458}, by R-sym 90° of the PCIS. It is divided into two horizontal sections, each enclosed in a dashed box. The top section is for pcset A {01357} and pcset B {02467}. The bottom section is for pcset A {012458} and pcset B {034678}. Each section shows a musical staff with a treble clef. Above the staff, the PCIS is listed as a sequence of numbers. Below the staff, the PCS is listed as a sequence of numbers. A vertical line with a double-headed arrow labeled 'axis' separates the two pcsets in each section. The PCIS for pcset A is reversed to become the PCIS for pcset B. The PCS for pcset A is also reversed to become the PCS for pcset B. The top section is labeled 'sc 5-24' and the bottom section is labeled 'sc 6-15'.

Section	pcset A	PCIS A	PCS A	pcset B	PCIS B	PCS B
sc 5-24	{01357}	1 2 2 2	0 1 3 5 7	{02467}	2 2 2 1	0 2 4 6 7
sc 6-15	{012458}	1 1 2 1 3	0 1 2 4 5 8	{034678}	3 1 2 1 1	0 3 4 6 7 8

The interval successions of certain pcsets and pcsegs express reflectional symmetry (R-sym 90°). For example, the PCIS <1-2-3-2-1> derived from 6-z29 {013689} is reflection-symmetric around the axis defined by ic3. In this example, the primitive could be either <1-2> or <1-2-3> (where <1-2-3> is an imbricated sub-segment).

⁶³ The order of operations for retrograde combined with transposition is T_n , then R.

Example 2.12. Retrograde transformations of a pcseg (RT₀ and RT₃)

RT₀ axis

PCs: 3 1 6 5 t e 8 | 8 e t 5 6 1 3

PCIS: 10 5 11 5 1 9 | 3 11 7 1 7 2

ICS: 2 5 1 5 1 3 | 3 1 5 1 5 2

RT₃ axis

PCs: 3 1 6 5 t e 8 | e 2 1 8 9 4 6

PCIS: 10 5 11 5 1 9 | 3 11 7 1 7 2

ICS: 2 5 1 5 1 3 | 3 1 5 1 5 2

Glide-Reflection Symmetry (GR-sym)

Glide-reflection symmetry (GR-sym) entails the combination of two functions (function combination), reflection and translation (in that order of operations). A glide-reflection symmetry transformation of a pcset yields the same result of TnI: that is, reflection is analogous to the operation of inversion, and translation is analogous to transposition. Example 2.13 illustrates the TnI transformation of a pcset, 5-31 {01369} as a GR-sym. The pcset, in normal order, is reflected around a 180° axis defined by pc0: in p-space, the ordered p-ints reverse direction, as shown; in pc-space, the pcs and the ordered pitch-class intervals undergo inversion (mod 12), and the ICS remains invariant. The result, pcset {369e0}, is the T₀I transform of {01369}. The “glide” aspect of the GR-sym operation—the T-sym—entails the transposition of {369e0} at $n = 9$. The result, pcset {03689}, is the T₉I transform of the original set {01369}.⁶⁴

The GR-sym for pcsegs also entails a 180° axis that is defined by the first pc of the segment. Example 2.14 illustrates the GR-sym transform of the series, P₀, from *In Memoriam Dylan Thomas* into I₁₀.⁶⁵ The successive intervals derived from the series,

⁶⁴ T₀I is also a GR-sym transformation: T₀ represents a “do-nothing” glide.

⁶⁵ Igor Stravinsky [Stravinsky], *In Memoriam Dylan Thomas: Dirge Canons and Song* (New York: Boosey & Hawkes, 1954), “Dirge-Canons,” Prelude, mm. 1-4, (trombone II). The pitches for P₀ and I₁₀

P_0 , are inverted around pc_4 , showing that the ICS remains invariant. The new serial unit produced by this transformation is labeled I_0 , which is a glide-reflection (if, for T_n , $n = 0$). The unit I_0 is then transposed (glide) by $n = 10$, resulting in the serial unit I_{10} .⁶⁶

Example 2.13. Inversion of a pcset as glide-reflection symmetry

5-31 {01369}

(Axis = pc_0) →

Ordered p-ints:	+1	+2	+3	+3
PCIS:	1	2	3	3
ICS:	1	2	3	3
PCIS:	11	10	9	9
Ordered p-ints:	-1	-2	-3	-3

(Axis = pc_0) →

5-31 {369e0} --> Glide (T_n , $n = 9$) --> 5-31 {03689}

← (Axis of translation)

Example 2.14. Inversion of a pcseg as glide-reflection symmetry

P0 <43012>

(Axis = pc_4) →

Ordered p-ints:	-1	-3	+1	+1
PCIS:	11	9	1	1
ICS:	1	3	1	1
PCIS:	1	3	11	11
Ordered p-ints:	+1	+3	-1	-1

(Axis = pc_4) →

I0 <45876>

I10 <23654>

← (Axis of translation)

--> Glide (T_n , $n = 0$) -->

--> Glide (T_n , $n = 10$) -->

are as they appear in the score.

⁶⁶ Unlike T_nI operators for pcsets, T_nI operators for pcsegs are communicative. The transformation of P_0 into I_{10} —inversion (I), then transposition (T_{10})—can also be realized by reversing the order of operations—transposition (T_{10}), then inversion.

Special Properties of Tessellated Symmetrical Sets

A symmetrical set is a pcset or pseg in which a succession of elements that define that set in some way (by its pcs and/or intervals) expresses a symmetry transformation. Symmetrical sets that express *tessellation* in which the symmetry is either translation-symmetric or reflection-symmetric have special properties. These properties are dependent on the type of elements that express the tessellation (pcs, SIA, or PCIS) and the type of symmetry that creates the tessellation (T-sym or R-sym).

For any tessellated translation-symmetric *successive-interval array* (SIA), the *number* of occurrences of the primitive, p , predicts the values for n at which that pcset is transpositionally symmetric ($12 \div p = n$).⁶⁷ In other words, the number (p) of translational images, including the primitive, indicates the number of transpositions and the values for n that leave the pcset invariant. For example, the SIA of 8-28 {0134679t} is <1-2-1-2-1-2-1-2>; the primitive <1-2> occurs four times, so $p = 4$ and $12 \div 4 = 3$. Thus, 8-28 {0134679t} is transpositionally symmetric at T_3 ($n = 0 + 3$), T_6 ($n = 3 + 3$), T_9 ($n = 3 + 3 + 3$) and T_0 ($n = 3 + 3 + 3 + 3, \text{ mod } 12$).⁶⁸ This method also predicts, for all TnI , the values for n at which the set is inversionally symmetric. Ultimately, the value for p predicts the number of unique pcsets that belong to that set class. For set-class 8-28, there are 3 members: given the total number of Tn/TnI operators ($12 Tn$ plus $12 TnI = 24$) and 8 values for n that leave the pcset invariant (4 values for n at Tn plus 4 values for n at TnI): $24 \div 8 = 3$.

For any pcset (in normal order) that expresses a tessellated *ordered pitch-class interval succession* (PCIS) (either T-sym or R-sym), the *number* of occurrences of the primitive, p , predicts the number of unique pcsets that belong to the set class to which that pcset belongs. This holds true providing the primitive cannot generate the complementing interval of the SIA, and no other primitive participates in a symmetry transformation that completes the SIA. When these conditions appear, the total number

⁶⁷ Straus, *Post-Tonal Theory*, 74. Every pcset is transpositionally symmetrical at T_0 —the identity property or ‘do-nothing’ operator. The pcsets that have transpositional symmetry other than the trivial case where $n = 0$ reduce to the following set classes: 3-12, 4-9/25/28, 6-7/20/30/35, 8-9/25/28, 9-12.

⁶⁸ The property of transpositional symmetry holds under rotational symmetry since the translation-symmetric transformation of a pcset yields the same result as the rotation-symmetric transformation for a value, n . A pcset belonging to 8-28 remains invariant under rotation (transposition) for values of $n = (0, 3, 6, 9)$.

of unique members of the set class to which that pcset belongs will be reduced to 12. For example, 7-35, PCIS <1-2-2-1-2-2> yields two expressions of the primitive <1-2-2> ($p = 2$): for the 24 Tn and TnI operators, $24 \div 2 = 12$. Thus, sc 7-35 has 12 members. The same is true for certain scs in which the PCIS does not display tessellated symmetries when the pcset is in normal order, but there is a rotation of the SIA that yields an interval-class succession other than the PCIS that expresses tessellated symmetries.⁶⁹

A pcseg that expresses an asymmetric pc succession will express symmetry in terms of its ordered sub-pcsegs if the *unordered pitch-class-interval succession*, or, *interval-class succession* (ICS) is symmetric: that is, if some symmetry transformation(s) relates the sub-pcsegs. For example, consider the pcseg <28149071>: the pc succession seems asymmetric, as does its PCIS <6-5-3-5-3-7-6>. The ICS <6-5-3-5-3-5-6> that derives from the PCIS, however, is reflection-symmetric around ic5 (the primitive is <6-5-3>, $p = 2$). Since the ICS of pcseg <28149071> is symmetric, and the value for p is 2, then the two sub-segments, <2814> and <9071> are in a transformational relationship. The following illustrates the transformation of pcseg <2814> into <9071> and the reciprocal transformation, pcseg <9071> into <2814>:

- (1) sub-pcseg <2814> = pcset 4-z29 {1248}, and
sub-pcseg <9071> = pcset 4-z15 {7901}
- (2) 4-z29 {1248} $\rightarrow$ T₅MI $\rightarrow$ 4-z15 {7901}
- the value for n = the value of the axis ic, 5, in ICS <6-5-3-5-3-5-6>
- (3) The reciprocal transformation is:
4-z15 {7901} $\rightarrow$ T₁MI $\rightarrow$ 4-z29 {1248}
- the value for n is 1, the M-transform of 5

Stretching, Shrinking, and Substitution

In the present study, *stretching* and *shrinking* represent special kinds of transformations that distort an image (a transformation) of some primitive defined by a pcseg such as a serial unit. In symmetry-transformation theory as it applies herein, a distortion of a pcseg means that there is a function that maps one pcseg *into* another

⁶⁹ For example: set-classes 4-20, 4-24; 5-15, 5-34, 5-35.

pcseg, or vice versa (not *onto*; that is, not one-to-one mapping), or there is a function that nearly maps one pcseg *onto* another. Thus, some original object defines each of these transformations: such an object is generally presented at the musical surface so that its identity is made clear before undergoing transformation. For example, the notion of a prime ordering of a series, P_0 , depends on the presentation of P_0 at the beginning of a movement before the transformations of other serial units can be understood.

Stretching connotes the interpolation and/or the addition of pcs into a pcseg (a serial unit) so that the identity of that pcseg is preserved within the new, enlarged pcseg. Interpolations may be achieved through the repetition of ordered elements or through the introduction of new elements. In some cases, a pcseg such as a serial unit may coalesce into a larger linear formation through the addition of a pcseg that is attached to the beginning or to end of the unit (an appendix)—these additional pcsegs may or may not map into that unit. The original unit always maps into a stretching.

Shrinking connotes the deletion of some of the internal constituents that define a serial unit so that the original unit becomes truncated or shortened. A shrinking always maps into the original unit.

Substitution (which is neither a stretching nor a shrinking) entails replacing one or more elements of a serial unit with other elements—these elements may be derived from that unit (where ordered elements exchange order positions) or are derived from external resources (that is, an element is simply replaced by another). If no other distortion is applied to the original pcseg, then the substituted unit *nearly maps onto* the original unit (the subject of near-mappings is discussed below).

All three processes of distortion—stretching, shrinking, and substitution—play significant roles in the analyses of the serial and non-serial pcsegs discussed in the subsequent analytic chapters. These processes are not limited to pcsegs—they can also apply to pcsets. The processes of mapping discussed above and the combinational processes to follow are more germane to the elucidation of transformations among pcsets.

Contiguous and Non-Contiguous Pitch-Class Objects in Symmetry Relationships

Contiguous and non-contiguous symmetrical formations (T-sym or R-sym) may be manifested as tessellations or *imbrications* (overlapping patterns: that is, symmetrical

formations in which the primitive overlaps with its images). Two *contiguous* psegments in R-sym90° relation that participate in a line form a pc palindrome, providing that there is no transposition other than the identity operation (T_0). The interval successions (that is, PCIS) of two contiguous psegments that are R-sym90° related through T_n ($n \neq 0$) or $T_n I$ form an interval palindrome. Two *non-contiguous* psegments related through R-sym90°—either $T_n I$ or T_n ($n \neq 0$)—that participate in a line form an *interrupted palindrome* (either a pc or an PCIS type).⁷⁰

As we will observe in the analyses that follow, interrupted translation-symmetric or reflection-symmetric formations are especially significant if the primitives constitute the boundary events of a linear formation (a line, or a succession of vertical adjacencies). Boundary events may be defined by psegments or pcsets that may derive from psegments or vertical adjacencies. In any case, boundary events that are in a symmetry relationship create an analytic frame for a complex linear formation since they establish a referential collection (ordered or unordered) around which the other components of the linear formation interact.⁷¹

Combinational Processes

The transformation of pc objects through combinational processes has significant analytical consequences for the subject repertoire of the present study. The dispositions of the various interacting linear formations (serial and non-serial) produce complex linear formations in which certain pc objects emerge that seem to be the by-products of symmetry transformations, yet have important structural attributes that often supersede linear symmetry transformations. These pc objects include pcsets derived from the accretion of psegments within a single linear unit, and pcsets derived from the vertical adjacencies formed through simultaneously unfolding psegments. As the ensuing analyses will show, pc objects that take shape through combinational processes become, in many

⁷⁰ For convenience, the present study assumes that R-sym also connotes GR-sym if the pc objects under consideration are in a $T_n I$ relationship.

⁷¹ For example, see the discussions of the super-serial formations in the analyses of *In Memoriam Dylan Thomas*.

instances, structural determinants: that is, they are part of the structural underpinnings that determine the deployment of the various linear formations. In other cases, pc objects that coalesce through combinational processes may truly be by-products of other linear processes. In either case, combinational processes, like symmetry transformations and mappings, have the potential to elucidate patterns of invariance and change within the compositional environments of the works considered herein.

Combinational processes include the familiar set-theoretic operations of union, intersection, and complement (or difference).⁷² Following are standard definitions for the basic operations of the algebra of sets:

UNION: The set $C = A \cup B$ consists of all those elements that are either in A or in B or both A and B . In symbols, [an element or a set of elements] $x \in C$ if either $x \in A$ or $x \in B$ or both. The set C is called the union of A and B .

INTERSECTION: The set $C = A \cap B$ consists of all those elements that are in A and in B . In symbols, $x \in C$ if $x \in A$ and $x \in B$. The set C is called the intersection of A and B .

COMPLEMENT AND DIFFERENCE: Let U be the universal set, and let A be a subset of U . Then the complement of A is the set of all elements in U that are not in A . This set is symbolized by writing A' or $U - A$.⁷³ [The statement $U - A = A'$ is also called the *difference* of U and A and may be symbolized as $\tilde{A}$.]⁷⁴

Inclusion and Complementation

The set-theoretic concepts of subset and superset, and the combinational processes of union, intersection, and complementation (difference) are essential to notions of *inclusion relation* and *complementation* in pitch-class set theory.

In pitch-class set theory, union is the process whereby two (or more) pcsets combine to form a new pcset ($A \cup B = C$). The resultant pcset is a superset of the component sets providing that the component pcsets are not identical ($A \neq B$: $C \supset A$ and $C \supset B$); conversely, the component pcsets are subsets of the superset ($A \subset C$ and $B \subset C$).⁷⁵

⁷² Richardson, *Finite Mathematics*, 39-47; Goodman and Pratt, *Finite Mathematics*, 39-49. The symbols used for set algebra in the present study are from these sources.

⁷³ Goodman and Pratt, *Finite Mathematics*, 46-47, 55.

⁷⁴ Richardson, *Finite Mathematics*, 47.

⁷⁵ Allen Forte, *The Structure of Atonal Music* (New Haven and London: Yale University Press, 1973), 22. Forte symbolizes $A \cup B = C$ as $C = +(A,B)$.

Intersection is the process whereby two (or more) pcsets combine to form a new pcset comprising the set of pcs that are invariant among the component pcsets ($A \cap B = C$: $C \subset A$ and $C \subset B$).⁷⁶

The inclusion relation applies to any two pcsets, A and B , in which the pc content of one set is contained in the other: if pcset $A \in$ pcset B , then pcsets A and B are in the *literal* inclusion relationship. The inclusion relation also holds for any two pcsets, A and B , in which the pc content of one set is *not* contained in the other, but a TTO exists that maps the smaller pcset into the larger. In this sense, pcsets A and B are in the *abstract* inclusion relationship: for two pcsets A and B that are in the abstract inclusion relation, the *set class* of pcset A is a member of the *set class* of pcset B . Thus, literal inclusion relates pcsets and abstract inclusion relates set classes. The KI relation defined by Robert Morris rests on the notion of abstract inclusion: for two scs, S and H , to be in the KI relation, $S \subseteq H$ ($\subseteq$ is the symbol for inclusion up to identity).⁷⁷

Ultimately, the aggregate—the universal set comprising the 12 pcs—is the superset in which all pcsets, except for U , are subsets. The cardinality of any subset of U is < 12 : thus, the cardinality of A' ($\#A'$) is equal to $12 - \#A$ (the cardinality of A). The *literal* complement A' of a pcset A is the difference of U (the aggregate) and pcset A if and only if $x \in U$ and $x \notin A$ (where x is a pcset).⁷⁸ In other words, the literal complement of pcset A ($\# < 12$) is the pcset A' that contains the elements of U excluded from pcset A . The relation of complementation also holds for any Tn or TnI of the literal complement of a pcset A : if there are elements in A that are invariant with respect to A' , then A' is the *abstract* complement of A .⁷⁹ In terms of transformational processes, literal and abstract complementation can be symbolized as follows:

A' is the *literal* complement of A if and only if $(A \cup A') = U$ and $(A \cap A') = \emptyset$;
 A' is the *abstract* complement of A if and only if $(A \cap A') = C$ ($C \subset A$ and $C \subset A'$) and there is a Tn or TnI transformation of A' so that $(A \cup A') = U$.

⁷⁶ Ibid., 29-30. Forte symbolizes $A \cap B = C$ as $C = \cdot(A, B)$.

⁷⁷ Robert D. Morris, "K, KH, and Beyond," in *Music Theory in Concept and Practice*, ed. James M. Baker, David W. Beach, and Jonathan W. Bernard (University of Rochester Press, 1997), 276-77.

⁷⁸ Forte, *Atonal Music*, 73-74; Straus, *Post-Tonal Theory*, 81.

⁷⁹ Straus, *Post-Tonal Theory*, 81.

An interesting feature of complement-related scs is that the content of their interval vector is proportional. Joseph Straus explains:

For complementary sets, the difference in the number of occurrences of each interval is equal to the difference between the size of the sets (except for the tritone, in which case the former will be half the latter).⁸⁰

The Rp Relation, Near-Mapping, and Near-Equivalency

The similarity relation R_p defined by Allen Forte arises from the interaction of combinational processes and mapping. Two pcsets are in the R_p relation if both pcsets share the same cardinality n and there is a pcset of cardinality $n - 1$ that is a subset of both pcsets. For pcsets S_1 and S_2 in R_p relation,

$$R_p(S_1, S_2) \text{ iff } (S_3 \subset S_1, S_3 \subset S_2)^{81}$$

The pcset S_3 is the set that results from the intersection of S_1 and S_2 ($S_1 \cap S_2 = S_3$).

With respect to two pcsets in the R_p relation, the intersecting set is *literally* included in both. Joseph Straus extends Forte's literal R_p relation to describe pcsets that nearly map onto each other through T_n or T_nI .⁸² This abstraction of the R_p relation holds for two pcsets of cardinality n that do not share a common subset of maximum pc similarity ($n - 1$), but $(n - 1)$ elements of the pcsets map onto each other under T_n or T_nI , making the pcsets as a whole related through *near-transposition* ($*T_n$) and *near-inversion* ($*T_nI$):

Two harmonies [i.e., pcsets of cardinality n] are related by near-transposition or near-inversion if all but one of their notes are related by actual transposition or actual inversion.⁸³

Both Forte and Straus debate the usefulness of the R_p relation. At first, Forte suggests that the R_p relation "is not especially significant since many sets are so related to a large

⁸⁰ Ibid.

⁸¹ Forte, *Atonal Music*, 47.

⁸² Morris, *Composition with Pitch-Classes*, 106. Morris also discusses the abstract R_p relation: "Two SCs [scs] containing pcsets of cardinality n are in the R_p relation if one SC [sc] has at least one member that can share a subset of cardinality $(n - 1)$ with a member of the other SC. R_p can be "weakly represented" if the actual pcsets articulating the SCs in the relation do not actually intersect in $(n - 1)$ pcs."

⁸³ Straus, "Voice Leading in Atonal Music," 268.

number of other sets.”⁸⁴ Straus acknowledges this, but points out that Forte’s viewpoint has undergone revision when Forte describes the “unary transform.” According to Forte,

A unary voice-leading transformation results in the mutation of one pitch-class set into another by a change of a single element.”⁸⁵

Straus demonstrates that the Rp relation, when viewed as near-mapping and transformational process, is significant in the context of linear analysis. For Straus, the Rp relation is at once a measure of similarity and a transformational process that places linear relations within a transformational network.⁸⁶

The present study introduces the term *near-equivalency* (NE), which connotes the Rp relation in both literal and abstract manifestations. If the Rp relation is abstract—that is, the relation is established through a near-mapping involving a *Tn or *TnI—then the symbol NE is used. If the transformation operator that nearly maps one pcset onto another plays a significant analytical role, then the symbols NE (*Tn) or NE (*TnI) are used to point up the specific transformational operators involved. If the Rp relation is literal, then the symbol NE (Rp) is used. In this instance, NE (Rp) is analogous to Forte’s *unary transform*. Simply put, NE (Rp) represents the transformation of one pcset into another by substituting one pc for another. In general, NE always involves *Tn or *TnI, thus NE (Rp) involves *T₀ or some *TnI that nearly maps the two pcsets onto each other.⁸⁷

The Transformational System

The transformational processes described above have the potential to uncover patterns of invariance and change that are governed by the structural principles underlying the surface organization of the works considered in the present study. In post-tonal environments in which serial techniques are employed exclusively, symmetry

⁸⁴ Forte, *Atonal Music*, 48.

⁸⁵ Allen Forte, “New Approaches to the Linear Analysis of Music,” *Journal of the American Musicological Society* 41 (1988): 315-48; Straus, “Voice Leading in Atonal Music,” 270 and n.31.

⁸⁶ Straus, “Voice Leading in Atonal Music,” 270-73.

⁸⁷ *Ibid.*, n.31. Straus describes Forte’s *unary transform*.

transformations play an obvious role in the structuring of the musical surface. In such compositions, serial units that participate in a single line form strip patterns; polyphonic interactions could be modeled as wallpatterns. These patterns are not obvious in Stravinsky's early serial music, however, since serial technique is only one of several principles that regulates, influences, or determines the structuring of the musical surface.

The analytic polarization of linear formations found at the musical surface of Stravinsky's early serial works into categories of serial and non-serial suggests that these works are replete with compositional discontinuities. Once the entire apparatus of transformational analysis is engaged, interacting serial and non-serial formations approach compositional (and analytical) continuity. Symmetry transformations and mappings, combinational processes, and NE transformations form a *transformational system*—that is, a system that combines the various transformational processes and allows for their interaction. Filtering pc objects discovered in the course of analysis through the transformational system reaps a rich analytic harvest: the once-divergent pc objects found at the musical surface now have the potential to coalesce into close relationships at higher structural levels.

A MODEL OF SET-CLASS SPACE ORIENTED TO THREE GENERA

The inclusion-relation model provides an essential analytic tool for drawing the multifarious pitch-class sets and set classes discovered through analysis into meaningful associations. Ultimately, however, all of the transformational relationships enumerated above—including literal and abstract inclusion—need to fit into a single, simple, theoretical framework. The present study proposes a *model of set-class space*, a complex of three well-defined *referential collections* or *genera*: the diatonic, chromatic, and octatonic (set-classes 7-35, 7-1, and 8-28, respectively).⁸⁸ Transformational relationships

⁸⁸ Since the modal scales (i.e., the seven-element member pcsets of sc 7-35) are familiar to most musicians, scs of equal or near-equal sizes are chosen to represent the chromatic and octatonic genera. The issue of genera undergoes considerable exploration in the subsequent discussions.

among the multifarious ordered and unordered pitch-class sets are thus oriented to this generic model.

The notion of set-class space is a refinement of the concept of pitch-class space. It is understood that a pcset is an abstract representation of elements derived from pitch space that are organized into well-defined sets comprising pcs, and that a set-class is an abstract representation of all pcsets that share the same cardinality, the same SIA, and the same interval vector (except for z-related hexachords). Thus, set-class space is simply the complex of all set classes defined in the *Structure of Atonal Music*. In symbolic terms, the abstraction from pitch space to set-class space is:

$$\text{p-space} \rightarrow \text{pc-space} \rightarrow \text{sc-space}$$

The model of set-class space used herein refines the complexity of the entire collection of set classes by establishing a limited number of set classes that function as the primary points of reference to which the pc objects that emerge through analysis are related (or nearly related) through abstract inclusion. This, of course, is the challenge that drives the formation of inclusion-relation theories such as the K, Kh, and KI set complexes,⁸⁹ and the theories of pitch-class set genera set forth by Allen Forte and Richard Parks.⁹⁰

The concept of a *referential collection* (or, *pitch-class region*) and the concept of a *simple genus* are nearly analogous, but hold subtle (or not so subtle) attributes that differentiate them. Before proceeding to the rationale for the selection of the constituent genera and the explication of the model of set-class space, it is necessary to introduce and define these concepts.

⁸⁹ Forte, *Atonal Music*, 93-94; Morris, "K, Kh, and Beyond," 277; Morris, *Composition with Pitch-Classes*, 98-103. Forte's K and Kh complexes are based on the concepts of the abstract complement relation in association with the abstract inclusion relation. Morris makes the distinction between literal and abstract set complexes and defines the literal and abstract K- and Kh-complexes in *Composition with Pitch-Classes*. Morris's KI relation has been introduced above.

⁹⁰ Allen Forte, "Pitch-Class Set Genera and the Origin of Modern Harmonic Species," *Journal of Music Theory* 32 (1988): 187-270; Richard S. Parks, "Pitch-Class Set Genera: My Theory, Forte's Theory," *Music Analysis* 17/ii (1998): 206-26. Parks's theory of pc set genera first appeared in his book, *The Music of Claude Debussy* (1989).

Pitch-Class Regions, Referential Collections, and Collectional Interaction

Joel Lester uses the term *pitch-class regions* to represent large pcsets that serve as resources from which pcs in localized spans of nontonal music derive. Analogous to scales in tonal music, pitch-class regions have a structural function in the sense that they coordinate local pitch events within “larger structural levels,” and “interact with and participate in creating the form of the composition.”⁹¹ Joseph Straus prefers the term *referential collection* to *pitch-class region*.⁹² The use of a referential collection affects a “sense of centricity” and provides a means of unifying sections of music within post-tonal compositional environments. As with Lester’s pitch-class region, “the composer can create a sense of large-scale movement from one harmonic area to another” by “changing the large referential set and/or the pitch or pitch-class center.”⁹³

Both Lester and Straus recognize that the diatonic, the whole-tone, and the octatonic scales and their derivative pcsets are examples of scs that commonly function as referential collections in many post-tonal compositions.⁹⁴ In regard to the diatonic collection, both authors make clear that the use of the diatonic objects does not presume that the music is tonal. Irrespective of the presence of tonal-like harmonic formations, these are nontonal and non-functional. Straus posits that the diatonic collection, which “provides a strong link to earlier music, . . . acts in a new way, as primarily a referential source collection from which surface motives are drawn.”⁹⁵

Straus points out that two or more referential collections often “occur in productive interaction with each other”:

Music may shift from one to another and musical passages can be understood in terms of the *interpenetration* of one by another [*italics mine*].⁹⁶

⁹¹ Lester, *Analytic Approaches*, 146.

⁹² Berger, “Problems of Pitch Organization in Stravinsky”: 12. Berger’s use of the term *referential collection* predates Straus’s.

⁹³ Straus, *Post-Tonal Theory*, 116.

⁹⁴ Lester, *Analytic Approaches*, 146–47; Straus, *Post-Tonal Theory*, 116–23.

⁹⁵ Straus, *Post-Tonal Theory*, 119.

⁹⁶ *Ibid.*, 123.

The diatonic and octatonic collections, for example, hold distinctive structural attributes yet share several subsets. Thus, in Straus's opinion, "they make a particularly effective pair." Herein lies the analytic basis of Pieter van den Toorn's seminal work, *The Music of Igor Stravinsky*. The use of referential collections derived from the octatonic scales and the diatonic scales, and the collectional interaction of the diatonic and the octatonic provide the means by which van den Toorn identifies and relates salient pitch objects in terms of local and large-scale structure and formal process.⁹⁷

Pitch-Class Set Genera and the Set-Class Genus

The concept of the referential collection and the concept of a pcset genus (or sc genus) intersect on several salient points. Richard Parks's definition of a *simple genus* (that is, a *simple set-class genus*) and the examples he provides point up the close relationship between referential collection and genus:

[Definition 1] A *simple genus* is a collection of scs related to a single cynosural sc by inclusion, as either subsets or supersets of that sc . . .

[Definition 2] *Primary members of a simple genus* are those scs that are either subsets or supersets of the cynosural sc.⁹⁸

Given Parks's Definitions 1 and 2, the idea of a simple genus in which primary membership rests on inclusion relation to a cynosural sc is essentially the same as a referential collection: that is, there is a pcset or a sc that defines the referential collection to which pcsets must be inclusion-related in order to hold membership. In addition, Parks's definition for the simple genus makes clear that superset and subset scs qualify as primary members.

Parks posits "four preference rules for choosing genera to model pitch materials in musical objects." The first and most important rule makes Parks's analytic attitude clear:

⁹⁷ Straus, *Post-Tonal Theory*, 132. Straus says that van den Toorn's book is the "definitive treatment of this subject."

⁹⁸ Parks, "Pitch-Class Set Genera," 207; Forte, *Atonal Music*, 94-95. By *cynosural sc*, Parks means "the designated sc to which other scs relate by inclusion." Parks defined four simple genera—diatonic, whole-tone, octatonic and chromatic—in his book on Debussy. Parks adds that his Definition 2 "is only slightly more restrictive than Forte's set-complex K." Forte's formal definition for the set-complex K is:

$$S/S' \in K(T, T') \text{ iff } S \supset T \mid S \supset T'$$

That is: S or its complement S' is a member of the set complex about T if and only if S "can contain or be contained in" T or S "can contain or be contained in" in the complement of T (T').

[Preference Rule 1] Prefer those genera that contain as members as many as possible (ideally, all) of the scs represented in the musical object that is the subject of investigation.⁹⁹

For Parks, the pitch objects that are derived through the early stages of analysis of a composition suggest the definitions for the genera that most appropriately models pitch organization.¹⁰⁰

The term *genus* as used in the present study is at once analogous to the terms *referential collection* and *simple set-class genus*. Nonetheless, *referential collection* is a meaningful and useful term. From this point on, *referential collection* will mean the set-class that represents a specific genus: 7-35 for diatonic, 7-1 for chromatic, and 8-28 for octatonic. Thus, referential collection is now analogous to Parks's term *cynosure*. The term *genus* will mean the collection of set classes that are inclusion-related or related by other means to a referential collection. The concepts underlying the term *genus*—as it is used henceforth and as will become clear—incorporates the notion of Forte's *progenitor*

⁹⁹ Parks, "Pitch-Class Set Genera," 211.

¹⁰⁰ The present study leans in favor of Richard Parks's theory of pitch-class set genera over that of Allen Forte's, yet incorporates some aspects of Forte's theory. One important reason why this study is biased towards Parks's theory is that Forte's genera, while rigorously formulated by well-defined rules, precede actual examples from the post-tonal repertoire (Forte 1988, 188). A negative outcome of this, in terms of the repertoire considered in the present study, is that the "diatonic collection 7-35 spans seven genera" (Forte 1988, 211). Thus, in Forte's theory, the diatonic collection is not a genus. On the other hand, the grounds for Parks's theory are "arbitrarily pragmatic rather than idealistic" (Parks 1998, 211-13).

An important difference between Parks's and Forte's models of pcset genera is that in Forte's model, the progenitor sc is limited to trichords which in turn lead towards the definition of twelve genera based on the distinctive intervallic qualities of each of the trichordal scs (Forte 1988, 190). In Parks theory, the distinctive intervallic qualities of the cynosural sc (which "denotes Forte's 'progenitor set'") are just as important, but potential cynosures are not limited to trichords. Instead, Parks selects cynosures and the member sets that characterize his genera for their distinct qualities and for their familiarity (or accessibility) among musicians. For example, in his book *The Music of Claude Debussy*, Parks "identified five genera by means of inclusion relations converging upon various scales and otherwise distinctive pitch constructions." Four of these genera have already been mentioned in a footnote, above (the diatonic, whole-tone, octatonic and chromatic simple genera); the other is a *complex genus* (Parks 1998, 207, 211).

A crucial distinction between Forte's and Parks's theories lies in their predictive potential. Forte's model predicts harmonic languages that derive from the basic interval-class pairs that characterize each trichordal set class. In this sense, Forte's model seems more compositional than analytical since it establishes a potential harmonic language that *might* be appropriate for a particular post-tonal work. (In this context, "harmonic" refers to melodic and simultaneous intervals and sonorities. Forte does not mean to invoke the norms of the tonal tradition.) In contrast, Parks's model seems more flexible and less prescriptive than Forte's. Although Parks's model assumes the presence of familiar pitch resources that are common to the musical culture in which post-tonal composers interact, it also allows for new genera that embrace the harmonic idiosyncrasies of those composers and their works.

set,¹⁰¹ and aspects of Parks's *simple genus* and his definitions for the *characteristic members of a genus*.¹⁰²

Rationale for the Selection of the Constituent Genera in the Model of Set-Class Space

There are five reasons for the selection of the three genera—diatonic, chromatic, and octatonic—as the primary constituents for the model of set-class space. The first three are consistent with Parks's criterion of familiarity and distinctiveness, and his first preference rule. The fourth reason rests on the precedence set in the analytic literature in which the significance of two of the genera in Stravinsky's music is well established. The fifth reason proceeds from the transformational relationship among the genera, which in turn points towards the notions of *set-class transformation* and *inter-generic transformation*.

(1) Most musicians have encountered music and technical exercises that employ diatonic, chromatic, and octatonic scales as well as pitch formations derived from these genera. Thus, these referential collections should evoke a sense of sonic and kinesthetic familiarity with those who encounter the present study.¹⁰³

(2) Each genus is highly distinctive: set-classes 7-35, 7-1, and 8-28 (representing the diatonic, chromatic, and octatonic genera, respectively) display unique intervallic characteristics in terms of their interval vectors and their SIAs. Thus, the member sets that best evince the qualities of each genus do so because of the uniformity in their intervallic characteristics in relation to the primary referential collection and the progenitor set associated with each genus (see below).

(3) The repertoire under investigation displays at the musical surface a variety of diatonic and chromatic sets including pitch-class sets of cardinalities ranging from 3 to 9. Octatonic sets are present, but cardinalities of more than four are relatively rare. Various segmentation strategies, however, reveal the presence of *non-generic* set classes—that is, scs that do not neatly fit into the diatonic-chromatic-octatonic generic model. An explanation for the presence of non-generic scs emerges from the interaction of the three

¹⁰¹ Forte, "Pitch-Class Set Genera," 188-92.

¹⁰² Parks, "Pitch-Class Set Genera," 209 (Definition 8). See below.

¹⁰³ *Ibid.*, 211.

genera and through the transformations that establish relationships among non-generic sets and one or more of the three genera.

(4) Previous analytical studies of Stravinsky's music have proposed theories of pitch organization in which the genera used in the present study play significant roles as primary referential collections. Arthur Berger and Pieter van den Toorn have successfully demonstrated the significance of octatonic collections in selected examples of Stravinsky's music.¹⁰⁴ Henri Pousseur argues that octatonic collections found in Webern's serial music are present in one of Stravinsky's early serial works, that is, the ballet *Agon*.¹⁰⁵ The octatonic-diatonic binarism developed by van den Toorn in his seminal work, *The Music of Igor Stravinsky*, effectively models the collectional interaction between diatonic and octatonic pitch formations. Van den Toorn's model, however, implicitly diminishes the structural significance of chromatic pitch formations such as those found in the works under investigation in the present study. Furthermore, the ensuing analyses demonstrate that the role of the octatonic genus in this particular repertoire is relatively minimal, while the diatonic and chromatic genera are active both at the musical surface and at deeper structural levels. As will become clear, the significance of the octatonic genus lies in its transformational relationship with the diatonic and chromatic genera.

(5) The three referential collections that represent each of the genera are associated through some of the transformational processes enumerated above. Although each referential collection displays distinctive interval constructions, the processes that affect transformation from one referential collection to another point to the symmetry underlying this model of set-class space. This symmetry affects the coalescence of the disparate referential collections into a single, cohesive model.

¹⁰⁴ Berger, "Problems of Pitch Organization in Stravinsky," 20; van den Toorn, *The Music of Igor Stravinsky*. Berger coins the term *octatonic* in his article.

¹⁰⁵ Pousseur, "Stravinsky by Way of Webern (I): 26. Pousseur refers to the octatonic collection in terms of Messiaen's second mode of limited transposition ("Mode II").

The Symmetry of the Model of Generic Set-Class Space

The symmetry that underlies the model of set-class space rests primarily on the transformational relationships among the cynosural set-classes, and secondarily on the intervallic characteristics of each of these set classes. Example 2.15 illustrates the transformational relationships among the cynosural scs and their complements for the diatonic, chromatic, and octatonic genera. Each cynosure is represented by a pc succession—generated by an *interval cycle* (*int cycle*)—that is a realization of a member pcset for that cynosure and its literal complement.¹⁰⁶

In example 2.15, lines 3 and 4 (numbered in the right margin) illustrate the pc successions produced by the int-5 cycle (diatonic) and the int-1 cycle (chromatic), respectively—each cycle is initiated at pc0.¹⁰⁷ Since the pc successions produced through both cycles form the aggregate, they are partitioned into a segment of seven elements and a segment of five elements. This in turn yields the cynosures and their complements for the diatonic and chromatic genera represented by 7-35 {013568t} and its literal complement 5-35 {79e24}, and 7-1 {0123456} and its literal complement 5-1 {789te}. Lines 2 and 5, which are identical, illustrate the generation of the complement of 8-28, 4-28 by the int-3 cycle. Line 6 illustrates the generation of 8-28, the octatonic cynosure, through the interval-pair-1-2 cycle (the primitive of the SIA for 8-28). Line 1 illustrates the generation of 8-28 by the int-pair-5-10 cycle (the int-pair <5-10> is the M-transform of the int-pair <1-2>).

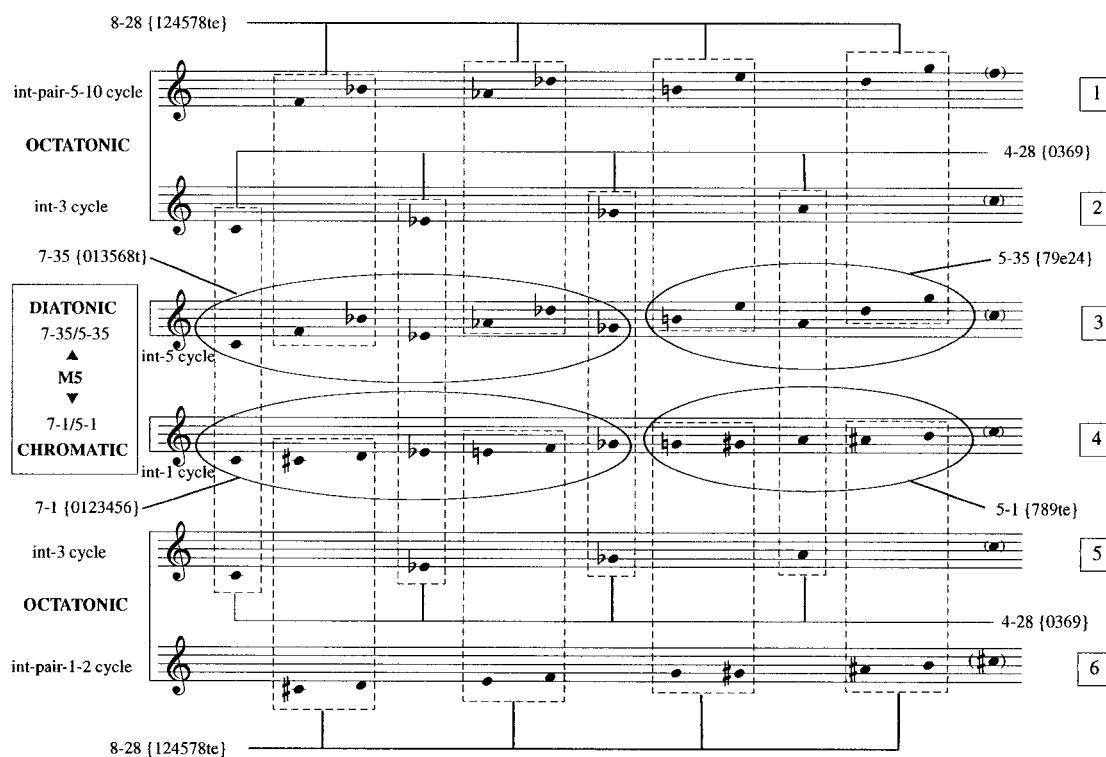
The transformational processes that relate each of the lines generated through interval cycles in example 2.15 articulate the symmetry that underlies the generic model of set-class space. The M transformation affects a one-to-one mapping between each ordered pc from the int-5 cycle (diatonic) onto the int-1 cycle (chromatic). Since the M transformation is reciprocal, the transformation can be mapped from lines 3 to 4, or 4 to 3. The intersection of lines 3 and 4 produces 4-28 {0369}, (line 2 or line 5), which is the literal complement of 8-28 (124578te) (lines 1 or 6). The difference of lines 4 and 3 (line

¹⁰⁶ Catherine Nolan, "Hierarchic Linear Structures in Webern's Twelve-Tone Music" (Ph.D. dissertation, Yale University, 1989). Nolan describes this method of generation by interval cycle.

¹⁰⁷ The type of interval that participates in these interval cycles is an ordered pitch-class interval (pc-int).

4 – line 3) is line 6, 8-28 {124578te}, the pc succession produced through the int-pair-1-2 cycle. The difference of lines 3 and line 4 (line 3 – line 4), line 1, is also 8-28 {124578te}. The successive transformations of the pc successions produced through the int-5 cycle to the int-1 cycle 1 to int-pair-1-2 cycle (or int-pair-5-10 cycle) can be reversed since each transformation is reciprocal. The union of lines 5 and 6 produces line 4, and the union of lines 1 and 2 produces line 3; lines 3 and 4 are M-transforms of each other.

Example 2.15. A transformational model of generic set-class space



In this model of generic set-class space, the symmetry between the diatonic and chromatic genera is strongly expressed through the intervallic characteristics of the cynosural scs. Thus, set-classes 7-35 and 7-1 hold five important properties that bring them into close association. First, the respective interval vectors for scs 7-35 and 7-1—[254361] and [654321]—display the property of *unique multiplicity of interval class*, which means that each entry of the ic-vector is unique in comparison to the other

entries.¹⁰⁸ Second, scs 7-35 and 7-1 (and their complements, 5-35 and 5-1, respectively) are directly associated by their generation from single interval cycles, int-5 cycle and int-1 cycle, respectively (example 2.15, lines 3 and 4). Third, both the int-5 cycle and the int-1 cycle can generate the aggregate (example 2.15, lines 3 and 4). Fourth, the PCISs of 7-35 and 7-1— $\langle 1-2-2-1-2-2 \rangle$ and $\langle 1-1-1-1-1-1 \rangle$, respectively—are symmetrical. Fifth, 7-35 and 7-1 are related through the M-transform.

The M-transform relation between 7-35 and 7-1 warrants further comment. When any two scs are of the same cardinality and express *different* interval vectors, they are M-related (M_5 or M_7 transformation) *if* the first (ic1) and fifth (ic5) entries of their interval vectors exchange position *and* the other four entries (ics 2, 3, 4, and 6) remain constant. In other words, the number of ics 1 in any set transform into ics 5 (and vice versa) under the M transformation. This type of exchange is an example of Forte's R_1 relationship, a measure of similarity.¹⁰⁹ The R_1 condition points up the close intervallic relationship between M-related sets sharing the same cardinality. Set-classes 7-35 and 7-1 are in the R_1 relation, and retain the property of unique multiplicity of interval class under the M-transform. Thus, the M transformation draws chromatic and diatonic scs into a highly abstract association.¹¹⁰

Set-class 8-28 is unique with respect to 7-35 and 7-1. Set-class 8-28 does not have the property of unique multiplicity of interval class, nor can it be generated from a single interval cycle.¹¹¹ The int-pair-1-2 cycle generates 8-28 (thus, its SIA expresses symmetry), but it cannot generate the aggregate (example 2.15, line 6). Furthermore, 8-28 does not transform under M, except for the trivial case: that is, 8-28 (or any of its subsets) maps onto itself under the M-transformation.

¹⁰⁸ Forte, *Atonal Music*, 31; Straus, *Post-Tonal Theory*, 62. The present study uses square brackets for interval vectors in order to distinguish them from pcsets and interval successions (SIAs, PCISs, and ICSs).

¹⁰⁹ Forte, *Atonal Music*, 48-49.

¹¹⁰ Morris, *Composition with Pitch-Classes*, 77-78. Morris points out that M-related sets also share the same invariance vector.

¹¹¹ The interval vector of 8-28 is [448444].

The Diatonic, Chromatic, and Octatonic Genera: Cynosural Sc, Progenitor Trichord, and Primary and Characteristic Members

Each genus is defined by a referential collection, a progenitor trichordal sc, a collection of primary members, and a collection of characteristic members. The *primary members* for each genus are those scs of cardinality three to nine that are inclusion-related as subsets and supersets to the referential collection, including the referential collection itself (the referential collection is analogous to Parks's cynosural sc). In addition, each genus contains one trichord that serves as the *progenitor* for that genus, which represents the smallest sc that best evinces the intervallic qualities of the member scs (see below). Contained within the entire collection of member scs for each genus is a smaller collection called the *characteristic members* that display "those qualities that render a particular genus distinct."¹¹² The characteristic members of a genus meet the following four desiderata proposed by Parks:

- (1) They include the cynosural sc *and a well-defined progenitor sc*.
- (2) They are all subsets or supersets of each other.
- (3) They display some uniformity of ic distribution within their interval vectors.
- (4) They display some uniformity in interval patterns within their SIAs.¹¹³

Table 2.3 (below) lists the characteristic members for the diatonic, chromatic, and octatonic genera, and their prime forms, interval vectors, and SIAs (the PCIS for any sc can be determined by ignoring the complementing interval of its SIA). The cynosural and progenitor scs for each genus are in bold typeface. Each collection of characteristic members meets the four desiderata listed above (the progenitor sets will be discussed below). All are subsets or supersets of each other. The uniformity in interval distribution within the diatonic and chromatic sc vectors is expressed through the unique entries at ic2, ic3, and ic5 for the diatonic scs (all cardinalities, 3 to 9), and the unique entries at ic1, ic2, and ic3 for chromatic scs (all cardinalities, 3 to 9). In addition, diatonic and

¹¹² Parks, "Pitch-Class Set Genera," 209 (Definition 8).

¹¹³ *Ibid.* (Definition 8). The first desideratum has been modified from Parks's with the addition of the condition regarding the inclusion of a well-defined progenitor set (indicated in italics). The second desideratum excludes an exception given by Parks that allows two cynosures that are not inclusion-related to participate in a single (complex) genus.

chromatic sc vectors display unique multiplicity of interval class for cardinalities six and seven. The vector entries for octatonic scs display quasi-symmetrical distributions for each cardinality. The interval distributions within the SIAs of the scs belonging to each generic collection clearly display uniform interval patterns.

The distribution of intervals within the vectors and the SIAs for the characteristic members of each genus points up the unique intervallic characteristics of the three genera. Upon comparing the vector entries for ic5, ic1, and ic3 for sets of equal cardinality among the three collections, it is apparent that diatonic scs display the highest values for ic5, the chromatic scs display the highest values for ic1, and the octatonic scs display the highest values for ic3 and ic6. The SIAs for the chromatic and octatonic scs are symmetric; the symmetry of the SIAs derived from diatonic scs is less apparent.

Table 2.4 (below) lists the primary members for each of the three genera defined by the cynosural scs 7-35, 7-1, and 8-28. The column at the far left indicates cardinality. The subset-classes for each genus are distributed about the characteristic member for each cardinality according (roughly) to the number of member sets for that sc that occur in each of the respective cynosural scs (this number is given, in italics, below each sc ordinal). Superset-classes (up to cardinality 9) are also arranged this way. The number, in italics, given below each superset-class ordinal represents the number of member sets of the cynosural sc that can be contained in the superset-class. Cynosures are enclosed within solid-lined rectangles; progenitors are enclosed within broken-lined rectangles; characteristic members are in bold typeface; the solid lines connect the characteristic members of each genus.

The total number of scs belonging to each genus is: diatonic, 43; chromatic, 43; octatonic, 36.¹¹⁴ Set classes of cardinality six to nine belong to only one genus. Thus, generic membership is easily determined for pcsets that map *onto* any of these scs. For sets of cardinality three to five, however, there is a greater chance that the pcset in question will hold membership in more than one genus. Table 2.5 (below) lists the *pan-generic* scs (scs that are inclusion-related to all three collections) and the *inter-generic* scs (scs that are inclusion-related to two of the three collections) for 7-35, 7-1, and 8-28.

¹¹⁴ The symmetry of the numbers of member scs for the diatonic and chromatic genera reflects the M-transformational relationship of these two genera.

Table 2.3. Characteristic members of the diatonic, chromatic, and octatonic genera

DIATONIC			
SC	PRIME FORM	INTERVAL VECTOR	SIA
3-9	{027}	[010020]	2 – 5 – 5
4-23	{0257}	[021030]	2 – 3 – 2 – 5
5-35	{02479}	[032140]	2 – 2 – 3 – 2 – 3
6-32	{024579}	[143250]	2 – 2 – 1 – 2 – 2 – 3
7-35	{013568t}	[254361]	1 – 2 – 2 – 1 – 2 – 2 – 2
8-23	{0123578t}	[465472]	1 – 1 – 1 – 2 – 2 – 1 – 2 – 2
9-9	{01235678t}	[676683]	1 – 1 – 1 – 2 – 1 – 1 – 1 – 2 – 2
CHROMATIC			
SC	PRIME FORM	INTERVAL VECTOR	SIA
3-1	{012}	[210000]	1 – 1 – 10
4-1	{0123}	[321000]	1 – 1 – 1 – 9
5-1	{01234}	[432100]	1 – 1 – 1 – 1 – 8
6-1	{012345}	[543210]	1 – 1 – 1 – 1 – 1 – 7
7-1	{0123456}	[654321]	1 – 1 – 1 – 1 – 1 – 1 – 6
8-1	{01234567}	[765442]	1 – 1 – 1 – 1 – 1 – 1 – 1 – 5
9-1	{012345678}	[876663]	1 – 1 – 1 – 1 – 1 – 1 – 1 – 1 – 4
OCTATONIC			
SC	PRIME FORM	INTERVAL VECTOR	SIA
3-2	{013}	[111000]	1 – 2 – 9
4-3	{0134}	[212100]	1 – 2 – 1 – 8
5-10	{01346}	[223111]	1 – 2 – 1 – 2 – 6
6-z13	{013467}	[324222]	1 – 2 – 1 – 2 – 1 – 5
7-31	{0134679}	[336333]	1 – 2 – 1 – 2 – 1 – 2 – 3
8-28	{0134679t}	[448444]	1 – 2 – 1 – 2 – 1 – 2 – 1 – 2
9-10	{01234679t}	[668664]	1 – 1 – 1 – 1 – 2 – 1 – 2 – 1 – 2

Table 2.4. The primary members of the diatonic, chromatic, and octatonic genera

Cardinality	Diatonic	Chromatic	Octatonic
9	6 7 9 11 1 2 3 1	6 2 1 3 1 2 3 1	10 1
8	22 23 26 1 2 1	2 1 3 1 2 1	28
7	35	1	31
6	z25 32 33 z26 2 2 2 1	2 1 z3 z4 2 2 2 1	z23 z30 z13 27 z49 z50 4 4 4 8 4 4
5	z12 20 25 23 35 27 29 24 34 1 2 2 4 3 4 2 2 1	z12 6 4 2 1 3 9 10 8 1 2 2 4 3 4 2 2 1	31 25 16 10 19 28 32 8 8 8 8 8 8 8
4	21 10 13 20 27 26 14 23 22 11 16 z29 8 1 2 2 2 2 3 4 4 6 4 2 2 1	21 12 5 7 3 2 1 4 11 10 13 z15 8 1 2 2 2 3 6 4 4 4 2 2 2 1	28 9 17 10 18 z15 12 3 13 z29 27 26 25 2 2 4 4 8 8 8 4 8 8 8 4 2
3	10 5 6 2 7 1 9 1 11 4 8 1 2 3 4 8 5 6 4 2	10 6 4 2 1 1 3 7 5 8 1 3 4 8 5 6 4 2 2	10 5 3 2 1 7 8 11 8 8 8 8 8 8 8

Table 2.5. Pan-generic and inter-generic scs of 7-35/7-1/8-28

PAN-GENERIC SCS	INTER-GENERIC SCS		
7-35 $\cap$ 7-1 $\cap$ 8-28	7-35 $\cap$ 7-1	7-1 $\cap$ 8-28	8-28 $\cap$ 7-35
3-2	3-2	3-2 3-3	3-2
3-5	3-4 3-5 3-6	3-5	3-5
3-7	3-7	3-7	3-7
3-8	3-8	3-8	3-8
3-10	3-10	3-10 4-3	3-10 3-11
4-10	4-8 4-11 4-10	4-10	4-10
4-13	4-13 4-21	4-12 4-13 4-z15	4-13
	5-z12	5-10	4-26 4-27 4-z29 5-25

Among sets of cardinalities ranging from three to nine, trichords have the greatest chance of being inclusion-related to more than one genus. Table 2.6 lists all twelve trichordal scs and indicates the number of possible non-redundant mappings for each trichord with respect to each referential collection. Of the twelve trichordal-scs, five (nearly 50%) are pan-generic, and six or seven (50% or higher) are inter-generic. Of the twelve trichordal-scs, only 3-1 and 3-9 are subsets of one referential collection, and sc 3-12 is the only trichord that is *non-generic* (it is *not* inclusion-related to any of the three cynosures).

Table 2.6. Trichordal subsets of 7-35/7-1/8-28

SET CLASS	PRIME FORM	Number of members in 7-35	Number of members in 7-1	Number of members in 8-28
3-1	{012}	—	5	—
3-2	{013}	4	8	8
3-3	{014}	—	6	8
3-4	{015}	4	4	—
3-5	{016}	2	2	8
3-6	{024}	3	3	—
3-7	{025}	8	4	8
3-8	{026}	2	2	8
3-9	{027}	5	—	—
3-10	{036}	1	1	8
3-11	{037}	6	—	8
3-12	{048}	—	—	—

The sets of inter-generic trichords that result from the intersections of 7-35/7-1, 7-1/8-28, and 8-28/7-35:

$7-35 \cap 7-1 = (3-2, 3-4, 3-5, 3-6, 3-7, 3-8, 3-10)$ - seven scs

$7-1 \cap 8-28 = (3-2, 3-3, 3-5, 3-7, 3-8, 3-10)$ - six scs

$8-28 \cap 7-35 = (3-2, 3-5, 3-7, 3-8, 3-10, 3-11)$ - six scs

The set of pan-generic trichords that results from the intersection of all three genera:

$7-35 \cap 7-1 \cap 8-28 = (3-2, 3-5, 3-7, 3-8, 3-10)$ - five scs

Certain trichords fulfill two criteria that distinguish them as belonging exclusively or primarily to a specific genus: (1) uniqueness, (2) generative potential. The first criterion favours those trichords that are inclusion-related to only one genus. The second criterion is the potential of the trichord's PCIS to generate some or all of the larger characteristic member scs for that genus, including the cynosure and some of its supersets—that is, the PCIS of the trichord becomes the primitive of an int-pair cycle. If a trichord can be

generated from a single-interval cycle, and can generate all of the characteristic members of a genus, the generative potential of its PCIS does not need to be explored. If a trichord manifests itself in only one of the genera and meets the second criteria, that trichord holds special status as the progenitor set of its respective genus. If a trichord is inclusion-related to more than one genus, but meets the second criterion, then its strongest generic affiliation is determined by the referential collection generated through the int-pair cycle derived from its PCIS.

Example 2.16. Diatonic and chromatic scs generated from a single-interval cycle

The image displays two musical examples, 3-9 and 3-1, illustrating the generation of set-classes from single-interval cycles.

Example 3-9 (Diatonic): Labeled "int-5 cycle", it shows a sequence of 12 notes on a staff. Below the staff, a series of 12 boxes, each containing the number "5", represent the intervallic structure. Brackets below these boxes indicate the following set-classes and their intervallic content:

- 3-9 {t05}
- 4-23 {t035}
- 5-35 {8t035}
- 6-32 {8t0135}
- 7-35 {013568t}
- 8-23 {te013568}
- 9-9 {te0134568}

The sequence ends with the label "Aggregate completed".

Example 3-1 (Chromatic): Labeled "int-1 cycle", it shows a sequence of 12 notes on a staff. Below the staff, a series of 12 boxes, each containing the number "1", represent the intervallic structure. Brackets below these boxes indicate the following set-classes and their intervallic content:

- 3-1 {012}
- 4-1 {0123}
- 5-1 {01234}
- 6-1 {012345}
- 7-1 {0123456}
- 8-1 {01234567}
- 9-1 {012345678}

The sequence ends with the label "Aggregate completed".

Set-classes 3-9 and 3-1 are the only trichords that belong exclusively to a single genus, and the characteristic members for the genus to which each belongs, including 3-9 and 3-1, can be generated from a single-interval cycle (int-5 cycle and int-1 cycle, respectively). Thus, sc 3-9 is the progenitor for the diatonic genus, and sc 3-1 is the

progenitor for the chromatic genus (note that 3-9 and 3-1 are M-partners). Example 2.16 (above) illustrates the generation of the characteristic members for the diatonic and chromatic genera.

Set-class 3-2 is the best choice as the progenitor set for 8-28. Although sc 3-2 is pan-generic and its PCIS $\langle 1-2 \rangle$ is a sub-segment of the PCIS for the diatonic scs 6-32 and 7-35 (tables 2.3, 2.4, 2.5, and 2.6), it meets the criterion that its PCIS is to generate the characteristic members for the octatonic genus. Example 2.17 illustrates the scs derived from the pc succession generated by the int-pair-1-2 cycle. Tessellations of the int-pair $\langle 1-2 \rangle$ yield scs 3-2, 5-10 and 7-31, identified in example 2.17 as translation-symmetric (T-sym) formations. Reflection-symmetric (R-sym) formations derived from sub-segments of the int-pair-1-2 cycle yield scs 4-3, 6-z13, and 8-28 (of course, 8-28 can also be produced through tessellations of $\langle 1-2 \rangle$).

The int-pair $\langle 1-2 \rangle$ cannot generate sc 4-28, the complement of 8-28. The sum of the integers of the PCIS of 3-2 ($1 + 2$) yields pc-int3, which in turn is able to generate scs 3-10 {036} and 4-28 {0369} (the PCIS of 3-10 and 4-28, $\langle 3-3 \rangle$ and $\langle 3-3-3 \rangle$ are sub-segments of the int-3 cycle $\langle 3-3-3-3 \rangle$, which yields pcseg $\langle 03690 \rangle$). Set-class 3-10 is pan-generic, yet its interval characteristics are quintessentially octatonic. The complement of 3-10, sc 9-10, is the only nine-element superset that contains sc 8-28. Thus sc 9-10, and not sc 9-2, is the only nine-element sc that holds primary membership in the octatonic genus and is (obviously) the characteristic nine-element member of octatonic genus. (See table 2.4.)

Example 2.17. Octatonic scs generated from trichord 3-2

3-2 {013}

3-2

int-pair-1-2 cycle

1 2 1 2 1 2 1 2

4-3 {0134} <-- R-sym PCIS $\langle 1-2-1 \rangle$

5-10 {01346} <-- T-sym PCIS $\langle 1-2-1-2 \rangle$

6-z13 {013467} <-- R-sym PCIS $\langle 1-2-1-2-1 \rangle$

7-31 {0134679} <-- T-sym PCIS $\langle 1-2-1-2-1-2 \rangle$

8-28 {0134679t} <-- R-sym PCIS $\langle 1-2-1-2-1-2-1 \rangle$

Example 2.18. Diatonic scs generated from trichords 3-9, 3-7, and 3-11

The image displays three musical staves, each representing a different trichord and its associated diatonic scale construction.

- Staff 1 (3-9):** The trichord 3-9 (027) is shown. Below it, the 'int-pair-2-5 cycle' is represented by a sequence of boxes containing the intervals 2 and 5. Brackets below the scale indicate the following sets: 4-23 (7902), 5-35 (02479), 6-32 (79e024), 7-35 (679e024), 8-23 (e0124679), and 9-9 (6789e0124). The scale ends with 'Aggregate completed'.
- Staff 2 (3-7):** The trichord 3-7 (025) is shown. The 'int-pair-2-3 cycle' uses boxes with intervals 2 and 3. Brackets indicate the following sets: 5-35 (t0257), 6-32 (t02357), 7-35 (23578t0), 8-23 (0123578t), and 9-9 (01235678t). The scale ends with 'Aggregate completed'.
- Staff 3 (3-11):** The trichord 3-11 (037) is shown. The 'int-pair-3-4 cycle' uses boxes with intervals 3 and 4. Brackets indicate the following sets: 5-27 (7t023), 7-35 (9t02357), 8-23 (234579t0), and 9-9 (9te023457). The scale ends with 'Aggregate completed'.

Two other trichords, scs 3-7 and 3-11, express intervallic characteristics that associate them primarily with the diatonic genus, even though 3-7 is pan-generic and 3-11 is inter-generic (diatonic and chromatic). Example 2.18 (above) explores the derivation of scs based on the int-pairs derived from 3-7 <2-3> and 3-11 <3-4> in comparison to the int-pair derived from 3-9 <2-5>. Each int-pair participates as the primitive of tessellated translation-symmetric formations that produce, in succession, the diatonic sc 7-35 and some of its subsets and all of its supersets. The int-pair <2-5> from sc 3-9 generates all of

the characteristic members for the diatonic genus. The int-pair from 3-7 <2-3> also generates the characteristic members of the diatonic genus, except for sc 4-23. The int-pair from 3-11 <3-4> can only generate 7-35, 8-23, and 9-9 in addition to sc 5-27, which is unique to the diatonic genus. In this context, scs 3-7 and 3-11 are primarily associated with the diatonic genus, although they cannot function as progenitors nor do they fulfill the desiderata for the characteristic membership. Their appearance in other genera, however, is no less important. Rather, these and other inter- and pan-generic scs identified through analysis function as points of intersection (points of convergence or points of departure) for the multifarious pitch formations that interact within the environment of this model of generic set-class space.

Generic and Non-Generic Set-Classes

Membership of a pcset in one or more of the three genera is based primarily on abstract and literal inclusion relationships. As we have seen, the intervallic characteristics of a particular pcset that holds membership in more than one genus may provide additional information that can be used to establish a stronger relationship with one genus in preference to another. Furthermore, the context in which inter- and pan-generic pcsets appear may influence the analytic decision to prioritize the generic memberships for such sets. Thus, inclusion relations and intervallic characteristics, as well as context, can also provide the means by which non-generic pcsets form relationships with one or more genera.

A non-generic sc is *near generic* to a particular genus if one or more of the following criteria are met.

- (1) The non-generic sc is nearly equivalent (NE) to a primary member of a genus.
- (2) The non-generic sc displays characteristics in its PCIS (or SIA), and/or interval vector that are consistent with the characteristic members of a particular genus. This criterion allows z-related hexachords and complement-related scs to be drawn into a generic association.
- (3) The non-generic sc has subset-classes that are inclusion-related and/or NE to the primary members of a genus. This relationship is significant when large scs are

involved (cardinalities of 7 to 10), and the number of subset-classes is limited (usually to two).

It is possible that a non-generic sc is NE to more than one genus, that its SIA (PCIS) or interval vector evinces the intervallic characteristics of more than one genus, or that the subset-classes derived from a large non-generic sc clearly belong to different genera. Non-generic scs that display one or more of these properties cannot be drawn into near-generic association with a single genus.

Set-Class Transformations and Intra-Generic and Inter-Generic Transformations

A set-class transformation occurs when some transformational process acts upon a pc object so that the set class to which the object belongs changes (see, for example, the discussion pertaining to circular permutations, above). Several transformational processes—such as PCIS rotation (PCIS C-sym), the multiplicative operation (M), and near-equivalency (NE)—have the capability to enact a set-class transformation. Set-class transformations have the potential to associate non-generic scs with generic scs (for example, the NE-transform establishes the near-generic relationship between a generic sc and a non-generic sc). If the set-class transform-partners are members of the *same* genus, the set-class transformation is *intra-generic*. If the set-class transform-partners belong to two *different* genera, then the set-class transformation is *inter-generic*.

Intra-generic transformation has the potential to strengthen or weaken associations among generic primary members of cardinality n . For example, the nine pentachords of the diatonic genus fall into two groups defined by the NE transformation (the double arrows denote transformation):

$$\begin{aligned} & \text{(Group 1)} \\ & 5\text{-}z12 \{01356\} \Leftrightarrow 5\text{-}24 \{01357\} \Leftrightarrow 5\text{-}23 \{02357\} \Leftrightarrow 5\text{-}25 \{02358\} \Leftrightarrow \\ & \Leftrightarrow 5\text{-}27 \{01358\} \Leftrightarrow 5\text{-}29 \{01368\} \Leftrightarrow 5\text{-}20 \{01378\} \end{aligned}$$

$$\begin{aligned} & \text{(Group 2)} \\ & 5\text{-}35 \{02479\} \Leftrightarrow 5\text{-}34 \{02469\} \end{aligned}$$

Successive NE transformations associate the seven members of Group 1, and the two members of Group 2, and therefore define the boundaries for Groups 1 and 2 since there

are no NE-partners between the two groups. In this instance, the NE relations among the prime forms of these pentachordal scs are literal (Rp). The general, or abstract NE relation will produce the same groupings for various pcset realizations of these scs.

The notion of inter-generic transformation rests on the underlying symmetry of the model of generic set-class space, as well the transformational processes that establish this symmetry. These (and other) transformational processes may be invoked in order to bring two scs of different genera into relationship. For example, the M-partners scs 6-z25 and 6-z3 belong exclusively to the diatonic and chromatic genera, respectively. The NE transformation also establishes a relationship between these two hexachords, since the prime forms of 6-z25 {013568} and 6-z3 {012356} are in the Rp similarity relationship—5-z12 {01356}, the set produced through intersection, is inter-generic with respect to the diatonic and the chromatic genera. The combinational process of union, which plays a significant role in defining the primary members for each genus, has the potential to affect set-class transformation among sets of *different* cardinalities by combining pc objects that belong to one or more scs into a larger sc. This process allows small generic, inter-generic, and pan-generic scs to form into a larger sc that is a primary member of a single genus.

Set-Class Transformation and the Fluid Model of Generic Set-Class Space

The model of generic set-class space is not intended to be exclusionary with respect to non-generic pcsets. Rather, the model functions like a compass; it provides a means for orienting the multifarious pcsets discovered through analysis to three “compass points” defined by the diatonic, chromatic, and octatonic genera. Non-generic scs, including near-generic scs, arise from the interaction (or interpenetration) of two or three genera. Set classes that do not hold clear generic associations are as significant as those that do. The model of generic set-class space is more than a system of classification. As will become apparent in the ensuing chapters, taxonomic considerations engender far-reaching analytic consequences in terms of the discovery of and explanation for apparent compositional continuities and discontinuities.

METHODOLOGY

The main tools of analysis for this study derive from serial theory and pitch-class set theory. Although there are instances of diatonic pitch constructs and tonal-like formations in this repertoire, tonal theory does not provide an appropriate explanation for their presence or their interactions with other types of pitch constructs.¹¹⁵ Pitch-class set theory, however, does not predict functional relationships among pitch classes. The potential of pitch-class set theory as a means of explanation lies in its ability to draw pitch objects into abstract associations without relying on an a priori functional model. Thus, pitch-class set theory provides an ideal avenue of investigation for this repertoire.

Transformational analysis provides the means by which pitch-class objects discovered through the segmentation of the musical surface can be drawn into dynamic relationships. It is through this process that serial and non-serial formations approach structural equivalency. That is, while the serial unit loses structural priority through the process of transformational analysis, pcsets derived from the serial unit and their transformations as well as other linear and vertical formations can attain greater structural significance. The significance of the relationship between serial units and non-serial formations becomes marginal when analytical priority is biased towards serial units. If the serial unit is not the only analytical priority, then non-serial formations may receive near-equal status to serial formations through the process of transformational analysis.

Each work examined in the present study expresses a primary linear component, the serial unit, which represents a motivic or thematic unit. This unit generally undergoes one or more transformations, many of which are consistent with those typical of classical serial procedures (i.e., canonical transformations). To elucidate the transformational relationships among serial formations on their own terms, the transformational relationships among non-serial formations and serial formations, and the transformational relationships among non-serial formations on their own terms, is the objective of the

¹¹⁵ For a piece to be tonal in the Schenkerian sense, functional tonal relationships must be operating on all levels of structure, including the background. An analysis of the repertoire under investigation that incorporates tonal theory can only reveal the presence of tonal-like formations that occur at or near the musical surface—these formations do not have a relationship with a Schenkerian structural background.

present study. By examining transformational relationships, the significance of the pre-compositional design of the series can be explored, and a theory of pitch structure for each work can then be put forward.

The analytical method used henceforth unfolds in five general stages. The first stage identifies the prime ordering of the series and explores its precompositional potential.¹¹⁶ The series, its sub-pcsegs and concomitant intervals, and the pcsets and scs that the series engenders may be the primary source from which other linear and vertical formations derive pitch materials. The first stage also investigates the relationship between the series and the text (with the exception of the serial interludes from the ballet *Orpheus*). The second stage entails identifying the deployment of the serial units (the series and its canonical transformations) and explores the relationship between the text and the serial units (when it is germane to the analysis). The third stage elucidates non-serial linear formations. The segmentation of these formations depends on a variety of variables including temporal proximity to a serial unit, the relationship to text structure, metric placement and rhythm, phrasing, and instrumentation. The third stage also establishes the formal design of the work, and detects symmetry transformations at the formal level. The fourth stage identifies significant simultaneities arising from the vertical interactions of linear formations. These include boundary events (that is, the boundary sonorities associated with serial units and/or phrase and section boundaries), internal simultaneities, and pc collections associated with specific measures and sections. The fifth stage explores the transformational relationships among and the generic orientation of the multifarious pc objects, and models these objects and their relationships as local and large-scale networks oriented to the model of generic set-class space.

In addition to prose, graphic illustrations are essential to the explication of the analytic processes and the conclusions drawn from analysis for each of the works considered herein. A reductive-analytic approach to the complex musical surfaces of these works is a necessary step towards the formation of theories of pitch structure. The analyses of these works and their concomitant reductive-analytic graphs are not

¹¹⁶ Lester, *Analytic Approaches*, 191, 203. *Precompositional* potential is analogous to Lester's concept of *precompositional factors*, which "are those [factors] that are always true based on the construction of a series and relationships between series-forms. When placed in prominent positions, precompositional relations become factors in a composition."

comprehensive. The reductive-analytic technique varies for each work, or sections of a work, according to the level of detail necessary to make clear the kinds of transformational gestures and generic relationships that are most germane towards establishing a theory of pitch structure for that work.

The majority of graphic materials are in the form of pitch reductions that eliminate performance parameters such as rhythm, dynamics, and articulations. Nonetheless, the pitches that appear in these reductions generally reflect the actual pitches and their relative registral and temporal positions as they appear in the score so that the reader can readily grasp the relationship of the reductions to the score (see, for example, example 2.4). The reductive-analytic graphs in this dissertation employ stems, beams, slurs, lines, brackets, boxes, and ovals, using these devices to illustrate segmentations, and creating other kinds of enclosures that group pitch-class elements into larger objects, or to point up large-scale associations among these objects (see, for example, example 2.15). The use of stems, beams, and slurs in the analytic graphs that follow is not intended to invoke the Schenkerian analytic technique and the “baggage” of tonal theory that comes with it.

Stem-and-beam systems accompanied by a serial-unit label and a pcseg (pc integers within angled brackets) enclose serial formations; stem-and-beam systems, slurs or other styles of enclosures accompanied by a set-class label and a pcseg or a pcset enclose non-serial formations. In many cases, the graphs approximate durations (indicated by ties) and indicate repetitions of pitches as they appear in the score in order to illustrate the participation of a pitch class in a simultaneity or in a succession of local events. Horizontal brackets positioned under or over the staves refer *only* to the pitch-classes that appear directly above or under, respectively (for examples of under-the-staff brackets, see examples 2.3, 2.4, 2.17 and 2.18). The details pertaining to the reductive analysis of each work are forthcoming in the analytical chapters.

The Transformational System and the Transformational Network

The transformational system simply represents the totality of transformational processes discussed above: symmetry transformations and mappings (including linear-vertical transformations, stretchings, shrinkings, and substitutions), combinational processes, and the NE-transform. The term *system* implies that all of the transformational

processes can be grouped together in the non-mathematical sense of a group, and that these processes can interact with one another (for example, “glide-reflection symmetry”). Determining which transformation or transformations establish close relationships among musical objects is the same as discovering the transformation or transformations that act upon a musical object that in turn produces images of that object. Thus, modeling relationships among specific pc objects does not need to engage the entire apparatus of the transformational system.

The transformational system and the model of generic set-class space interact throughout the course of analysis. The model does not exclude the possibility of referential collections other than those that represent the three genera; rather, this set-class space introduces a hierarchy among the plethora of genera that can exist in the universe of twelve pitch classes. Thus, the analytical status of pc objects is biased towards those objects that show affinity with one or more of the three genera. In turn, the qualitative assessment of pc objects in terms of genus has the potential to reveal the dynamic nature of the pitch environments in which serial and non-serial formations interact.

Ideally, almost any pc object could be drawn into a transformational relationship with any other pc object, irrespective of cardinality, order relationships, and so forth. If, however, several transformational steps are required to establish a relationship between two pc objects, the explanation of that relationship loses credibility, whereas an explanation that requires as few as possible transformational steps in order to establish a relationship between two pc objects carries more analytical conviction. The analytical stance taken in this study allows the differences between pc objects to be as significant as similarities. Similarities and differences among pc objects create tensions (conflicts) at the musical surface. Some of these conflicts resolve analytically by filtering pc objects through the transformational system and then arranging the results into networks.

The *transformational network* is introduced by David Lewin in his seminal work *Generalized Musical Intervals and Transformations*.¹¹⁷ A transformational network is a graphic and prose-based representation of the transformations that act upon musical

¹¹⁷ Lewin, *Generalized Musical Intervals and Transformations*.

objects and draws those objects into relationship. John Clough explains the essence of Lewin's work:

[A] *transformation network* (which includes a *transformation graph*) has a set of musical objects related to one another by means of the semigroup (which may or may not be a group), but here the members of the semigroup—the transformations—are conceived as *acting upon* the musical objects rather than *spanning among* them . . . The transformation network includes chains of transformations connected in various ways and articulated by the objects that result from actions of particular transformations on particular objects . . .¹¹⁸

The graphic aspect of a transformational network—the *transformational graph*—can be realized in any number of ways. Joseph Straus, following Lewin, describes a simple method of representing a network:

We can represent these transpositional [transformational] relationships using a combination of *nodes* (circles that contain some musical element, such as a note or a set) and *arrows* (to show the operation that connects the nodes).¹¹⁹

Transformational networks and their concomitant graphs are represented in a number of ways in the present study. Many of the reductive-analytic graphs infer large-scale networks that trace the transformations of serial units with respect to the prime ordering of the series (P_0) through the labels assigned to each of these units. In other cases, transformational networks are described in prose with reference to a specific instance of illustrative material such as a reductive graph, a figure, or a table (for example, see figure 2.1 and tables 2.1 and 2.2). Irrespective of modes of presentation, the underlying analytic motivation remains consistent throughout this dissertation: that is, to investigate the interaction of serial and non-serial formations in each of the works addressed in the following analytical chapters and to develop theories of pitch structure for these works.

¹¹⁸ John Clough, review of *Generalized Musical Intervals and Transformations*, by David Lewin, *Music Theory Spectrum* 11 (1989): 227.

¹¹⁹ Straus, *Post-Tonal Theory*, 38-39.

CONCLUSION: COMPOSITIONAL INTENTION AND ANALYTICAL OBJECTIVE

A composer relies on several models when engaged in the process of creation. With respect to Stravinsky's early serial works, one model derives from classical serialism; other models derive from Stravinsky's usage of diatonic, chromatic, and octatonic resources in his pre-1951 repertoire. By incorporating serial techniques into compositional environments that include other types of pitch organization, Stravinsky demonstrates that serial technique is only one of many techniques available to him. Stravinsky's idiosyncratic approach to serialism is a reflection of his interpretation of the technique and how he might employ it to complement his artistic vision without compromising his aesthetic values.

The object of determining close and remote transformational relationships among pc objects is to explore how Stravinsky exploits the precompositional potential of the series, and how he achieves compositional coherence through literal and abstract representations of significant pc objects. Generally, the types and complexities of transformational relationships among pc objects within a single work do not reduce analytically to a single principle. This point is crucial, as is its explanation: this is the crisis caused by the interaction of serial versus non-serial formations. The analytical conflict that exists between serial and non-serial formations, the hallmark of Stravinsky's early serial works, is resolved in the present study through the mechanisms of transformational analysis and the model of generic set-class space.

CHAPTER THREE

THE “SERIAL INTERLUDES” IN *ORPHEUS*

INTRODUCTION

Orpheus (*Orphée*) was commissioned in 1947 by Lincoln Kirstein, who represented the Ballet Society for the New York City Ballet Company, and was completed September 23, 1947.¹ The premiere, performed by the Ballet Society of New York, took place on April 28, 1948 under the direction of Stravinsky; George Balanchine choreographed the original performance. *Orpheus*, in three scenes, is scored for orchestra: piccolo, 2 flutes, 2 oboes (1 doubling English horn), 2 Bb clarinets, 2 bassoons; 4 horns (in F), 2 Bb trumpets, 2 tenor trombones (1 doubling bass trombone); timpani, harp; string orchestra (quintet).²

The corpus of literature pertaining to Stravinsky's early serial period identifies “Ricercar II” from the *Cantata* (1952) as Stravinsky's first serial composition (see Chapter 1). Merton Shatzkin, however, successfully challenges this view by demonstrating that the first and third interludes of *Orpheus* display serial formations, all of which are transformations of the same series.³ Because these “serial interludes”

¹ Eric Walter White, *Stravinsky: The Composer and his Works*, 2d ed. (London and Boston: Faber and Faber, 1979), 440.

² Igor Stravinsky, *Orpheus* (New York: Boosey and Hawkes Music Publishers Limited, 1948), i.

³ Shatzkin, “A Pre-Cantata Serialism in Stravinsky”: 140-41; van den Toorn, *Stravinsky*, 305-17, 311. Shatzkin calls Interlude 3 “the second interlude.” Van den Toorn provides an analysis of the ballet in terms of his octatonic-diatonic model. He briefly mentions the first interlude (at R41), but does not recognize the serial formations. Rather, he posits that the interlude begins with the “solemn, fuguelike [sic] exposition” of an octatonic “subject” Bb-Db-E-C-Bb, which is imitated a “fourth” below in terms of F-Ab-B-G-F: this ‘entrance’ is followed at No. 43 [R43] by a return of the original . . . statement.”

represent the first clear instances of serialism in Stravinsky's compositions, their analysis is germane to the present study.⁴

Although *Orpheus* is purely instrumental, it is a program work; the underlying story shapes this work as does text in the works considered in the remaining analytical chapters.⁵ There are three interludes in *Orpheus*, two of which are the subjects of the present study. The first interlude, hereinafter called Interlude 1, R41 - R46, separates the first and second scenes.⁶ This accompanies the moment where "Angel and Orpheus reappear in the gloom of Tartarus."⁷ The second interlude (Interlude 2, R89) separates the first and second "Air de danse" in scene II. Here, the "tormented souls in Tartarus stretch out their fettered arms towards Orpheus, and implore him to continue his song of consolation."⁸ The third interlude (Interlude 3, R122 - R124) separates the "Pas-de-deux" (pp.39f, R101f) and the "Pas d'action" that concludes Scene 2 (pp.47f, R125f). A set change takes place during Interlude 3: "Veiled curtain, behind which the decor [sic] of the first scene is placed."⁹

Shatzkin notes that serialism is only one method of linear organization employed in the interludes, but he does not describe the other, non-serial formations or their interactions with the serial formations. The purpose of the present study, therefore, is to formulate a theory of pitch structure that explicates the interactions of serial and non-serial formations in these movements, and draws these disparate pc objects into a single, analytical model. Before these objectives undergo further refinement below, the path of investigation taken by the present study begins by exploring the precompositional potential of the series in order to determine the transformational processes that effect

⁴ The reader is reminded that Chapter 1 discusses the views held by some that instances of serialism appear even earlier in Stravinsky's music.

⁵ Shatzkin, "A Pre-Cantata Serialism": 140. Shatzkin makes this point: "The two serial interludes are interrelated programmatically—they each occur at turning points in the plot (each precedes an encounter by the protagonist with hostile, violent forces)—and in style and content. Thus they stand out somewhat in relief to the rest of the score."

⁶ Stravinsky, *Orpheus*, 17-18. "R" is the abbreviation for *rehearsal number*.

⁷ Ibid., 17, R43.

⁸ Ibid., 34, R89.

⁹ Ibid., 45-46.

analytical cohesion among the elements of the series as well as among serial units, and to identify the relationship of the series to the model of generic set-class space.

THE SERIES: GENERIC TRANSFORMATION AS AN ASPECT OF COMPOSITIONAL DESIGN

The prime ordering of the series, $P_0 \langle t140t7809t \rangle$, is first articulated at the beginning of Interlude 1 at R41.¹⁰ P_0 consists of ten ordered elements and seven unique pcs drawn from the pcset 7-16 {789t014}—pc0 occurs twice and pc10 (t) occurs three times. Set-class 7-16 is non-generic with respect to the diatonic, chromatic, and octatonic genera since, but through the operation of near-equivalency mapping, 7-16 is both *near-octatonic* and *near-chromatic*. That is, sc 7-16 is a transformation of the octatonic heptachord 7-31 (the only seven-element subset-class of 8-28) and a transformation of the chromatic heptachord 7-1. Specifically, pcset 7-16 {789t014} is NE to 7-31 {79t0134} through the intersection of 6-27 {79t014} and pcset 7-16 {789t014} is NE to 7-1 {789te01} through the intersection of 6-z3 {789t01}. Set-class 6-27 is exclusive to the octatonic genus, while sc 6-z3 is exclusive to the chromatic genus. The octatonic hexachord 6-27 {79t014} is NE (Rp) to the chromatic hexachord 6-z3 {789t01} through the intersection of the octatonic pentachord 5-10 {79t01}.¹¹

The relations just described indicate that the design of the series suggests successive transformations of pcsegs that have strong affiliations with the octatonic genus to pcsegs that have strong affiliations with the chromatic genus. Example 3.1 illustrates the series, P_0 , as a succession of pcs and the tetrachordal and pentachordal scs and pcsegs derived from the process of segmentation through imbrication.¹² Table 3.1 summarizes the generic affiliation of the tetrachordal pcsegs discovered through imbrication. As illustrated in example 3.1 and table 3.1, each successive imbricated tetrachord is an NE (Rp) partner of its neighbor. The first tetrachord, 4-12 {t014}, holds membership in both

¹⁰ Stravinsky, *Orpheus*, 17.

¹¹ See Chapter 2, tables 2.3 and 2.4, and “A Model of Set-Class Space: Generic and Non-Generic Set-Classes.”

¹² Ordered elements of the series have been reduced to pcs (i.e., they do not reflect register nor p-ints).

the octatonic and chromatic genera. Since the PCIS of 4-12 <2-1-3> displays the characteristic interval succession of the octatonic genus (that is, <2-1-(2+1)>), its strongest association is with the octatonic genus.¹³ The second tetrachord, 4-27 {47t0}, is a subset of 8-28 and 7-35, thus it is inter-generic octatonic-diatonic. The third tetrachord, 4-11 {78t0}, is inter-generic diatonic-chromatic—it is a subset of 7-35 and 7-1. The fourth and fifth tetrachords, 4-4 {7890} and 4-2 {89t0}, respectively, are exclusive to the chromatic genus—their transformation is intra-generic. Thus, the process of NE transformation that effects localized sc transformations within the series also effects large-scale inter-generic transformation of serial psegments from the octatonic genus to the chromatic genus through the diatonic genus.

Example 3.1. *Orpheus*: Pcsegs derived from the series (P₀)

Order position: 1 2 3 4 5 6 7 8 9 10

Palindrome: t 0 t 0 t

axis

4-12 {t014} 5-2 {789t0}

The inter-generic transformation of the serial pcsegs from the octatonic to the chromatic genus is expressed through the imbrication by pentachord of the series shown below the staff in example 3.1. The pcset 5-31 {7t104}, an octatonic pentachord formed by order positions 1-6, shares pcset 3-7 {7t0}—order positions 4-6—with the chromatic

¹³ The reader is reminded that hyphens are used herein to separate the elements of an interval succession (ICS, PCIS, or SIA) in order to differentiate interval successions from pcsegs since both are contained within angled brackets.

pcset 5-2 {789t0}, order positions 4-10. Note that sc 5-31 is the abstract complement of the octatonic heptachord 7-31.

Table 3.1. *Orpheus*: Ordered generic transformations of imbricated tetrachords in P_0

ORDER POSITION	PCSEG	SET CLASS	PCSET	∈ CYNOSURE	GENERA
1,2,3,4	<t140>	4-12	{t014}	8-28/7-1	octatonic/chromatic
3,4,5,6	<40t7>	4-27	{7t04}	8-28, 7-35	octatonic/diatonic
5,6,7,8	<t780>	4-11	{78t0}	7-35/7-1	diatonic/chromatic
6,7,8,9	<7809>	4-4	{7890}	7-1	chromatic
7,8,9,10	<809t>	4-2	{89t0}	7-1	chromatic

Example 3.1 also shows a five-element palindrome formed by the recurring pcs of the series and the scs and pcsets derived from the partitioning of the series based on the position of the axis (the midpoint of the palindrome). A palindrome formed by the recurring pcs of the series further establishes the inter-generic transformation of the series (example 3.1). In P_0 , the recurring pcs, which are found at order positions (o.p.) 1, 4, 5, and 10, form into the palindromic sub-pcseg <t0t0t> (axis pc10 at o.p.5), which frames the octatonic pcset 4-12 {t014} and the chromatic pcset 5-2 {789t0}. As will become evident in the subsequent analytical chapters, symmetry is an important element of serial design in the other works considered in the present study.

The P and I forms of the series and their concomitant pcsets are given in table 3.2. The P and I forms that share the same labeling integer are similar in many respects: the pcs that fall on order positions 1, 3, 5, and 10 are invariant; their concomitant pcsets are NE (Rp). As the ensuing analyses will show, this property of partial invariance among the *ordered* pcs of the P and I pairs that share the same labeling integer is not exploited by the composer in these movements. The NE property associated with the pitch-class collections derived from P and I pairs, however, establishes relationships among serial and non-serial formations.

Stravinsky employs a limited number of P forms (transpositions) of the series in this work, and there are no literal retrograde or inverted expressions of the series—this is

consistent with Shatzkin's observations.¹⁴ The analytical methods used herein, however, reveal many subtle references to I forms as well as to other P forms. In addition, the inter-generic expressions characteristic of the series are manifested globally through the interactions of the multifarious constituent linear formations. As we will see, the conclusions drawn from the following analyses represent a marked departure from those made by Shatzkin.

Table 3.2. *Orpheus*: P and I forms of the series and their concomitant pcsets

P FORM	PCSEG	PCSET (7-16)	I FORM	PCSEG	PCSET (7-16)
0	<t 1 4 0 t 7 8 0 9 t>	{789t014}	0	<t 7 4 8 t 1 0 8 e t>	{78te014}
1	<e 2 5 1 e 8 9 1 t e>	{89te125}	1	<e 8 5 9 e 2 1 9 0 e>	{89e0125}
2	<0 3 6 2 0 9 t 2 e 0>	{9te0236}	2	<0 9 6 t 0 3 2 t 1 0>	{9t01236}
3	<1 4 7 3 1 t e 3 0 1>	{te01347}	3	<1 t 7 e 1 4 3 e 2 1>	{te12347}
4	<2 5 8 4 2 e 0 4 1 2>	{e012458}	4	<2 e 8 0 2 5 4 0 3 2>	{e023458}
5	<3 6 9 5 3 0 1 5 2 3>	{0123569}	5	<3 0 9 1 3 6 5 1 4 3>	{0134569}
6	<4 7 t 6 4 1 2 6 3 4>	{123467t}	6	<4 1 t 2 4 7 6 2 5 4>	{124567t}
7	<5 8 e 7 5 2 3 7 4 5>	{234578e}	7	<5 2 e 3 5 8 7 3 6 5>	{235678e}
8	<6 9 0 8 6 3 4 8 5 6>	{3456890}	8	<6 3 0 4 6 9 8 4 7 6>	{3467890}
9	<7 t 1 9 7 4 5 9 6 7>	{45679t1}	9	<7 4 1 5 7 t 9 5 8 7>	{45789t1}
10	<8 e 2 t 8 5 6 t 7 8>	{5678te2}	10	<8 5 2 6 8 e t 6 9 8>	{5689te2}
11	<9 0 3 e 9 6 7 e 8 9>	{6789e03}	11	<9 6 3 7 9 0 e 7 t 9>	{679te03}

ANALYTICAL OBJECTIVE AND THE ANALYTICAL GRAPHS

The objective of the present study is to construct an image of the unique post-tonal environment of the "serial" interludes in which serial and non-serial formations participate in a continuous analytical model. The series has a thematic function in these movements, yet the organization of the musical surfaces partially obfuscates their articulation since serial technique is not the predominant compositional technique. Thus,

¹⁴ Shatzkin, "A Pre-Cantata Serialism": 141-42.

the present study engages the apparatus of transformational analysis in order to investigate the relationship of these compositionally discontinuous pc objects to sc 7-16 (the set class that represents the series), and explores the role genera plays in shaping relationships among the constituent linear formations of Interludes 1 and 3.

In this approach, serial formations are shown in relationship to the other, disparate linear formations that participate in the contrapuntal texture of these movements so that the compositional discontinuity expressed at or near the musical surface is reduced at a deeper structural level. The analytical dichotomy of serial and non-serial formations is partly resolved by allowing non-serial formations that share pcs with serial formations to have equal analytic status with serial formations. This, in turn, indicates yet another discontinuity expressed by the polarization of serial and related non-serial formations, and formations that do not share pc content with serial formations. As will become clear, this polarization reveals the generic interaction that contributes to the distinctive compositional environment of these movements. Once aligned to the model of generic set-class space, the various formations that seem to compete with one another for structural status become the expressive elements of a dynamic compositional model abstractly represented herein as a transformational network in which pc objects are drawn into fluid relationships effected through transformational processes.

The graphic analyses of Interludes 1 and 3 that follow (see examples 3.2 and 3.3) are pitch-class reductions of the score in which every pitch is represented.¹⁵ Ties are used to approximate duration when it is necessary to show that certain pitches continue to participate in the vertical texture beyond their attack point. The rehearsal numbers provided in the score are reproduced for each example. Measure numbers and letters representing sectional divisions are provided for each example (these do not appear in the score). Measures are numbered from the beginning of each movement and bar lines are indicated by “ticks” (i.e., short vertical lines on each staff).

The segmentation strategy employed in the analytical graphs attempts to elucidate three general types of linear formations:

¹⁵ See also Chapter 2 (“Methodology”).

- (1) Serial formations (i.e., instances of ordered mappings and distortions of serial units);
- (2) Non-serial formations that share pitch-class content with a specific serial unit (inclusion related, such as subsets or Rp-related sets);
- (3) Non-serial formations that may or may not express transformational relationships with the series.

The process of segmentation begins with the discovery of serial units and non-serial formations that share pc content with the pcsets derived from serial units. The segmentation of the remaining non-serial formations is primarily determined by exclusion (they do not belong to the other types of formations). In all cases, segmentation considers timbre to be an important cohesive force in the definition and elucidation of serial and non-serial formations in addition to other articulative gestures such as metric placement (segments usually originate at the beginning of a measure) and duration. Additional or alternate segmentations illustrate the intensified presence of a particular pcset, sc or sc group associated with a particular genus, or point up relationships between small non-serial pcsegs and serial units.

In order to organize the multiple staves of the score into meaningful reductions in examples 3.2 and 3.3, serial units are shown in the upper staff group and non-serial linear formations are shown in the lower staff group (the upper staff group of example 3.3 has one staff). This style of presentation clarifies the thematic role of the serial formations by placing them in a score position analogous to the “structural soprano.” The order of staves for non-serial formations reflects, in a general way, the order of staves in score form and the registers in which the various instruments operate. Although the method used herein often entails registral distortions of the various instrumental lines, the reduction process attempts to preserve contour (in p-space) and, whenever possible, the actual register in which formations unfold. For reasons of convenience, the reduction in example 3.2 is notated entirely in the treble clef. In example 3.3, the ‘cello and double bass lines are notated in the bass clef at the pitch level where they are actually voiced (mm. 2-10) following their participation in the presentation of P₂ (m.1).

The instruments that perform each linear formation are indicated at the beginning of each segment. Every segment is enclosed by a stem-and-beam system (except for the

linear formations in Interlude 1, mm. 30-34), and labeled with either a serial-unit label or a set-class label and a pcseg representing the enclosed segment (in angled brackets), which are enclosed in boxes. Stems are placed at the attack points of each boundary pc. Broken-line boxes, accompanied by labels, enclose elements that effect distortions of serial units (internal repetitions and interpolations), and enclose the small-scale linear formations that constitute the appendices to P_0 in example 3.3. Slurs are also used to enclose small-scale linear formations that need further illustrative clarity given the visual clutter that arises from this method of graphing.

When appropriate, additional labels and symbols are used in conjunction with the basic method of labeling linear formations. Labels such as “Stretched” or “Stretched with multiple distortions” indicate that the linear formation is distorted from the analytical model from which it derives its serial label. In these instances, the serial unit maps *into* the distorted formation. Square brackets “[]” enclosing pcs within the pcsegs derived from a serial formation denotes interpolation or repetition of elements; a pc in parenthesis “()” denotes a pc that belongs to that serial unit but is not actually expressed in the linear formation derived from the score. A special label, “appendix,” refers to brief linear formations that are attached to the end of serial formations. These formations are continuous with the serial formation to which they are appended through similar timbre and invariant ordered or unordered pc content. Moreover, as can be gleaned from examples 3.2 and 3.3, an appendix functions to establish a connection from the preceding serial formation to a simultaneously unfolding non-serial formation through invariance and simultaneity. If a pcset derived from a non-serial formation shares pc content with a serial unit, a symbol is added beside or below the primary label to indicate the specific relationship. The following symbols are used to represent such relationships (from examples 3.2 and 3.3):

“ss {I ₄ }”	— a subset of the pcset derived from I ₄
“ss {P ₀ }/{I ₈ }”	— a subset of both {P ₀ } and {I ₈ }
“NE {I ₇ }”	— NE (Rp) to {I ₇ }
“NE {P ₁₀ }/{I ₅ }”	— NE (Rp) to both {P ₁₀ } and {I ₅ }
“= {I ₉ }”	— complete pc equivalency to {I ₉ }

The vertical adjacencies considered herein result from the momentary coincidence of the boundary pcs of the segments with the vertically aligned pcs found in simultaneous linear formations. These vertical adjacencies are shown below the staff systems in examples 3.2 and 3.3 by brackets and labels indicating the sc and pcset derived from the vertical combination of pitches. If a pcset derived from a vertical adjacency shares pc content with a serial unit, a symbol is added below the primary label to indicate the specific relationship. The vertical adjacencies shown in the graphs represent “snapshots” of the interacting lines; that is, glimpses of the simultaneities that form as a result of linear interactions. As will become evident in the ensuing analyses, these “snapshots” reveal that sonority is more than a mere by-product of linear interaction.

INTERLUDE 1

As shown in example 3.2, the selection and deployment of serial units P_0 and P_7 , and the progressive increase in density effected through additional linear formations in Interlude 1 suggest divisions that form the basis of a large binary form.¹⁶ There are two main sections, A and A' (mm. 1-12 and 13-29, respectively), each of which consists of two subsections ($a, b; a', b'$) followed by a codetta (mm. 30-34). Table 3.3 summarizes the relationships of these formal divisions to the serial units depicted in the upper staff group of example 3.2.

Table 3.3. *Orpheus*, Interlude 1: Formal plan

SECTION	A		A'		Codetta
SUBSECTION	a	b	a'	b'	—
MEASURES	1-4	5-12	13-18	19-29	30-34
SERIAL UNITS	P_0	P_7	P_0	P_7/P_6	5-16: Abstract complement of sc 7-16 and pcset derived from $\{I_{10}\}$

¹⁶ Stravinsky, *Orpheus*, 17-18. Interlude 1 begins at R41 and concludes one measure before R47; it comprises thirty-four measures.

The musical score is divided into two main sections: Serial Formations and Non-Serial Formations. The Serial Formations section includes staves for String Quintet, Tpt. I, Tbn. I, Vn. II, Vn. II, Vla., Vc., D.B., and Tbn. I, Vn. I. The Non-Serial Formations section includes staves for Vn. II, Vla., Vc., D.B., Vn. I (Tbn. I), and Vn. I. The score is marked with various musical notations, including notes, rests, and dynamic markings. It also includes a section for Hn. 2, 4 and Hn. 1, 3, and a section for Vc., D.B. The score is labeled with 'A' and 'A'' and includes a 'Codetta' section. The score is marked with various musical notations, including notes, rests, and dynamic markings. It also includes a section for Hn. 2, 4 and Hn. 1, 3, and a section for Vc., D.B. The score is labeled with 'A' and 'A'' and includes a 'Codetta' section.

Serial Formations and Serial Distortions in Interlude 1

The pcsegs representing the series P_0 and its canonical transformations listed above in table 3.2 provide analytic models that establish the basis for the explication of the processes of distortion that effect diversity among the serial formations in this movement. Of the six serial formations shown in example 3.2, the two presentations of P_0 and the third presentation of P_7 do not express distortions—their relationship to the serial model is clear.

The exposition of the series P_0 by the string quintet in subsection *a* (mm. 1-4) is shown in example 3.2 as a single, cohesive structure enclosed by the stem and beam system. In the score, P_0 is distributed over several registers in a dramatic descending gesture comprising a succession of contiguous, interlocking segments. Notice that the fragmentation and timbral reinforcement of order positions (o.p.) 1-3 in m.1 (Vn.I, II; Vla.) highlights the initial octatonic character of the series through the expression of pcset 3-10 <t14>, a primary trichord of the octatonic genus and the abstract complement of the characteristic nonachord of the octatonic genus, sc 9-10 (the significance of this point will become clear). In the score and in example 3.2, the articulation of P_0 and P_7 is no less cohesive (mm. 13-17 and 25-29, respectively). Each of these formations is expressed as a contiguous, uninterrupted unfolding of a serial unit that derives part of its integrity through timbre, as do the other linear serial and non-serial formations identified through analysis in the present study.

The three remaining serial formations entail significant distortions of the serial units upon which they are modeled. Each of these distortions instantiates *stretching*—that is, a distortion of a serial unit brought about through the insertion of additional materials (repetition of ordered elements or interpolations). The process of stretching does not alter the order of elements in a serial unit, but it does interrupt the continuity of their unfolding. Thus, for a linear formation to have an identity as a serial unit, the elements of

that serial unit must be able to map *into* the ordered succession of elements of the linear formation.¹⁷

The “stretched” P₇ formation in mm. 5-10 is a distortion of P₇ that results from the interruption of its contiguous unfolding by the repetition of o.p.1-5, forming pcset 4-12 {578e}. The brief linear formation identified as “appendix” 3-2 <578> is derived from P₇ and simultaneously reinforces pcs expressed in the viola 7-35 formation (m.11). The second appearance of P₇ in mm. 19-23 entails multiple distortions, including stretching—effected by the interpolations between o.p.7 and 8, and o.p.8-10—and an order omission—o.p.9 (pc4) is missing. The appendix associated with this formation contains elements of P₇ and reinforces pcs expressed in the Vc./D.B. 4-11 formation (m.24). The P₆ formation that unfolds simultaneously with the P₇ formations (mm. 19f) is distorted through the extensive interpolation of pcseg <2321273>, which derives its pc content from {P₆}: that is, pcset 4-5 {1237} is a subset of {P₆}. The final element of P₆ (pc4) occurs in m.29.

Non-Serial Formations and Their Relationship to Serial Units in Interlude 1

The diversity in the designs of the non-serial formations discovered through analysis evidences the marked compositional discontinuities that appear at the musical surface. Once the primacy of the order relations defined by the series is relegated to a lesser analytical status, however, these apparent discontinuities coalesce into a rich microcosm of transformational relationships. This type of analytic activity is not intended to diminish the expressive power that the composer achieves through the juxtaposition of these disparate linear formations. Rather, this path of analysis is intended to discover the cohesive compositional environment in which these different linear types interact.

Table 3.4 lists the multifarious serial and non-serial linear formations that are identified as segments in example 3.2, and points up their relationship to the series, P₀.

¹⁷ See Chapter 2 (“Symmetry Transformations and Mappings as Music Theoretic Processes: Stretching, Shrinking, and Substitution”).

Each segment is listed in table according to the section in which it occurs, and is identified by its performing forces and respective serial label or sc label—concomitant pcsegs are represented as pcsets. The fourth column of table 3.4 notes the transformational pathways that establish the relationship of each linear formation to the series. The final column indicates additional information such as M and NE partnerships and inclusion relations among large generic pcsets.

Table 3.4. *Orpheus*, Interlude 1: Linear formation and their relationship to the series

SECTION	INSTRUMENT(S)	LABEL/PCSET	RELATION TO P_0	COMMENT
$A—a$	Strings	P_0 {789t014}	Identity	Exposition
$A—b$	Tpt.I, Tbn.I, Vn.II	P_7 {234578e}	T_7	
	Vn.II	4-11 {2357}	ss { P_7 }	
	Vla.	4-2 {0234}	ss { I_4 }	
	Vla.	7-35 {23578t0}	Contains 5-z12 {23578} = ss { P_7 } / { I_7 }	M-partner of 7-1
	Vc., D.B. Spans sections b and a'	7-35 {013568t}	Contains 5-z12 {01356} = ss { P_5 } / { I_5 }	M-partner of 7-1
$A'—a'$	Tbn.I, Vn.I	P_0 {789t014}	Identity	
	Vn.II	7-1 {789te01}	NE { P_0 } / { I_0 } Contains pcseg 5-2 {89te1} = ss { P_1 }	M-partner of 7-35
	Vla.	7-1 {456789t}	NE { P_9 } / { I_9 }	M-partner of 7-35
	Vc., D.B.	7-2 {56789t0}	NE 7-1 {456789t} Vn.II	
	Vn.I (Tbn.I) Spans sections a' and b'	4-2 {5789}	ss { I_9 }	
	Ob., E.H.	P_7 {234578e}	T_7	
$A'—b'$	Vc., D.B.	P_6 {123467t}	T_6	
	Vn.II	6-1 {56789t}	Contains pcseg 4-1 {789t} = ss { P_0 }	ss 7-1 {456789t} and ss 7-2 {56789t0}
	Vla.	7-2 {8te0123}	Contains pcsegs: 4-z29 {8023} = ss { I_4 } 5-2 {te013} = ss { P_3 }	NE 7-1
	Vn.I	4-11 {2357}	ss { P_7 }	= Vn.II, section $A—b$
	Vn.I	4-12 {578e}	ss { P_7 } / { I_7 }	
<i>Codetta</i>	Vc., D.B.; Hn.1,2,3,4	5-16 {25689}	Abstract complement of 7-16 and ss { I_{10} }	

The inclusion relations enumerated in table 3.4 establish crucial links between serial formations and large and small non-serial formations. Non-serial formations that yield set-classes 4-12, 4-11, 4-2, and 5-2 hold close transformational relationships with the series since these set classes are expressed by the serial pcsegs at o.p.1-5 (sc 4-12), o.p.4-8 (sc 4-11), o.p.7-10 (sc 4-2) and o.p.6-10 (sc 5-2)—see example 3.1. Irrespective of its cardinality, each pcset derived from a non-serial segment is inclusion-related to one or two serial units, either a P/I pair, or a single I unit. The association with I forms is particularly significant, since inverted forms of the series are not expressed in Interlude 1 (or Interlude 3). Rather, I forms are abstractly represented by pcsegs that are permutations of subsets derived from the pcsets associated with specific I forms. Moreover, several of these non-serial formations evince specific generic characteristics. Thus, the transformational processes of combination and mappings that effect abstract relations among the diverse linear formations to the series also establish transformational pathways that link the non-generic set class expressed by the series, sc 7-16, directly to the octatonic and chromatic genera, and indirectly to diatonic genus. These generic interconnections reflect the inherent pan-generic quality of the serial design that is expressed through the succession of imbricated pcsegs derived through the analysis of P_0 (example 3.1).

Among the large segments of Interlude 1, the chromatic 7-1 formations hold a strong relationship with the series since sc 7-1 is an NE partner of sc 7-16—they share sc 6-z3. The Vn.II segment in mm. 13-18, pcset 7-1 {789te01}, shares pcset 6-z3 {789t01} with $\{P_0\}$ and 6-z3 {78te01} with $\{I_0\}$. The viola segment that yields 7-1 {456789t}, which unfolds simultaneously with the Vn.II 7-1 segment, shares 6-z3 {45679t} with $\{P_9\}$ and 6-z3 {45789t} with $\{I_9\}$. The diatonic 7-35 formations, on the other hand, have a relatively indirect relationship to the series since only five of seven pcs are inclusion-related to sc 7-16. The extended segment that yields pcset 7-35 {013568t}, mm. 5-13 (Vc., D.B.), shares the pentachord 5-z12 {01356} with $\{P_5\}$ and $\{I_5\}$.¹⁸ The 7-35

¹⁸ The pc collections of the serial units P_5 and I_5 are NE— $\{P_5\}$ NE $\{I_5\}$. They share subset 6-z28 {013569}.

segment in mm. 11-13 (Vla.) yields pcset {23578t0}, which shares 5-z12 {23578} with {P₇} and {I₇}.¹⁹

The codetta, the section beginning at R46 (mm. 30-34), establishes a direct transformational pathway between the series and the octatonic genus. The codetta expresses a re-articulated sonority comprised mainly of sustained pitches, 3-11 {259} (Hn.1, 3; Vc., D.B.), complemented by an ostinato figure, pcset 2-2 {68} (Hn.2, 4). The codetta does not display serial organization, yet the pcset derived from the interacting linear formations, 5-16 {25689}, is a subset of {I₁₀}, and the abstract complement of 7-16, the sc to which the series itself belongs. Moreover, sc 5-16 is exclusive to the octatonic genus.

INTERLUDE 3

As shown in example 3.3, the selection and deployment of serial units and the progressive increase in density effected through additional non-serial formations suggest formal divisions in Interlude 3, but, unlike Interlude 1, these divisions are not as well defined. The presentations of three serial units—P₂, P₅, and P₀—establish the basis of a three-part form (table 3.6). The segmentation method used herein, however, reveals a non-synchronous relationships between the boundaries of some non-serial formations and the articulating serial units. Thus, the non-serial formations are in a subtle conflict with this formal scheme (compare table 3.6 and example 3.3).

Table 3.5. *Orpheus*, Interlude 3: Formal plan

SECTION	A	B	C	(End of C)
MEASURES	1-2	2-5	5-10	10
ROW-FORMS	P ₂	P ₅	P ₀	Sonority derived from {P ₂ }

¹⁹ The expression of scs 6-z3 and 5-z12 and their important generic connections in these movements forecasts a crucial aspect of the compositional design of *Ricercar II*, the subject of Chapter 4.

Example 3.3. *Orpheus*: Interlude 3, analytical graph

The analytical graph for Example 3.3, *Orpheus*: Interlude 3, is divided into three main sections: A, B, and C. The graph shows musical notation for Serial Formations (Tpt. 1, 2; Tbn. 1; Vc., D.B.) and Non-Serial Formations (Hn. 1, 2; Vn. 1; Tbn. 1; Vc., D.B.).

Section A (Measures 122-123):

- Serial Formations:** Tpt. 1, 2; Tbn. 1; Vc., D.B. Stretched P2 <03620|20|{0|2e0}>. o.p. 4-5 repeated, pct, pc0 interpolated.
- Non-Serial Formations:** Hn. 1, 2; Vn. 1. Stretched P5 <3695|6532|301523>. o.p. 1-4 <3695>. interpolated 4-3 <6532> ss {P5}. o.p. 5-10 <301523>.

Section B (Measures 123-124):

- Serial Formations:** Tpt. 1, 2. Stretched P5 <3695|6532|301523>. o.p. 1-4 <3695>.
- Non-Serial Formations:** Hn. 1, 2; Vn. 1. Stretched P5 <3695|6532|301523>. o.p. 1-4 <3695>.

Section C (Measures 124-125):

- Serial Formations:** Tpt. 1, 2; Tbn. 1; Vc., D.B. Stretched P5 <3695|6532|301523>. o.p. 1-4 <3695>.
- Non-Serial Formations:** Hn. 1, 2; Vn. 1. Stretched P5 <3695|6532|301523>. o.p. 1-4 <3695>.

The graph includes various musical notations such as 'Stretched P2', 'Stretched P5', 'P0', and 'P10'. The graph is divided into sections A, B, and C, with measures 122, 123, and 124 marked. The bottom section shows measures 124 and 125, with various musical notations and annotations.

Serial and Non-Serial Formations in Interlude 3

Of the three serial formations articulated in Interlude 3, the first two—P₂, section *A*, and P₅, section *B*—entail distortions of their serial models effected through the interpolations shown in example 3.3. Similar to the treatment of P₀ in Interlude 1, the final serial formation in section *C* articulates P₀ as a contiguous, uninterrupted linear entity. Unlike Interlude 1, the non-serial linear formations of Interlude 3 shown in example 3.3 often span sectional divisions. The complex of imbricated and subdivided segments applied to the large-scale linear formation reveals how smaller linear formations that evidence clear relationships to serial units though pc invariance are subsumed within the larger, diatonic or near-diatonic formations, which in turn intensifies the presence of the diatonic genus within this pan-generic environment.

Table 3.6 (below) lists the multifarious serial and non-serial linear formations that are identified as segments in example 3.3. Following the format of table 3.4 (above), table 3.6 identifies the relationship of the linear formations to the series, P₀, and points up important details such as generic associations and other inclusion relations.

As illustrated by example 3.3 and table 3.6, the majority of the pcsets derived from the linear formations identified through analysis are inclusion-related to serial units. Moreover, several of these are related to only one serial unit as invariant subsets (the 5-2 pcsets in section *C*, Vc./D.B), as NE (Rp) partners (the 7-11 and 7-24 pcsets in sections *B* and *C*, Vc./D.B and Ob.2/Cl.2, respectively), and through *complete pc equivalency*—that is, the 7-16 formation articulated by Tbn.1 in mm. 3-5 expresses the *complete* pcset of I₉. As we have seen, I forms of the series do not manifest themselves as ordered serial formations, but they do contribute pcs that participate in cohesive linear formations. Irrespective of their P or I relationships, these formations instantiate extreme serial distortions; that is, the transformational processes of permutation, interpolation and omission—processes that have effected distortions in the many of the serial formations identified above—have so radically distorted these formations, serial units cannot map onto or into them.

Table 3.6. *Orpheus*, Interlude 3: Linear formation and their relationship to the series

SECTION	INSTRUMENT(S)	LABEL/PCSET	RELATION TO P_0	COMMENT
A	Tpt.1,2; Vc., D.B.	P_2 {89te125}	T_2	
	Vc., D.B.	4-11 {e024}	ss $\{P_4\}/\{I_4\}$	Reinforces pcs from P_2 formation
	Tbn.1	4-12 {t014}	ss $\{P_3\}/\{I_0\}$	
B	Tpt.1,2	P_5	T_5	
	Vc., D.B.	7-11 {0134568}	NE $\{P_8\}$	NE 7-16; and Participates in 9-9 {te0134568} (mm. 3-5)
	Vc., D.B.	5-23 {8te13}	Inconclusive	Participates in 7-35 {568te13} (mm. 4-6)
	Tbn.1	7-16 {45789t1}	= $\{I_9\}$	Identity to $\{I_9\}$
	Vc., D.B.	5-23 {13568}	Inconclusive	Participates in 7-35 {568te13} (mm. 4-6); and Participates in 9-9 {5678te013} (mm. 5-9)
C	Hn.1,2; Vn.1	P_0	Identity	
	Tpt.1,2	6-z3 {te1234}	ss $\{I_3\}$	
	Tbn.1	3-2 {8te}	ss $\{P_1\}/P_{10}/\{I_0\}/\{I_{10}\}$	
	Ob.1, Cl.1	7-34 {013468t}	Inconclusive	NE 7-35; and Participates in 8-22 {te013468} (mm. 7-9)
	Ob.1, Cl.1	4-1 {tet01}	ss $\{P_3\}/\{I_0\}$	Participates in 8-22 {te013468} (mm. 7-9)
	Ob.2, Cl.2	7-24 {e135678}	NE $\{I_7\}$	NE 7-16 and NE 7-35
	Vc., D.B.	5-2 {te013}	ss $\{P_3\}$	= $\{P_3, o.p.5-10\}$; and Participates in 9-9 {5678te013} (mm. 5-9)
	Vc., D.B.	5-2 {5678t}	ss $\{P_{10}\}$	= $\{P_{10}, o.p.5-10\}$; and Participates in 9-9 {5678te013} (mm. 5-9)
	Cl.1	4-23 {t035}	Inconclusive	Diatonic sc (characteristic tetrad)
	Cl.2	4-22 {2469}	Inconclusive	Diatonic sc (primary tetrad)
	Vn.1	3-11 {36t}	ss $\{P_2\}/P_{11}/\{I_2\}/\{I_{11}\}$	Participates in 9-9 {5678te013} (mm. 5-9)
	Vn.1, Vla. Hn.1,3	3-1 {9te}	ss $\{P_1\}/P_2/\{I_{10}\}/\{I_{11}\}$	"appendix" to P_0 formation; derived from P_2

Table 3.6 indicates there are also several linear formations that do not have a clear transformational link to the series (marked "Inconclusive"). The pcsets derived from these formations all evince diatonic characteristics: according to the model for the diatonic genus, sc 4-23 is a characteristic member, scs 4-22 and 5-23 are primary

members, and sc 7-24 is an NE partner of 7-35.²⁰ In addition to the expressions of large diatonic collections that result from the concatenation of smaller segments that hold relationships with the series, the presence of these diatonic pcsets further evidences the characteristic pan-generic interactions of these movements.

INTERLUDES 1 AND 3: SONORITY AS AN INDICATOR OF LINEAR-VERTICAL TRANSFORMATION AND GENERIC INTERACTION

The vertical adjacencies identified in examples 3.2 and 3.3 by the pcsets shown below the staff systems represent a sampling of the instantaneous vertical interactions among the simultaneously unfolding linear formations of Interludes 1 and 3. While the majority of these pcsets are derived from the simultaneities that coincide with the boundaries of serial formations, some are derived from the simultaneities that coincide with the boundaries of non-serial formations. Once filtered through the apparatus of transformational analysis and subjected to interpretation through the model of generic set-class space, these pcsets reveal important aspects of the underlying compositional design of these movements. Generic interaction, inherent to serial design and expressed globally in these movements by the disparate linear formations identified through analysis, is also expressed by the sonorities that form through their vertical interactions. Moreover, this mode of analysis reveals that these sonorities instantiate linear-vertical transformations (T-LV) of serial units.²¹

Table 3.7 lists the pcsets associated with the vertical adjacencies illustrated in examples 3.2 and 3.3 according to their location in the movements and indicates their transformational relationship to the series and their generic affiliation. All of the pcsets listed, except for 4-14 {1348}, are subsets of pcsets associated with serial units. The trichords belong to several serial pcsets, which tends to trivialize their associations with serial units (e.g., 3-7 {258} belongs to eight serial units). The majority of the tetrachords

²⁰ See Chapter 2 (tables 2.3 and 2.4).

²¹ See Chapter 2, "Symmetry Transformations and Mapping as Music Theoretic Processes: Rotational Symmetry: . . ." The linear-vertical transformation describes, in a general way, the conversion of a line (a pseg, represented by a pcset) into a simultaneity (represented by a pcset).

and 5-16 pentad, however, belong to only one or two serial pcsets, which in turn evidences explicit instances of T-LV transformations among serial units and sonorities.

Table 3.7. *Orpheus*, Interludes 1 and 3: Simultaneities—serial and generic memberships

INTERLUDE 1			
SECTION/MEASURE	SONORITY (SC/PCSET)	LV-T WITH SERIAL UNIT(S)	GENUS
<i>A</i> — <i>b</i> , m.10	3-7 {258}	$P_1/P_4/P_7/P_{10}/I_1/I_4/I_7/I_{10}$	Octatonic/Diatonic/Chromatic
<i>A'</i> — <i>a'</i> , m.13	3-7 {57t}	$P_9/P_{10}/I_6/I_9$	Octatonic/Diatonic/Chromatic
<i>A'</i> — <i>a'</i> , m.15	4-12 {6890}	$P_8/P_{11}/I_8$	Octatonic/Chromatic
<i>A'</i> — <i>a'</i> , m.16	4-19 {0148}	$P_0/P_4/I_0$	NON-GENERIC
<i>A'</i> — <i>a'</i> , m.17	3-3 {69t}	$P_2/P_9/I_2/I_{10}/I_{11}$	Octatonic/Chromatic
<i>A'</i> — <i>b'</i> , m.19	4-z15 {458t}	I_9	Octatonic/Chromatic
<i>A'</i> — <i>b</i> , m.23	4-z29 {5680}	P_8	Octatonic/Diatonic
<i>A'</i> — <i>b</i> , m.25	4-18 {e256}	P_{10}/I_{10}	Octatonic
<i>Codetta</i> , mm. 30-34	5-16 {25689}	I_{10}	Octatonic
INTERLUDE 3			
<i>A</i> , m.2	3-8 {t04}	$P_0/P_3/I_0$	Octatonic/Diatonic/Chromatic
<i>B</i> , m.3	3-5 {056}	$P_5/P_8/I_5$	Octatonic/Diatonic/Chromatic
<i>B</i> , m.5	3-4 {891}	$P_0/P_1/I_1/I_9$	Diatonic/Chromatic
<i>C</i> , m.6	4-14 {1348}	————	Diatonic
<i>C</i> , m.6	4-27 {8t14}	P_0/I_0	Octatonic/Diatonic
<i>C</i> , m.7	3-4 {e34}	$P_3/P_7/I_3/I_4$	Diatonic/Chromatic
<i>C</i> , m.7	4-20 {7803}	P_{11}/I_8	Diatonic
<i>C</i> , m.8	3-7 {8t1}	$P_0/P_1/I_0/I_9$	Octatonic/Diatonic/Chromatic
<i>C</i> , m.8	3-7 {035}	$P_5/P_8/I_4/I_5$	Octatonic/Diatonic/Chromatic
<i>C</i> , m.9	4-8 {9t23}	P_2/I_2	Diatonic/Chromatic
<i>C</i> , m.9	4-18 {347t}	P_6/I_3	Octatonic
<i>C</i> , mm. 9-10	4-11 {9t02}	P_2/I_2	Diatonic/Chromatic

With the exception of pcset 4-19 {0148}, all of the pcsets listed in table 3.7 hold membership in at least one genus—that is, each is a primary member of one or more genera. Of the twenty-one pcsets, fourteen hold membership with the octatonic genus (three are exclusive, five are inter-generic, and the six are pan-generic), thirteen hold

membership with the chromatic genus (seven are inter-generic and six are pan-generic), and twelve hold membership with the diatonic genus (two are exclusive, six are inter-generic, and six are pan-generic). This seems to indicate that no one genus dominates the vertical interactions of the serial and non-serial formations that constitute the musical surface of the interludes. Nonetheless, a closer examination of the scs associated with these sonorities is necessary in order to determine the extent to which each of the three genera is expressed through the vertical interactions of the various linear formations.

Table 3.8 lists all of the scs derived from the pcsets representing the simultaneities listed in table 3.7. Table 3.8 provides the PCIS for each sc, and indicates its membership(s) to each genus through the number of member sets for that sc that occur in the cynosural sc. The results are shown in the last two columns: the second-to-last column indicates the generic, inter-generic, or pan-generic affiliations (*D*, *C*, and *O* denote diatonic, chromatic, and octatonic membership, respectively; *NG* denotes non-generic); the last column indicates the primary generic affiliation. In order to determine the primary generic affiliation, the number of members each genus contains for any one of the scs in addition to the characteristic generic interval successions expressed in the PCIS for each sc are taken into consideration. Thus, the numbers representing generic membership and PCISs that are shown in bold typeface are the factors that decided the primary generic affiliation for each of the scs listed.

Of the sixteen scs listed in table 3.8, nine are shown to be primarily octatonic (scs 3-3, 3-5, 3-8, 4-12, 4-z15, 4-18, 4-27, 4-z29, 5-16), six are primarily diatonic (scs 3-4, 3-7, 4-8, 4-11, 4-14, 4-20), and one is non-generic (sc 4-19). This suggests that the vertical interactions among linear formations are strongly aligned to simultaneities that evince characteristic interval structures inherent to the octatonic and diatonic genera.

Table 3.8. *Orpheus*, Interludes 1 and 3: Simultaneities and generic affiliation

SET-CLASS	PCIS	GENUS/NUMBER OF MEMBER SCS			GENERIC, INTER-GENERIC, PAN-GENERIC	PRIMARY GENERIC AFFILIATION
		<i>Diatonic</i> 7-35	<i>Chromatic</i> 7-1	<i>Octatonic</i> 8-28		
3-3	<1-3>	—	6	8	C-O	Octatonic
3-4	<1-4>	4	4	—	D-C	Diatonic
3-5	<1-5>	2	2	8	D-C-O	Octatonic
3-7	<2-3>	8	2	8	D-C-O	Diatonic
3-8	<2-4>	2	2	8	D-C-O	Octatonic
4-8	<1-4-1>	1	1	—	D-C	Diatonic
4-11	<1-2-2>	4	4	—	D-C	Diatonic
4-12	<2-1-3>	—	2	8	C-O	Octatonic
4-14	<2-1-3>	4	—	—	D	Diatonic
4-z15	<1-3-2>	—	2	8	C-O	Octatonic
4-18	<1-3-3>	—	—	8	O	Octatonic
4-19	<1-3-4>	—	—	—	NG	Non-Generic
4-20	<1-4-3>	2	—	—	D	Diatonic
4-27	<2-3-3>	2	—	8	D-O	Octatonic
4-z29	<1-2-4>	2	—	8	D-O	Octatonic
5-16	<1-2-1-3>	—	—	8	O	Octatonic

CONCLUSION: THE FLUID TRANSFORMATION OF SC 7-16 INTO SERIAL AND NON-SERIAL FORMATIONS

The approach taken to the analysis of the serial interludes of *Orpheus* began with exploring the precompositional potential of the series, P₀. According to the model of generic set-class space, sc 7-16—the sc representing the series—is both near-octatonic and near-chromatic. Moreover, the near-generic property of sc 7-16 is realized through serial processes. Segmentation by imbrication and NE mapping revealed that the series comprises a succession of tetrachordal pcsegs that express inter-generic transformation effected by the progression of scs that are strongly aligned to the octatonic genus, to

inter-generic octatonic-diatonic and diatonic-chromatic scs, to scs that are strongly aligned to the chromatic genus (example 3.1 and table 3.1).

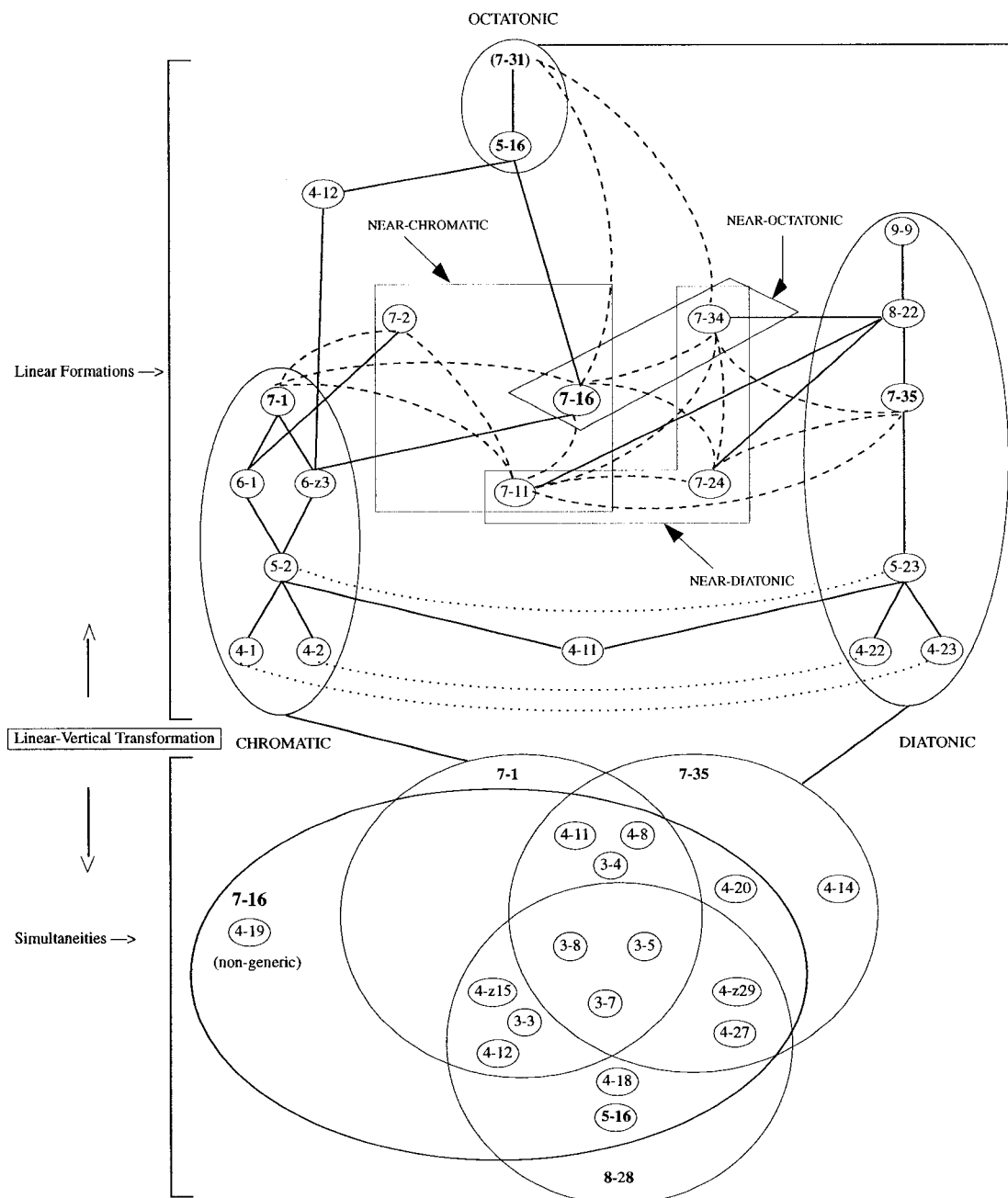
The next stage of analysis entailed segmenting the compositional surface into serial and non-serial formations, and examining some of the vertical adjacencies associated with the boundaries of these segments. As we have seen, serial formations express both canonical and non-canonical transformations of the series, P_0 , the latter resulting in distortions of the serial unit upon which these formations are modeled. Non-serial formations that share pcsets with serial units, then, represent radical distortions of serial units or pcsegs derived from those units—serial units cannot map into or onto them. The sonorities derived from the instantaneous vertical interactions among linear formations yields pcsets that are inclusion-related to pcsets derived from serial units, which indicates a subtle continuity between line and simultaneity effected through the symmetry of the linear-vertical transformation.

While the property of pc invariance reduces the analytic polarization among serial units and non-serial formations that share significant numbers of pcs with serial units, linear formations that do not share significant pc collections with serial units remain compositionally and analytically discontinuous. Moreover, these formations tend to express pcsets that are strongly aligned to the diatonic genus, the genus that is weakly expressed by the series. Thus, in order to create a dynamic image of the compositional environment in which these disparate linear formations interact, the present study proposes a model of pitch structure for Interludes 1 and 3 that emerges from tracing the transformational pathways that link the near-octatonic/near-chromatic sc 7-16, the sc expressed by the series, to the diverse non-serial formations, many of which express strong connections to the diatonic genus.

Figure 3.1 is a transformational network set within the context of generic set-class space that illustrates the fluid transformation of sc 7-16 into the various scs derived from the multifarious linear and vertical formations identified through analysis. Set classes (encircled) are grouped according to their generic affiliation and cardinality. The large ovals shown at the sides and top of figure 3.1 represent generic regions: the ovals positioned at the left and right sides enclose scs that are both primary members of and exclusive to the chromatic and diatonic genera, respectively; the small oval positioned at

the top encloses sc 5-16, the largest primary member of octatonic genus expressed through segmentation. The cynosures of each genus are presented in bold typeface—sc 7-31, representing the octatonic cynosure sc 8-28, is in parentheses because it is not articulated as a cohesive linear formation in these movements.

Figure 3.1. *Orpheus*, Interludes 1 and 3: Transformational network



Straight solid lines indicate inclusion relations, broken curved lines denote NE partnerships (i.e., NE transformation), and dotted lines denote M-partners (i.e., scs that are M-transforms of one another). Thus, every sc shown in figure 3.1 has at least one transformational pathway that links it to the series, and every sc is generically aligned. Notice that scs 4-11 and 4-12 are depicted as being “suspended” between two genera, which is a fitting illustration of their inter-generic memberships.

Set-class 7-16 (in bold typeface) occupies the central position of figure 3.1 relative to the three generic regions, which reflects the pan-generic attribute of the *series*, P_0 . As shown in the graph, sc 7-16 is NE to the octatonic heptad sc 7-31 and the chromatic heptad sc 7-1, but not to the diatonic heptad, sc 7-35—this is a reflection of the inter-generic octatonic-chromatic attribute of sc 7-16, the sc expressed by the series. Notice that sc 7-16 is also inclusion-related to its abstract complement, the octatonic pentad sc 5-16, which strengthens its affiliation with the octatonic genus.

The positions of the remaining non-generic scs are determined on the basis of their NE relationships to the cynosure of each genus in addition to their inclusion-relations with primary or characteristic generic scs, and their NE relationship to sc 7-16. These scs, in turn, define the three *near-generic regions*—near-chromatic, near-diatonic, and near-octatonic—that are enclosed by the polygons arranged about sc 7-16. With the exception of sc 7-2, these non-generic scs belong to more than one near-generic region: scs 7-2, 7-11 and 7-16 define the near-chromatic region; scs 7-16 and 7-34 define the near-octatonic region; and scs 7-11, 7-24, and 7-34 define the near-diatonic region (notice that, in addition to their NE relation to sc 7-35, they are also subset-classes of sc 8-22).

The complex Venn diagram shown in lower part of figure 3.1 illustrates the generic memberships of the scs derived from the simultaneities and their relationship to the series as subset-classes of sc 7-16. Consistent with the observations made above, the sc 7-16 enclosure (the large oval) holds all of these scs except the diatonic sc 4-14. The generic enclosures—that is, the circles labeled by the cynosural scs 7-1, 7-35, and 8-28 in bold typeface—are connected by solid lines to their respective generic region in the upper part of the graph, which symbolizes the generic attenuations of the linear interactions. All of the scs are contained within at least one generic enclosure, with the exception of the non-generic sc 4-19 (shown below the 7-16 label). If the chromatic enclosure were to be

removed, the generic scs would still be contained within one or both of the remaining generic enclosures, which reflects their exclusive or inter-generic membership with the octatonic and diatonic genera. This, in turn, infers that expressions of the chromatic genus in the simultaneities arise from the interactions of the octatonic and diatonic genera.

The transformational model depicted as figure 3.1 captures the essence of the compositional discontinuities of these movements that are expressed at or near the musical surface as well as at deeper structural levels. Once the linear formations were extricated from the serial model, the issue of order relationships became secondary. This analytical approach only partially reduced the dichotomy of serial and non-serial formations since many linear formations express significant *variance* with serial units. In addition, many of these formations are affiliated with the diatonic genus as primary members. As shown in figure 3.1, sc 7-16 is two transformational steps away from sc 7-35, the cynosure of the diatonic genus, and is not inclusion-related to any of the other large scs listed in the diatonic region (i.e., 5-23, 8-22, and 9-9). The relationship of sc 7-16 to linear formations that express chromatic and octatonic characteristics, on the other hand, is more direct—as figure 3.1 shows, sc 7-16 is only one transformational step away from these formations. The intent of the present analytic activity is not to force these compositional discontinuities into analytic resolution. Rather, the purpose here is to create an image of the unique compositional environment that allows these generically disparate, serial and non-serial formations to participate equally as analytically viable, musically coherent structures.

The quasi-symmetrical format of figure 3.1 evokes, in an abstract way, a balanced image of the dynamic interactions of the generically polarized chromatic and diatonic linear formations. The M-related diatonic and chromatic sc pairs 5-2/23, 4-1/23 and 4-2/22 are localized compositional realizations of the symmetry underlying the model of generic set-class space, while the generic regions to which they belong symbolize the global chromatic-diatonic dichotomy that plays such an expressive role in these movements. Near-equivalency, which is at once a transformational process and a measure of similarity, plays a crucial role in drawing pc objects from these polarized genera into relationships. While the M transformation draws the polarized chromatic and

diatonic genera into a single, theoretical model at a highly abstract level, the NE transformation describes the process by which generically disparate objects are drawn into a single compositional model. In other words, the M transformation is symbolic of chromatic-diatonic polarization, which is analytically realized through the processes of segmentation and generic assessment. The NE transformation, on the other hand, captures the actual compositional processes that exploit the chromatic-diatonic polarization in order to create a dynamic compositional environment in which chromatic and diatonic pc objects interact as expressive, musical gestures.

The juxtaposition of serial and non-serial formations and the interaction of linear formations that evince diverse generic characteristics are salient features of the compositional designs of these two movements from *Orpheus*. These features are programmatic in origin and are, therefore, intrinsically expressive, thus the attitude underlying their explication in the present study attempts to avoid a purely organic approach in which all linear formations are shown to be in some way derivative of the series. While the present study holds that the serial formations have a thematic function that facilitates a connection between the Interludes 1 and 3, it posits that the precompositional origin of the series arises from the ordered interactions of the octatonic, diatonic, and chromatic genera.

As we have seen, the pan-generic quality of the series is expressed locally and globally in the pcsets associated with the multifarious linear formations and simultaneities. While some of these pcsets are exclusive to a single genus, or are inter-generic or pan-generic, the generic affiliations of other pcsets are less clear. Through the processes of NE transformation and inclusion relations, however, we have been able to establish the transformational pathways that link the series and its canonical and non-canonical transformations to these disparate generic and non-generic sets. Once the various scs are aligned through the context of generic set-class space with sc 7-16 occupying the position of a nexus set, these pathways coalesce into a continuous, fluid transformational model. Ultimately, this model conveys a vivid image of Stravinsky's approach to the compositional design of these movements within the larger context of the ballet *Orpheus* in which the continuous compositional environment is defined through generic interactions rather than order relations.

CHAPTER FOUR

RICERCAR II, FROM THE *CANTATA*

INTRODUCTION

Stravinsky composed the *Cantata* between April 1951 and August 1952, and dedicated it to the Los Angeles Symphony Society, which premiered it under his direction on November 11, 1952.¹ Stravinsky explains the motivation behind the composition in the program note for the premiere:

After finishing *The Rake's Progress*, I was persuaded by a strong desire to compose another work in which the problems of setting English words to music would reappear, but this time in a purer, non-dramatic form. I selected four popular anonymous lyrics of the fifteenth and sixteenth century, verses which attracted me not only for their great beauty and their compelling syllabification, but for their construction which suggested musical construction.²

The *Cantata*, in seven movements, is scored for soprano and tenor soloists, female chorus, and a chamber ensemble comprising two flutes, oboe, English horn (doubling Oboe 2), and 'cello. Of the four poems selected by Stravinsky, three are semi-sacred and one is secular. Ricercar II, the subject of the present chapter, is a setting of the semi-sacred lyric ("Sacred History") "Tomorrow shall be . . ." for tenor soloist.³

Table 4.1 outlines the seven movements of the *Cantata*. The deployment of the movements suggests a palindrome with Ricercar II—the central movement—acting as the axis of symmetry. This plan forecasts the symmetries that underlie the series and the

¹ Igor Stravinsky [Stravinsky], *Cantata* (New York: Boosey & Hawkes Music Publishers Limited, 1952), preface; White, *Stravinsky*, 468, n.1. Stravinsky means the Los Angeles Chamber Symphony Society.

² White, *Stravinsky*, 468-69.

³ White, *Stravinsky*, 469; Stravinsky, *Cantata*, 14.

formal design of Ricercar II. At the end of the movement, Stravinsky appends an extra measure with the instructions, "Ending for separate performance only."⁴ Thus, the present study treats Ricercar II as a complete work.

Music scholars generally agree that Ricercar II is Stravinsky's first serial composition. As we have seen, however, the ballet *Orpheus* of 1947 employs serial technique in the first and third interludes, albeit in a limited way. Similar to the serial interludes of *Orpheus*, the use of serial techniques in Ricercar II is compositionally discontinuous in the context of the other movements of the *Cantata*. Furthermore, as the ensuing analyses will demonstrate, Ricercar II is not completely serial. Rather, its musical surface is replete with both serial and non-serial formations. Through a cursory analysis of the score, the reader will notice that Stravinsky indicates the unfoldings of the serial units through the use of brackets; linear formations that do not have these brackets are non-serial.⁵ Analogous to the analytic challenge presented by the serial interludes of *Orpheus*, an explanation of pitch organization based solely on serial technique overlooks important relationships among the seemingly disparate linear formations discovered through analysis. In contrast, transformational analysis and the model of generic set-class space hold the potential to reveal a plethora of interrelationships among the serial and non-serial formations that constitute Ricercar II.

Table 4.1. *Cantata*: Movements

I	Prelude ("A Lyke-Wake Dirge," versus I)
II	Ricercar I
III	1st Interlude ("A Lyke-Wake Dirge," versus II)
IV	Ricercar II
V	2nd Interlude ("A Lyke-Wake Dirge," versus III)
VI	Westron Wind
VII	Postlude ("A Lyke-Wake Dirge," versus IV)

⁴ Stravinsky, *Cantata*, 25.

⁵ Straus, *Stravinsky's Late Music*, 58. Straus confirms that these analytical brackets are the composer's.

THE SERIES: SYMMETRY AND GENERIC INTERACTION
AS AN ASPECT OF PRECOMPOSITIONAL DESIGN

The serial unit employed in *Ricercar II* comprises eleven pitches and six pitch classes, which yields 6-z3 {e02345}. The first presentation of the series (P₀) occurs in the first measure of *Ricercar II* (the first Cantus Cancrizans, flutes and 'cello).⁶ The series, represented as a succession of pcs, is shown in example 4.1. Example 4.1 also illustrates division of the series by pcsegs, which in turn points up several expressions of symmetry and generic associations that become important aspects of the compositional design of this movement.

Successive partitioning by trichord of order positions 2-10 and 1-9 produces two palindromic sc successions, <3-6, 3-1, 3-1, 3-6> and <3-6, 3-2, 3-2, 3-6>, respectively. Imbrication by trichord of order positions 1-10 produces a palindromic succession of paired set classes, <3-6, 3-6, 3-2, 3-1, 3-2, 3-1, 3-6, 3-6>. Dividing the series into two equal parts reveals another expression of symmetry: order positions 1-5 and 7-11 yield expressions of sc 4-11: pcsets 4-11 {0245} and 4-11 (e024), respectively—pc3, found at the mid-point of the series (order position 6), functions as the axis.

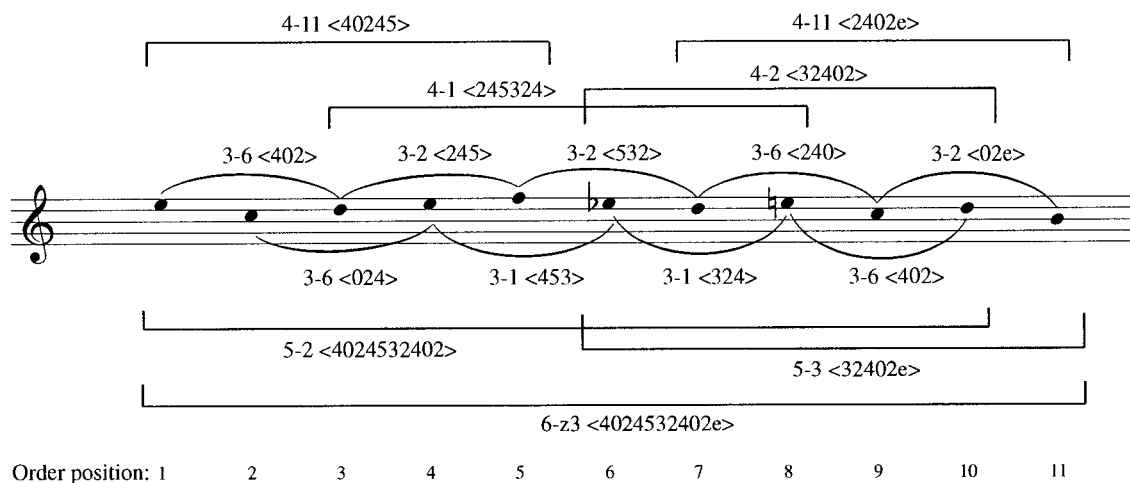
Set-class 6-z3, to which the serial unit belongs, evinces characteristics of each of the three constituent genera that define the model of generic set-class space. The strongest generic affiliation of sc 6-z3 is with the chromatic genus since 6-z3 is a primary member of that genus but is not a primary member of either the diatonic or the octatonic genera. Set-class 6-z3, however, is near-diatonic *and* near-octatonic: through the intersection of sc 5-z12, 6-z3 is NE to the diatonic hexachord 6-z25 (6-z3 and 6-z25 are also M-partners); through the intersection of sc 5-10 (the characteristic pentachord of the octatonic genus), 6-z3 is NE to 6-z13 (the characteristic hexachord of the octatonic genus) and NE to both 6-z23 and 6-27 (primary members of the octatonic genus).⁷ As the ensuing analyses will bear out, the chromatic and diatonic genera play a central role in

⁶ Stravinsky, *Cantata*, 14.

⁷ In addition, two tetrachords that hold strong affiliation with the octatonic genus—scs 4-3 and 4-10—are subsets of 6-z3: sc 4-3 is the characteristic tetrachord of the octatonic genus; 4-10 is pan-generic, but its PCIS <2-1-2> is characteristically octatonic.

the formulation of theories of pitch structures for Ricercar II, while the role of the octatonic genus is relatively minimal.

Example 4.1. Ricercar II: Ordered sets derived from the series, P_0



The ordered deployment of the pcs that constitute the serial unit P_0 exploits the diatonic attributes of sc 6-z3. The serial design is suggestively diatonic in the sense of the tonal tradition. Given the “tonal root” of the collection $\{P_0\}$ as C, the chromatic collection 4-1 $\{2345\}$ —a subset of 6-z3 $\{P_0\}$ —has the potential to create a major or minor third above the “root.” Thus, the series (P_0) alludes to a movement from parallel major to minor and to major again; it ends on the “leading tone.” The coordination of diatonically associated vertical adjacencies with the unfolding of the serial units found in the Cantus Cancrizans, for example, augments the tonal allusion created by the interval and pitch succession of the series (see example 4.3, below). This coordination, however, is non-functional since functional harmonic support is entirely absent.

The twenty-four P and I forms of the series and their concomitant pcsets are given in table 4.2. Since the pcset $\{P_0\}$ and its transformations yield the twenty-four pcsets of sc 6-z3, there is a direct correspondence between each member pcset of sc 6-z3 and a specific serial unit. As we have seen in the previous analytical chapter (*Orpheus*), the correspondence between serial units, the pcsets derived from these units, and the pcsets

derived from non-serial formations shapes the elucidation of transformational relationships among serial and non-serial formations.

Table 4.2. Ricercar II: P and I forms of the series and their concomitant pcsets

P FORM	PCSEG	PCSET (6-z3)	I FORM	PCSEG	PCSET (6-z3)
0	<4 0 2 4 5 3 2 4 0 2 e>	{e02345}	0	<4 8 6 4 3 5 6 4 8 6 9>	{345689}
1	<5 1 3 5 6 4 3 5 1 3 0>	{013456}	1	<5 9 7 5 4 6 7 5 9 7 t>	{45679t}
2	<6 2 4 6 7 5 4 6 2 4 1>	{124567}	2	<6 t 8 6 5 7 8 6 t 8 e>	{5678te}
3	<7 3 5 7 8 6 5 7 3 5 2>	{235678}	3	<7 e 9 7 6 8 9 7 e 9 0>	{6789e0}
4	<8 4 6 8 9 7 6 8 4 6 3>	{346789}	4	<8 0 t 8 7 9 t 8 0 t 1>	{789t01}
5	<9 5 7 9 t 8 7 9 5 7 4>	{45789t}	5	<9 1 e 9 8 t e 9 1 e 2>	{89te12}
6	<t 6 8 t e 9 8 t 6 8 5>	{5689te}	6	<t 2 0 t 9 e 0 t 2 0 3>	{9te023}
7	<e 7 9 e 0 t 9 e 7 9 6>	{679te0}	7	<e 3 1 e t 0 1 e 3 1 4>	{te0134}
8	<0 8 t 0 1 e t 0 8 t 7>	{78te01}	8	<0 4 2 0 e 1 2 0 4 2 5>	{e01245}
9	<1 9 e 1 2 0 e 1 9 e 8>	{89e012}	9	<1 5 3 1 0 2 3 1 5 3 6>	{012356}
10	<2 t 0 2 3 1 0 2 t 0 9>	{9t0123}	10	<2 6 4 2 1 3 4 2 6 4 7>	{123467}
11	<3 e 1 3 4 2 1 3 e 1 t>	{te1234}	11	<3 7 5 3 2 4 5 3 7 5 8>	{234578}

The diatonic sc 6-z25, an NE-partner and the M-partner of sc 6-z3, is an important collection in Ricercar II even though it rarely appears at the musical surface. Many of the vertical adjacencies and non-serial linear formations relate to 6-z25 through inclusion with 6-z25 or its primary diatonic supersets. The transformation of the chromatic sc 6-z3 into the diatonic sc 6-z25 through the intersection of sc 5-z12, an important relationship that shapes the compositional design of this movement, is realized through the transformation of the linear serial formations into diatonic non-serial linear and vertical formations. Table 4.3 lists all of the subset-classes of cardinalities 3, 4, and 5 for scs 6-z3 and 6-z25, arranged as M-partner pairs. Set classes represented in bold typeface are shared by both 6-z3 and 6-z25: these are the subset-classes of sc 5-z12, the sc that establishes the NE relation between 6-z3 and 6-z25, and symbolizes the transformational point of departure that relates chromatic pc objects to diatonic pc objects.

Table 4.3. Ricercar II: Subset-classes of 6-z3 and 6-z25 as M-partners

PENTACHORDS		TETRACHORDS		TRICHORDS	
6-z3	6-z25	6-z3	6-z25	6-z3	6-z25
5-2	5-23	4-1	4-23	3-1	3-9
5-3	5-27	4-2	4-22	3-2	3-7
5-4	5-29	4-3	4-26	3-3	3-11
5-6	5-20	4-4	4-14	3-4	3-4
5-10	5-25	4-5	4-16	3-5	3-5
5-z12	5-z12	4-7	4-20	3-6	3-6
		4-8	4-8	3-7	3-2
		4-10	4-10	3-8	3-8
		4-11	4-11	3-10	3-10
		4-12	4-27		
		4-13	4-13		
		4-z15	4-z29		

The chromatic attributes of the series are strongly expressed in the set class that abstractly represents the series (sc 6-z3), while the serial disposition of the pcs derived from sc 6-z3 evince diatonic characteristics. According to the model of generic set-class space, sc 6-z3 is at once chromatic, near-diatonic, and near-octatonic. Thus, generic interaction—interpenetrations of elements from both the chromatic and diatonic genera—is characteristic of both the serial unit and sc 6-z3, and interpenetrations of all three genera are characteristic of sc 6-z3. At the same time, sc 6-z3 represents a point of intersection, a *nexus* set, that draws all three genera into a special association and suggests the potential transformational pathways that form relationships among the multifarious pc objects of Ricercar II that otherwise do not hold a direct relationship to the series.

FORMAL PLAN

Ricercar II comprises a succession of clearly delineated formal units, or blocks, that fall into two general categories: the quasi-serial Cantus Cancrizans and the Canons, and the non-serial ritornelli, each of which is further subdivided (table 4.4). While the series and its derivatives, instrumentation, and simultaneity effect continuity on one level, each block constitutes a closed formal unit. The entire succession of blocks divides into two major parts: the three sections of Cantus Cancrizans (herein referred to as Part 1), and the

Canons that follow (Part 2). The textures of Parts 1 and 2 are significantly different—the texture of Part 1 is relatively static in comparison to the more active contrapuntal texture of Part 2. Each of the two parts displays a similar arrangement of blocks—that is, a succession of alternating canons and ritornelli.

Table 4.4. Ricercar II: Formal plan

Part 1 (before R1, R1 – R5)

<i>Rehearsal #:</i>	mm. 1-8	mm. 9-12	R1 – R3	R4	R5
<i>Block name:</i>	Cantus Cancrizans 1 (CC1)	1st Ritornello (Rit ¹)	Cantus Cancrizans 2 (CC2)	2nd Ritornello (= Rit ¹)	Cantus Cancrizans 3 (CC3)

Part 2 (R6 and following)

<i>Rehearsal #:</i>	R6 – R7	R9	R10 – R12	R 13	R14 – R16
<i>Block name:</i>	Canon A ¹	3rd Ritornello (Rit ²)	Canon B	4th Ritornello (= Rit ²)	Canon A ²
<i>Rehearsal #:</i>	R17	R18 – R19	R20	R21 – R23	R24
<i>Block name:</i>	5th Ritornello (= Rit ²)	Canon C	6th Ritornello (= Rit ²)	Canon A ³	7th Ritornello (= Rit ²)
<i>Rehearsal #:</i>	R25 – R27	R28	R29 – R31	R32	R33 – R35
<i>Block name:</i>	Canon D	8th Ritornello (= Rit ²)	Canon A ⁴	9th Ritornello (= Rit ²)	Canon E
<i>Rehearsal #:</i>	R36	R37 – R39	R40	R40 + 4 mm.	
<i>Block name:</i>	10th Ritornello (= Rit ²)	Canon A ⁵	11th Ritornello (= Rit ²)	Ending for separate performance	

Serial units are found primarily in the tenor lines of the Cantus Cancrizans (Part 1), while simultaneous presentations of the serial unit by the tenor and instrumental lines are characteristic of the Canons of Part 2. The three Cantus Cancrizans (CC1, CC2, and CC3) are similar because of their shared structural attributes—this will be explored below. Two types of canon-type blocks are found in Part 2: recurring and non-recurring. The five recurring canon-type blocks (labeled herein Canons A¹ – A⁵, and collectively referred to as “A-type canons”), the first of which initiates Part 2 at R6, are identical in terms of pitch, instrumentation, and rhythm, but carry different text (there are minor rhythmic alterations to the tenor part, which are most likely a response to scansion). The “development” of pitch materials takes place in the four non-recurring canons of Part 2, labeled herein as Canons B, C, D, and E. Row-form selection and deployment, among other structural attributes, makes each non-recurring canon unique.

Serial units are completely absent in the ritornello-type blocks of Parts 1 and 2. The two ritornelli of Part 1 are identical; the nine ritornelli of Part 2 are different from those of Part 1 but are identical to each other (except for text). The ensuing analyses posits that the tenor line of the Part 1 ritornelli holds an abstract relationship with the series, and demonstrates how the tenor line of the Part 2 ritornelli derives from the tenor line of the Part 1 ritornelli. The relationship between the tenor lines in addition to other structural features discussed below, and the periodic reiteration of the text, “To call, to call my true love to my dance,” effects continuity between the Part 1 ritornelli (Rit¹) and the Part 2 ritornelli (Rit²).⁸

The symmetry of set-class deployment found in the design of the series is projected in the formal designs of Parts 1 and 2. In Part 1, the deployment of the three sections of Cantus Cancrizans (CC1, CC2, and CC3) and the two Rit¹ ritornelli articulates a reflection-symmetric design (a palindrome) about CC2: <CC1, Rit¹, CC2, Rit¹, CC3>. The deployment of the blocks in Part 2 expresses a translational-symmetric design based on a two-element primitive—canon and ritornello—that derives from the five-element formal palindrome of Part 1. This two-element primitive occurs nine times:

< A¹, Rit²; B, Rit²; A², Rit²; C, Rit²; A³, Rit²; D, Rit²; A⁴, Rit²; E, Rit²; A⁵, Rit² >

THE CANTUS CANCRIZANS: SYMMETRY TRANSFORMATIONS AND GENERIC TRANSFORMATION AS STRUCTURAL DETERMINANTS

As Stravinsky’s label “Cantus Cancrizans” suggests, the three Cantus Cancrizans blocks (herein labeled CC1, CC2, and CC3) feature retrograde imitative devices in the vocal (tenor) part. Although complete serial units are articulated only in the tenor line, reflectional and translational symmetries are expressed through the interaction of the instrumental and tenor lines.⁹ The following analysis explores the relationship between

⁸ With respect to the refrain “To call, to call my true love to my dance,” see *Cantata*, 14 (before R1), 17 (R9), 18 (R13), 21 (R20), and 23 (R32).

⁹ With the exception of the brief anacrusis-like instrumental statement at the beginning of Ricercar II (CC1) and the statements of serial sub-segments in the second Cantus Cancrizans.

the constituent serial units, traces the symmetrical deployment of these units in the tenor line, and investigates the interaction of the tenor and instrumental lines in terms of symmetry, sonority, generic interaction, and generic transformation.

The selection of serial units in the *Cantus Cancrizans* is limited to P_0 and I_8 , and their retrograde forms. The pcsets derived from P_0 and I_8 — $\{e02345\}$ and $\{e01245\}$, respectively—are NE (Rp) partners (5-z12 $\{e0245\}$ intersects). In addition to the NE (Rp) partnership between $\{P_0\}$ and $\{I_8\}$, the transformation of the prime ordering of the series P_0 into the serial unit I_8 preserves other structural features. Example 4.2 presents serial units P_0 and I_8 derived from the tenor line in the first *Cantus Cancrizans* (P_0 is shown in the top staff; I_8 is shown in the lower staff). As shown in the example, straight lines indicate the exchange of pcs 0 and 4 at order positions 1 and 2, 2 and 4, and 8 and 9, and pcs 5 and 11 at o.p.5 and 11. The dyad $\{04\}$ —encircled on the graph and labeled *motto dyad*—flags the beginning of each prograde serial unit: $\{04\}$ appears at the first and second order positions of P_0 as $\langle 40 \rangle$, and is reproduced in the corresponding position in I_8 as $\langle 04 \rangle$. Pitches-classes 5 and 11 are derived from the pitches that define the range of P_0 and I_8 in pitch space as shown in the score. The positions of the three instances of pc2 remain unchanged (enclosed in boxes at o.p.3, 7, and 10).

Example 4.2. *Ricercar II*: Comparison of P_0 and I_8

Order position: 1 2 3 4 5 6 7 8 9 10 11

The constituent serial units of the tenor line in each of the three *Cantus Cancrizans* are subsumed within larger, symmetrical formations comprising simple and composite palindromes. The principle of order relationship—the essence of serial organization—is

evident in the successions of sonorities that coincide with the boundaries and axes of these symmetrical formations. The interaction of the tenor lines and the sonorities articulated by the instrumental parts yield pcsets that are inclusion-related to the diatonic pcset 6-z25 {e02457}, an NE (Rp) partner of {P₀}, 6-z3 {e02345}.

Example 4.3 is a *reductive* analysis of the three Cantus Cancrizans. In order to draw attention to the unique array of symmetrical formations found in these blocks, the tenor line is reduced so that only the boundary pcs (o.p.1 and 11) and the motto dyad {04} are reproduced.¹⁰ Each graph comprises two staves: the top staff represents the tenor line, which expresses the serial units P₀ and I_g; the bottom staff illustrates the sonorities produced by the combined instrumental voices (the register of the lower pitches has been changed). The position of the pcs that constitute the sonorities on the graph have been adjusted from their precise temporal position on the score in order to show the relationship of these sonorities to the salient aspects of the symmetrical formations of the tenor line. In addition, the first graph (Cantus Cancrizans 1) omits the introductory, anacrusis-like statement of P₀ by the instruments in m.1 (measures are not shown on the graphs), and the second graph (Cantus Cancrizans 2) omits the statements of serial sub-segments found in the woodwinds (after R2).

As illustrated by example 4.3, Cantus Cancrizans 1 articulates two palindromes: the first palindrome comprises P₀ and RP₀ (pc11 as the axis); the second palindrome, consisting of I_g and RI_g, is elided to the first through the dyad <04> (pc5 as the axis). Together, the palindromes coalesce into a large-scale symmetrical formation—a compound or *composite* palindrome—defined by the boundary dyad {04} of each constituent palindrome. The dyad {04} is also exchanged between the tenor and the ‘cello, which encloses the entire composite palindrome.

¹⁰ Stravinsky provides brackets throughout the score that indicate the segmentation of the tenor line by serial unit in the Cantus Cancrizans and in the tenor and instrumental lines of the canons that follow.

Example 4.3. Ricercar II: Reductive analyses of the Cantus Cancrizans

Cantus Cancrizans 1

(Composite palindrome expressed by boundary dyads of two interlocking palindromes)

(Palindrome) P_0/RP_0 (Palindrome) I_8/RI_8

(Tenor) ← 4-8 {e045}

(Instrs.) ← 4-22 {0247}

4-22 {0247} 4-14 {7e02} 4-22 {0247} 4-10 {2457} 4-22 {0247}

5-27 {e0247} 5-23 {02457}

6-z25 {e02457}

Cantus Cancrizans 2

(Composite palindrome expressed by boundary dyads of two interlocking palindromes)

(Composite palindrome expressed by boundary dyads of two interlocking palindromes)

(Palindrome) P_0/RP_0 (Palindrome) P_0/RP_0 (Palindrome) I_8/RI_8

(Tenor) ← 4-8 {e045}

(Instrs.) ← 4-22 {0247}

4-22 {0247} 4-14 {7e02} 4-22 {0247} 4-14 {7e02} 4-22 {0247} 4-10 {2457} 4-22 {0247}

5-27 {e0247} 5-23 {02457}

6-z25 {e02457}

Cantus Cancrizans 3

(Palindrome) P_0/RP_0

← 3-4 {e04}

← 3-9 {027}

4-22 {0247} 4-14 {7e02} 4-22 {0247}

5-27 {e0247}

Cantus Cancrizans 2, which expresses two overlapping composite palindromes, is a variation of Cantus Cancrizans 1. The simple palindrome comprising P_0 and RP_0 is subsequently repeated (a translational symmetry), resulting in a composite palindrome

(pc4 as the axis). A simple palindrome comprising I₈ and RI₈ follows this formation (pc5 as the axis). The succession of the simple palindromes P₀-RP₀ and I₈-RI₈ form into a composite palindrome similar to that found in Cantus Cancrizans 1, with the dyad <04> as the axis—dyad {04} is exchanged between the tenor and Fl.1.

Cantus Cancrizans 3 is also a variation of Cantus Cancrizans 1. The symmetrical formation found in the tenor part is a simple palindrome comprising P₀ and RP₀. This formation balances the number of P₀-RP₀ formations found in all three Cantus Cancrizans (four) with the number of I₈-RI₈ formations found in Cantus Cancrizans 1 and 2 (two) in a ratio of 2:1.

In each of the three Cantus Cancrizans, the interacting tenor and instrumental lines produce palindromic successions of diatonic sonorities that coincide with the boundaries of the serial units expressed in the tenor line. The pcsets representing these sonorities, shown below each system in example 4.3, are all subsets of 6-z₂₅ {e02457}. Of these, only sc 4-10 found in Cantus Cancrizans 1 and 2 is also a subset-class of 6-z₃; pcset 4-10 {2457} is a subset of both {P₂} and {I₁₁} (see Canons, below).

The tetrachord 4-22 {0247} is a significant pcset in the Cantus Cancrizans. As indicated through the broken-lined rectangular enclosures in example 4.3, the pc collection derived from the sustained instrumental sonorities in Cantus Cancrizans 1 and 2 is 4-22 {0247}; in Cantus Cancrizans 3, this collection yields 3-9 {027}, a subset of 4-22 {0247}. The pcset 4-22 {0247} is also consistently expressed in the sonorities that coincide with the boundaries of the simple palindromes, and the axes and boundaries of the composite palindromes. The pcsets 4-14 {7e02} and 4-10 {2457}, found at the axes of the simple palindromes (P₀-RP₀ and I₈-RI₈, respectively) are NE (Rp) partners of 4-22 {0247}, but not of each other. The pcset 5-27 {e0247}, derived from the instrumental sonorities and the boundary pcs of the serial units in the P₀-RP₀ palindrome in all the Cantus Cancrizans, and pcset 5-23 {02457}, derived from the instrumental sonorities and the boundary pcs of the serial-unit components of the I₈-RI₈ palindrome, are in the NE (Rp) relationship through the intersection of 4-22 {0247}.

In the Cantus Cancrizans, the prevalence of diatonic sonorities juxtaposed with formations that are related to the chromatic sc 6-z₃ forecasts similar generic interactions expressed throughout Ricercar II. As we have seen, the serial deployment of the pcs

derived from the chromatic sc 6-z3 strongly alludes to diatonic pitch formations. The interlocking serial units in the tenor part of the Cantus Cancrizans are arranged into symmetrical formations, which in turn elevate the structural status of the pcs found at salient positions defined by the boundaries and axes. The pcsets derived from these events, 4-8 {e045} and 3-4 {e04}, are subsets of {P₀} and {I₈}, and of 6-z25 {e02457}, which is literally represented in the Cantus Cancrizans 1 and 2 as the pcset derived from the combined instrumental sonorities and the boundary pcs of the serial units. The relationship between the chromatic sc 6-z3 and the diatonic sc 6-z25, established in the Cantus Cancrizans and abstractly represented herein as M and NE processes, embodies the chromatic-diatonic interaction and the transformational relationships among serial and non-serial formations found elsewhere in the ritornelli and the Canons of Ricercar II.

THE RITORNELLI: TRANSFORMATIONS AND GENERIC MANIFESTATIONS OF THE SERIES

The ritornelli blocks deployed throughout Parts 1 and 2 of Ricercar II (Rit¹ blocks, Cantus Cancrizans; Rit² blocks, Canons, respectively) do not express serial organization—all of the linear formations that participate in the two types of ritornello blocks are non-serial. The marked contrast between the compositional designs of the serial blocks (Cantus Cancrizans and Canons) and the ritornello blocks clearly delineate the refrains of each section of verse.¹¹ Although the juxtaposition of serial and non-serial blocks in Ricercar II effects compositional discontinuity at the musical surface, there is an abstract relationship between these two general types of blocks that effects continuity at a higher structural level.

Example 4.4 explores the relationship of P₀ to the tenor part of Rit¹ (Rit¹-T) by comparing similarities between the sc successions of Rit¹-T and the *retrograde* form of P₀ (RP₀). The tenor line (Rit¹-T), comprising *twelve* ordered pc elements, is shown in the top staff; RP₀ is shown in the lower staff (*eleven* pc elements). The initial segment of Rit¹-T, pcseg <ete2>, represents an interpolation of the dyad <te> between o.p.1 and 2 of

¹¹ The text for Ricercar II is not reproduced in this dissertation.

$RP_0 \langle e2 \rangle$. There is also a direct mapping of o.p.11 between both formations (pc4). Other than these few correspondences, there is no consistent mapping of the ordered pc elements of RP_0 onto Rit^1-T . Order relationships, however, emerge at another level. The segmentation strategy employed in example 4.4 reveals a relatively close mapping between the set-class successions of the two formations. Thus, the transformation of P_0 into Rit^1-T is accomplished through the transformations of the constituent pcsegs of RP_0 , which radically distorts RP_0 in terms of pc successions, but abstractly preserves the succession of set-classes that derive from the constituent pcsegs of RP_0 .

Example 4.4. *Ricercar II*: Transformation of Rit^1 -Tenor from RP_0

Example 4.5 aligns the tenor lines of Rit^1 (Rit^1-T) and Rit^2 (Rit^2-T) in order to illustrate how Rit^2-T derives from the Rit^1-T through the transformational processes of interpolation and substitution (Rit^2-T is shown in the top staff; Rit^1-T is shown in the lower staff). As shown in example 4.5, Rit^2-T includes an interpolated segment between order positions 5 and 6 of Rit^1-T , and pc3 found at o.p.12 in Rit^2-T substitutes for pc2 found at the analogous position in Rit^1-T . This substitution results in the transformation of the Rit^1-T pc collection, 7-27 {24679te}, into the Rit^2-T pc collection, 8-20 {234679te}, a superset of { Rit^1-T }.

The sc succession that establishes the transformational link between RP_0 and Rit^1-T is disrupted in Rit^2-T because of the substituted pc at o.p.12 and the interpolated segment between o.p.5 and 6 (compare examples 4.4 and 4.5). These subtle changes, however,

establish a relationship between $\text{Rit}^2\text{-T}$ and two serial units, P_{11} and P_4 . The interpolated segment in $\text{Rit}^2\text{-T}$ that follows o.p.5 transforms pcset 3-3 {te2} in $\text{Rit}^1\text{-T}$ (o.p.1-5) to 4-z15 {te24}, a subset of $\{P_{11}\}$. The substitution of pc2 with pc3 transforms the diatonic pcset 5-23 {24679} in $\text{Rit}^1\text{-T}$ to the chromatic/octatonic pcset 5-10 {34679}—a subset of $\{P_4\}$ —in $\text{Rit}^2\text{-T}$ (o.p.7-12).

Example 4.5. *Ricercar II*: Transformation of $\text{Rit}^2\text{-Tenor}$ from $\text{Rit}^1\text{-Tenor}$

order position: 1 2 3 4 5 (interpolated) 6 7 8 9 10 11 12

Rit 2-Tenor

4-z15 {te24}

5-10 {34679}

3-3 {te2}

5-23 {24679}

← 8-20 {234679te}

Rit 1-Tenor

order position: 1 2 3 4 5 6 (6) 7 8 9 10 11 12

← 7-27 {24679te}

While the transformation of the serial unit into $\text{Rit}^1\text{-T}$ preserves the sc constituents of the serial unit, it does not preserve the genus to which sc 6-z3 belongs. Rather, the transformation of the serial unit into $\text{Rit}^1\text{-T}$ instantiates a generic transformation—in this case, a transformation from the chromatic to the diatonic genera. Set-class 6-z3, to which the serial unit belongs, is a primary member of the chromatic genus; sc 7-27, to which $\text{Rit}^1\text{-T}$ belongs, is near-diatonic (sc 7-27 is NE to sc 7-35; 6-32 intersects). Since sc 6-z3 is not inclusion-related to sc 7-27, and both set classes hold disparate generic affiliations, the analytical discontinuity between the serial blocks and the ritornelli seems irreducible.

Generic interaction—a characteristic of Stravinsky's serial design in this repertoire—figures prominently in the linear and vertical formations of the ritornelli. Pitch-class sets and scs derived from these formations, once evaluated in the context of the model of generic set-class space, can be drawn into associations with sc 6-z3 (the sc of the serial unit). Although sc 6-z3 does not appear at the musical surface in the ritornelli, it functions as a referential set about which the pc objects discovered through analysis are abstractly organized, through inclusion relations or other transformational

processes. While the musical surface of the ritornelli remains seemingly discontinuous, compositionally, with the Cantus Cancrizans and the Canons, the analytic discontinuity is resolved through the elucidation of the transformational pathways that relate sc 6-z3 to these generically disparate, non-serial pc objects.

Example 4.6 is a pitch reduction of Rit¹. The tenor line is partitioned into three segments and labeled as pcsets: 3-3 {te2}, 3-11 {47e}, and 5-23 {24679}. The linear formation articulated by Fl.1 yields the diatonic pcset 5-23 {79t02}, which maps onto the pcset formed by the last five elements of the tenor line. Flute 2 yields the near-chromatic pcset 7-3 {7te0123}, the M-partner of the near-diatonic sc 7-27 (the sc representing Rit¹-T). The pcset produced by the 'cello line is 6-z11 {9e0234}—sc 6-z11 is a both a subset-class of sc 7-27 and NE to sc 6-z3 (they share sc 5-10, which is expressed as a pcseg in Rit²-T).

Example 4.6. Ricercar II: Rit¹ pitch reduction

(mm.) 1 2 3 4

3-3 {te2} 3-11 {47e} 5-23 {24679}

Tenor

5-23 {79t02}

Fl. 1

7-3 {7te0123}

Fl. 2

6-z11 {9e0234}

Vc.

2-3 {e2} 4-14 {7e02} 4-19 {e037} 4-27 {247t} 4-z29 {379t} 5-21 {69t12} 5-27 {12469} 4-14 {0237}

5-11 {7te02} 7-z17 {te02347} 7-22 {123679t} 5-27 {12469} 8-18 {1234679t}

7-z17 {te02347} 9-10 {01234679t}

Example 4.7 is a pitch reduction of Rit². The linear pc formation expressed by Fl.1 <2ete>, a sub-segment of the tenor line, yields 3-3 {te2}. The pcset articulated through the Fl.2 line, 8-22 {1234679e} is a super-sc of 7-27 and is therefore NE to 8-20, the sc

representing the tenor line of Rit². In addition, pcset 8-22 {1234679e} contains one expression of 6-z3, {123467}—the pc content of I₁₀. The pcset 5-23 {e1246} representing the linear formation articulated by Ob.1, a subset of 8-22 {1234679e}, alludes to the last five elements of Rit¹-T. The pcset derived from the ‘cello line is the diatonic heptad 7-35 {679e024}, a subset-class of 8-22 (Fl.1).

Example 4.7. Ricercar II: Rit² pitch reduction

(mm.) 1 2 3

4-z15 {te24} 8-20 {234679te} 3-11 {47e} 5-10 {34679} (Ending for separate performance)

Tenor

Fl. 1 3-3 {te2}

Fl. 2 8-22 {1234679e}

Ob. 1 5-23 {e1246}

Vc. 7-35 {679e024}

2-3 {e2} 3-2 {e2} 3-7 {e24} 3-3 {te2} 4-23 {e247} 4-26 {e147} 4-5 {te147} 4-14 {e126} 5-31 {e024} 4-11 {e3} 4-14 {7e02}

3-3 {te2} 3-2 {e12} 4-z15 {te24} 5-35 {79e24} 9e24 {567e} {79t2}

5-10 {te124} 9-11 {5679te124} 7-2 {e012346}

9-11 {5679te124}

The pcsets derived from the simultaneities of Ritornelli 1 and 2 are related to the near-diatonic sc 7-27 (representing Rit¹-T) and its superset, 8-20 (representing Rit²-T). Although these sonorities seem to arise from the interaction of the various linear formations that constitute Rit¹ and Rit², they reveal a level of organization that underlies the selection and deployment of the constituent pcs that defines each instrumental linear formation. This organization is an expression of the linear-vertical transformation (T-LV)

discussed in Chapter 2, in which a line (pcseg), represented by a pcset, is converted into simultaneity (represented by a pcset).

Example 4.6 illustrates the succession of pcsets that represent the sonorities derived from the interacting linear formations of Rit¹ (indicated by the brackets, and sc-pcset labels placed below the system; every pc that participates in each of the linear formations is accounted for). Each sonority expresses three characteristics: (1) each contains at least of two of the pcs found in the segment that is simultaneously unfolding in the tenor line; (2) with the exception of sc 4-z29, each is literally or abstractly inclusion-related to 7-27 {24679te}; (3) each expresses the trichord 3-11, articulated in the second segment of the tenor line, as a subset. For example, pcset 4-27 {247t} is inclusion-related to pcset 7-27 {24679te}; 5-27 {12469} is both the abstract complement of 7-27 {24679te} and NE (Rp) to 5-23 {24679} (tenor, third segment).

The pitch-class levels at which the boundaries of the constituent instrumental and tenor lines of Rit¹ originate and terminate are controlled by two 4-14 pcsets, {7e02} and its T₂I transform {0237}. The first vertical adjacency, 2-3 {e2}, a vertical expression of the linear dyad <e2> derived from P₀, is subsumed within the second vertical adjacency, pcset 4-14 {7e02}.¹² Recall that pcset 4-14 {7e02} is expressed as the sonorities that correspond with the axes of the simple palindromic formations found in the Cantus Cancrizans. Moreover, 4-14 {7e02} forecasts the final sonority of Ricercar II (see below).

Example 4.7 illustrates the succession of pcsets representing the sonorities derived from the interacting linear formations of Rit² (indicated by the brackets, pcsets and sc labels placed below the system; every pc that participates in each of the linear formations is accounted for). With the exception of the octatonic 5-31 {te147} in m.2, all vertical adjacencies in Rit² are literally or abstractly inclusion-related to 8-20 {234679te}, the pcset representing the tenor line of Rit².¹³ In addition to inclusion-relations with sc 8-20, each sonority shown in example 4.7 contains at least two pcs found in the segment that is simultaneously unfolding in the tenor line, except 4-14 {e126} and 4-11 {e024} in m.3.

¹² Recall that pcset 4-14 {7e02} occurs as an axis vertical-adjacency in the palindromic formations of the Cantus Cancrizans.

¹³ Set-class 5-31 is a primary member of the octatonic genus (table 2.4).

These two pcsets represent the linear-vertical transformation of instrumental voices: 4-14 {e126} is a subset of 5-23 {e1246}, derived from the Ob.1 line; 4-11 {eo24} is a subset of 7-35 {679e024} derived from the 'cello line. The pcset 5-35 {79e24}, a subset of 7-35 {679e024} and its abstract complement, is also expressed through the succession of two sonorities—4-23 {9e24} and 4-26 {e247}—found in m.2.

The tenor line in example 4.7 is segmented into two pcsegs that yield 4-z15 {te24} and 5-10 {34679}, respectively. A secondary segment, shown in example 4.7 as a segment that overlaps the two primary ones, produces the trichord 3-11 {47e}. The first five pcs of the tenor line <ete2ete> are expressed vertically in m.1 in the two sonorities represented as 3-3 {te2}. The entire 4-z15 {te24} segment (mm. 1-2) is expressed vertically in m.1 through the successive trichords 3-7 {e24} and 3-3 {te2}. The entire 5-10 {34679} segment (mm. 2-3) is adumbrated by the pcset derived from the entire succession of sonorities found in m.1: 5-10 {te124}. Representations of the 3-11 {47e} segment are literally included in 4-26 {e247}, 4-27 {e147}, 5-31 {te147}, and 4-14 {e126}, and abstractly included in 4-14 {79t2}. The abstract complement of 3-11 {47e} is expressed in the pcset derived from the succession of sonorities that roughly coincide with the secondary segment <e474>. Example 4.7 also includes the special ending provided by Stravinsky for a separate performance of *Ricercar II* (follows the final iteration of *Rit*²). This final sonority, 4-14 {7e04}, which recalls the role 4-14 plays in the framing of *Rit*¹, includes pcset 3-11 {47e}.

The sonorities depicted as pcsets in examples 4.6 and 4.7 (*Rit*¹ and *Rit*²) coalesce into larger pcsets, each of which holds a strong association with one of the three genera. In example 4.6 (*Rit*¹), the sonorities found in mm. 1-2 and mm. 3-4 form into the near-chromatic heptad 7-z17 {te02347} and the extended octatonic nonachord 9-10 {01234679t}, respectively. In example 4.7 (*Rit*²), the sonorities found in mm. 1-2 and m.3 form into the diatonic nonachord 9-6 {5679te124} and the near-chromatic heptad 7-2 {e012346}, respectively.¹⁴

The large pc collections formed through the partitioning of the successions of sonorities illustrated in examples 4.6 and 4.7 represent large-scale manifestations of the

pan-generic quality of sc 6-z3, the result of compositional processes that transform the series into the tenor lines of Rit¹ and Rit², and transform the tenor lines into instrumental lines. The selection and deployment of the pitches that form into the individual instrumental lines is governed through transformational relationships with the tenor lines and with sc 6-z3 so that the sonorities created through the interaction of the linear formations express important primary linear formations. This process suggests a system of counterpoint that has its basis in the vertical expressions of important linear formations and the genera that these formations are associated with. In other words, these sonorities are not simply by-products of linear interactions. Rather, they are abstract expressions of the series and its close and remote transformations.

In the foregoing discussions, we have traced the transformation of the serial unit RP₀ into the tenor lines of the two types of ritornello blocks (Rit¹ and Rit²), established the relationship of the instrumental lines to the tenor lines, encountered vertical expressions of the tenor line and some of the instrumental lines (linear-vertical transformations), and discovered projections of the pan-generic attributes of the series in the partitioned successions of sonorities produced by interacting linear formations. Transformational analysis and the generic model of set-class space have played key roles in establishing these pathways and continue to do so in the ensuing discussions that develop theories of pitch structure for the Canons of Part 2.

THE CANONS: GENERIC INTERACTION AND DIATONIC INFLUENCE

The Canons found in Part 2 (each labeled “Canon” in the score and herein called the “Canons”)—seem compositionally discontinuous from the other blocks of Ricercar II. Unlike the Cantus Cancrizans and the ritornelli, each Canon expresses serial formations in *all* voices and each Canon expresses the aggregate.¹⁵ In each of the Canons, the tenor

¹⁴ See Chapter 2, table 2.4. Set-class 9-10 is a characteristic member of the octatonic genus; sc 9-6 is a primary member of the diatonic genus.

¹⁵ The total pc collection expressed by each of the first two Cantus Cancrizans (CC1 and CC2) is the near-chromatic pcset 8-2 {e0123457}; the total pc collection of CC2 is the near-diatonic pcset 7-11

part comprises three serial units (with the exception of Canon D—see below) while the instrumental lines express a mixture of serial and non-serial formations. The Canons—labeled herein as Canons A, B, C, D, and E (table 4.4)—fall into two groups. The first comprises the “A-type” canons (the recurring Canons A¹, A², A³, A⁴, and A⁵, which are identical except for the text); the second group comprises the non-recurring canons—Canons B, C, D, and E. While the recurring (A-type) canons affect a sense of stasis through their periodic reiteration, the non-recurring canons introduce a dynamic element into the otherwise symmetrical deployment of the A-type canons and the Rit²-blocks. Thus, the “developmental” aspect of *Ricercar II* takes place in these non-recurring canons since each expresses unique characteristics. The following discussion examines the relationship of serial and non-serial formations to sc 6-z3 (the set class that represents the series) and explores the role genera plays in defining relationships among the constituent linear formations of each Canon.

The Canons are illustrated in the present study through pitch-reduction graphs (examples 4.8, 4.9, 4.10, 4.11, and 4.12). Ties are used to approximate duration, which is necessary since certain pitches continue to participate in the vertical texture beyond their attack point. Following the layout of the score, the graphs use four staves: the top staff represents the tenor part, the middle staves represent the oboe parts (Ob.1 and Ob.2), and the lower staff represents the ‘cello part. The rehearsal numbers provided in the score are reproduced for each example. Measure numbers, which do not appear in the score, are provided for each example. In addition, small-case letters representing sub-sectional divisions are provided above each of tenor-line segments identified through analysis.

The strategy used towards linear segmentation begins with the discovery of serial units and non-serial formations that share pc content with the pcsets derived from serial units. The segmentation of the remaining non-serial formations is primarily determined by exclusion (they do not belong to the other types of formations) as well as metric placement (they usually originate at the beginning of a measure). As the ensuing analyses will show, the constituent segments of the tenor and instrumental lines are of three types:

{e023457}. The total pc collection of Rit¹ is 10-3 {9te0123467}, the abstract complement of the first vertical adjacency, 2-3 {e2}; the total pc collection of Rit² is 11-1 {9te01234567}.

(1) serial units; (2) pcsets generated from non-serial formations but associated with a serial unit's pcset (subsets or Rp-related sets); (3) diatonic and near-diatonic pcsets.

Every segment is enclosed by a stem-and-beam system, and labeled with either a serial-unit label or a set-class label (enclosed in boxes) and a pcseg representing the enclosed segment (in angled brackets). Stems are placed at the attack points of each boundary pc (for elided segments that articulate non-serial formations, the stem for the left boundary of the second segment is determined by the vertical coincidence of a left-boundary pc of a serial unit unfolding in another line). If a pcset derived from a non-serial formation shares pc content with a serial unit, a symbol is added beside or below the primary label to indicate the specific relationship. The following symbols are used to represent such relationships (in examples 4.8 and 4.9):

“ss {I₉}” — a subset of the pcset derived from I₉

“ss {P₀}/{I₈}” — a subset of both {P₀} and {I₈}

“NE {I₃}” — NE (Rp) to {I₃}

“NE {P₁₀}/{I₅}” — NE (Rp) to both {P₁₀} and {I₅}

“= {I₆}” — complete pc equivalency to {I₆}

Unlike the analyses of the ritornello blocks, the vertical adjacencies considered in the analyses of the Canons do not represent all of the possible sonorities produced through the moment-to-moment pitch interaction of simultaneously unfolding linear formations. Rather, the vertical adjacencies considered herein are limited to those created through the momentary coincidence of the boundary pcs of the segments with the vertically aligned pcs found in simultaneous linear formations. These vertical adjacencies are shown below the staff system by brackets and labels indicating the sc and pcset derived from the vertical combination of pitches.

Vertical adjacencies that coincide with the immediate boundaries of the serial-unit components of the tenor line are particularly important since the tenor part presents the primary articulative units (i.e., the linear formations that convey the lyrics), which in turn influences the deployment of serial units and other types of linear formations in the instrumental voices. The system of stems-and-beams with sc/pcset labels enclosed in hexagonal boxes placed above the top staff in each graph indicates the *boundary sets* for

the tenor line—that is, the total pc content of the boundary (vertical) sonorities associated with *each* segment of the tenor line. Since the tenor lines in each of the Canons yields three segments, there are three boundary sets associated with each tenor line. Accretions of boundary sets into larger sets (called *boundary supersets*) are also shown above the top staff. For Canons B, C, D, and E (the non-recurring canons), the boundary sets form into two supersets (depicted in the graphs as a second level of stems-and-beams and a sc/pcset designator enclosed in a rectangular box). As will become clear, this level of segmentation is consistent with the relationships among the formal subsections expressed by the four non-recurring canons (see below). The superset formed through the union of the three boundary sets is shown as an sc/pcset on the graphs for all Canons (rectangular box).

The purpose of this path of investigation is to reduce the analytical polarity among serial and non-serial formations through the elucidation of relationships among these formations, to determine the relationship of the vertical adjacencies and boundary sets to linear formations, and to explore ways that genera influences pitch organization. The method used to evaluate vertical adjacencies is by no means comprehensive. The vertical adjacencies shown in the graphs represent “snapshots” of the interacting lines; that is, glimpses of the simultaneities that form as a result of linear interactions. Nonetheless, these “snapshots” reveal that sonority is an indicator of generic influence rather than a mere by-product of linear interaction. In many cases, the pc content of important boundary sets influences the pitch level at which linear formations originate and/or terminate. The generic affiliations of boundary sets and supersets reveal special structural attributes of each Canon. Generic conformity among supersets indicates that the harmonic aspect of the canon is influenced by a single genus or a single near-generic set-class. Generic non-conformity among the various supersets indicates that more than one genus influences the design and deployment of linear formations.

The A-type (recurring) Canons

The five A-type canons are exemplified by Canon A¹, which begins at R.6 and spans twelve measures (example 4.8). The tenor part comprises a succession of three serial units (I_g, RP₁₀, P₀), each of which is articulated through the scansion of the text (each

Example 4.8. Ricercar II: Pitch reduction of Canon A¹ (A-type canons)

Boundary sets →

7-z36 {9e02345}, superset {P0}, 6-z3 {e02345}

5-27 {90245}

5-10 {9e023}

3-9 {9e4}

(R) 6 7 8

(a) (b) (a')

18 <0420e120425>

RP10 <90t201320t2>

P0 <4024532402e>

4-23 <474924>

RP10 <90t201320t2>

7-35 <4579e0e20e402e>

6-z10 <e097875>

NE {13}

5-23 <570t9>

P0 <4024532402e>

6-z6 <t8t813 {92}>

NE {P10}/{15}

5-2 <02320531>

ss {19}

6-z3 <9e09t023> = {16}

3-11 {904}

4-26 {0479}

3-7 {025}

4-13 {e245}

3-10 {903}

3-4 {7e0}

3-12 {7e3}

4-20 {0158}

3-10 {7tl}

3-4 {015}

3-7 {92}

3-11 {902}

3-11 {047}

2-5 {92}

3-7 {9e2}

3-9 {9e4}

(3-9 {9e4})

confd Ob.1 → <402e>

Ten.

Ob.1

Ob.2

Vc.

unit carries a phrase of text) and metric placement (each unit is clearly separated in time). The pcsets associated with the first and last serial units (I_8 and P_0) of the tenor line are Rp-related (reminiscent of the tenor lines of the *Cantus Cancrizans*), while the middle unit, RP_{10} , shares only three pcs with each of its neighbours. The segmentation of the instrumental lines is closely coordinated with the three divisions of the tenor part, which points up the partitioning of A-type canons into three subsections: *a b a'* (mm. 1-5, 6-9, 10-12)—see example 4.8 and tables 4.5 and 4.6.

The succession of segment-types for each of the three instrumental voices is summarized in table 4.5. As illustrated in example 4.8 and table 4.5, serial formations are expressed once only in each instrumental line, and once only in each subsection: P_0 , Ob.2 (*a*); P_3 , Ob.1 (*b*); P_0 , 'cello (*a'*)—notice that P_0 in the 'cello is completed by Ob.1 in m.12 (shown by the L-shaped beam and the broken line and arrow in example 4.8, and in the score as a distorted bracket).¹⁶

Table 4.5. *Ricercar II*: Summary of instrumental segment-types in A-type canons

	<i>a</i> , mm. 1-5	<i>b</i> , mm. (5)6-9		<i>a'</i> , mm. 10-12
Oboe 1	4-23 {2479} diatonic	RP_{10} serial		7-35 {e024579} diatonic
Oboe 2	P_0 serial	6-z10 {5789e0} NE (Rp) { I_3 }	5-23 {57t0} diatonic	7-23 {0234579} near-diatonic
'Cello	6-z3 {9te023} = { I_6 }	5-2 {01235} ss { I_9 }	6-z6 {89t123} NE (Rp) { P_{10} }/{ I_5 }	Incomplete P_0 = 5-2 {02345} (completed in Ob.1)

The pcsets derived from the segmentation of the oboe lines reveal the interaction of the diatonic and chromatic genera, an interaction that is intrinsic to the design of the series. The scs derived from the segments of the Ob.1 line express a progression from diatonic to chromatic to diatonic: sc 6-z3 (RP_{10}) framed by two diatonic sets, 4-23 {2479} and its superset 7-35 {e024579}. The formations in Ob.2 express a progression from chromatic to diatonic: chromatic scs 6-z3 (P_0) and sc 6-z10 followed by the

¹⁶ Stravinsky, *Cantata*. See, for example, p.17 (one measure before R9).

diatonic sc 5-23 and the near-diatonic sc 7-23 (the abstract complement of 5-23). The ‘cello line does not express diatonic-chromatic interaction. Rather, the ‘cello-line scs belong exclusively to the chromatic genus and are related to one another through expressions of 6-z3: 6-z3, to 5-2 (ss 6-z3), to 6-z6 (NE 6-z3), to 5-2 (ss 6-z3).

The pcsets derived from the vertical adjacencies of the A-type canons (shown below the staff system in example 4.8) are primarily diatonic, which in turn suggests that the diatonic genus influences linear design and interaction in terms of pitch selection and deployment. Table 4.6 lists these pcsets and draws them into associations with scs 6-z3 and 6-z25 (see also table 4.3). Of the fifteen pcsets listed, eight are inclusion-related to both 6-z3 and 6-z25, six are members of 6-z25 only, and one belongs to neither of the two hexachords (3-12 {7e3}). Since none of these pcsets belong exclusively to 6-z3, and all (but one) belong to 6-z25, their strongest generic affiliation is with the diatonic genus.

Table 4.6. Ricercar II: Generic associations of vertical adjacencies in A-type canons

<i>a</i> , mm. 1-5		<i>b</i> , mm. (5)6-9		<i>a'</i> , mm. 10-12	
SC/PCSET	ASSOCIATION WITH 6-Z3/6-Z25	SC/PCSET	ASSOCIATION WITH 6-Z3/6-Z25	SC/PCSET	ASSOCIATION WITH 6-Z3/6-Z25
3-11 {904}	6-z25	3-12 {7e3}	No association	3-11 {047}	6-z25
4-26 {0479}	6-z25	3-4 {7e0}	6-z3/6-z25	3-9 {9e4}	6-z25
3-7 {025}	6-z3/6-z25	3-10 {903}	6-z3/6-z25		
4-13 {e245}	6-z3/6-z25	4-20 {0158}	6-z25		
		3-10 {7t1}	6-z3/6-z25		
		3-11 {590}	6-z25		
		3-4 {015}	6-z3/6-z25		
		3-7 {902}	6-z3/6-z25		
		2-5 {92}	6-z3/6-z25		
Total pc content: 7-35 {e024579}		Total pc content 10-2 {789te01235}		Total pc content: 5-27 {479e0}	

The *boundary sets* derived from vertical adjacencies associated with the boundaries of the tenor-line serial units form a design similar to that found in the Ob.1 line: diatonic – serial – diatonic (example 4.8, above the staff system). The diatonic pcsets 5-27

{90245} and 3-9 {9e4} enclose the octatonic 5-10 {9e023}, a subset of $\{I_6\}$. The framing diatonic sets are subsets of 7-35 {e024579}, the pc collection derived from the vertical adjacencies of mm. 1-5; sc 5-27 is also expressed in the pc collection derived from the vertical adjacencies of mm. 10-12. The superset formed through the union of the boundary sets, 7-z36 {9e02345}, is both NE (Rp) to 7-35 {e024579} and a superset of $\{P_0\}$.

Transformational expressions of the series occur at the musical surface in A-type canons as serial units, as pcsegs sharing pc content with serial units, or as pcsegs that express the diatonic attributes of 6-z3, the sc representing the series. The diatonic genus is strongly expressed in the vertical dimension, both locally and globally, through the momentary sonorities defined by the boundary points of the various linear segments and through the larger pcsets derived from the tenor-lines boundary sets. The quintessentially diatonic sonorities 3-11 {904} and 3-9 {9e4} that frame the A-type canons exemplify the moment-to-moment vertical expressions of the diatonic genus, while the near-diatonic boundary superset 7-z36 {9e02345} exemplifies the large-scale vertical expression of the diatonic genus. Since 7-z36 {9e02345} contains the chromatic sc 6-z3 $\{P_0\}$, it represents yet another expression of chromatic-diatonic interaction, intrinsic to the serial design, that is characteristic of the linear formations which participate in the A-type canons as well as the constituent linear formations of the nonrecurring canons, Canons B, C, D, and E.

Canon B

Canon B, which begins at R10 and spans twelve measures, instantiates the chromatic-diatonic interaction that plays such an important role in the pitch structures of the various blocks of *Ricercar II* (example 4.9).¹⁷ Similar to the A-type canons, the linear segments discovered through analysis in Canon B express serial units, are derived from the pcsets associated with sc 6-z3, or are manifestations of the diatonic attributes of the series and sc 6-z3. In addition, the diatonic genus is clearly expressed in the vertical adjacencies

¹⁷ Stravinsky, *Cantata*, 17-18 (R10-R13).

associated with the boundaries of the interacting linear segments. Unlike the A-type canons, however, the octatonic genus is also expressed as an important vertical collection.

Example 4.9 is a pitch reduction of Canon B. The tenor line in Canon B comprises three serial units, RP₁₀ and P₁₀ (palindrome) elided to an *altered* version of I₄ (see below), which suggests the division of Canon B into three subsections. This division, however, is less defined in Canon B than in the A-type canons. Unlike the A-type canons, the phrase structure of the text is not as closely coordinated with the deployment of the serial units in Canon B. In addition, the three serial units of the tenor line are elided and, consequently, the boundary sets generated from the vertical adjacencies that coincide with the boundaries of the tenor line segmentation are also elided. Furthermore, the boundaries of the linear formations in the instrumental lines are not closely coordinated with the boundaries of the tenor-line serial units. Thus, the present analysis divides Canon B into three subsections: *a*, mm. 1-4; *a'*, mm. 4-8; *b*, mm. (8)9-12.

A salient feature of the tenor-line design in Canon B is the expression of significant transformational techniques that effect compositional continuities with the Cantus Cancrizans and the ritornello blocks. The palindromic formation in mm. 1-8 recalls the predominant design of the Cantus Cancrizans, while the segment in mm. 8-12 (labeled “Altered I₄” in example 4.9) recalls the transformational relationship between the tenor lines of Rit¹ and Rit². The altered I₄ segment is a *distortion* (a transformation) of the serial unit I₄ that is affected through substitution (see Chapter 2). As shown in example 4.9, the altered I₄ segment is elided to the previous segment in which P₁₀ unfolds so that the final element of P₁₀, pc9, becomes the first element of the altered I₄ unit. Thus, pc9 substitutes for the first element of I₄, pc8:

<i>Order position:</i>	1	2	3	4	5	6	7	8	9	10	11
I ₄ :	8	0	t	8	7	9	t	8	0	t	1
Altered I ₄ :	9	0	t	8	7	9	t	8	0	t	1

Although this distortion alters the serial unit in terms of order, it does not alter the pc content of I₄: both the segment “altered I₄” and the serial unit upon which it is modeled yield 6-z3 {789e01}.

The succession of segment-types for each of the three instrumental voices is summarized in table 4.7. As illustrated in example 4.9 and table 4.7, serial formations are expressed once only in each instrumental line: RP₇, Ob.1 (*a*); RI₁₁, Ob.2 (overlapping subsections *a'* and *b*); P₅, 'cello (*a*). The instrumental lines are also replete with linear components that derive pitch-classes from 6-z3 pcsets and subsets associated with a specific serial unit. Three of these segments hold a direct relationship with serial units expressed in Canon B: the RP₇ segment in Ob.1 is followed by 4-z15 segment that yields a subset of {P₇} (and {RP₇}, of course); the RI₁₁ segment in Ob.2 is preceded by and elided to the 6-z3 segment in mm. 5-7 that yields {I₁₁}; the 4-2 pcseg in the 'cello line, mm. 12, yields a subset of {P₁₀} (tenor). Notice that some of the diatonic-type segments yield collections that are expressed as vertical adjacencies: 3-11 <2959>, Ob.2 (m.4) and 3-11 {259}, m.4; 4-22 <970575905>, 'cello (mm. 9-11) and 4-22 {5790}, m.8.

Table 4.7. Ricercar II: Summary of instrumental segment-types in Canon B

	<i>a, a'</i> mm. 1-8				<i>b</i> , mm. (8)9-12		
Oboe 1	RP ₇ serial				4-z15 {67t0} ss {P ₇ }		5-23 {13468} diatonic
Oboe 2	5-10 {02356} ss {I ₉ }	3-11 {259} diatonic	6-z3 {234578} = {I ₁₁ }		RI ₁₁ serial		
'Cello	P ₅ serial		4-11 {0245} ss {I ₈ }/{P ₀ } (diatonic)	3-6 {8t0} diatonic	4-5 {1567} ss {P ₂ }	4-22 {5790} diatonic	4-2 {t012} ss {P ₁₀ }

Among the segments identified as "diatonic" in table 4.7, 4-11 {0245} is unique since it is inter-generic: it is a subset of 6-z3—{P₀} and {I₈}—and a subset-class of the diatonic hexachord 6-z25. In addition, 4-11 {0245} is the abstract complement of the near-chromatic octad 8-11 {01234579}, the superset of all the boundary sets shown above the staff in example 4.9.

Table 4.8 lists the pcsets derived from the vertical adjacencies of Canon B, identified below the staff system in example 4.9, and draws them into associations with scs 6-z3 and 6-z25 (see also table 4.3). Of the eighteen pcsets listed, five are inclusion-related to both 6-z3 and 6-z25, nine are members of 6-z25 only, three are members of 6-z3 only,

and one belongs to neither of the two hexachords (4-18 {78e2}). Since only four of the eighteen pcsets are excluded from membership in 6-z25, the majority of these pcsets are affiliated with the diatonic genus. While the diatonic genus continues to control vertical interactions at the local level, however, the collections of vertical-adjacency pcsets for each of the subsections indicates a progression from the diatonic genus to the chromatic (table 4.8). The vertical adjacencies of subsection *a* yields the near-diatonic pcset 7-25 {0235679}, while the vertical adjacencies of subsections *a'* and *b* yield near-expressions of the chromatic aggregate—11-1 {23456789te0} and 11-1 {123456789te}, respectively.

Table 4.8. Ricercar II: Generic associations of vertical adjacencies in Canon B

<i>a</i> , mm. 1-4		<i>a'</i> , mm. 4-8		<i>b</i> , mm. (8)9-12	
SC/PCSET	ASSOCIATION WITH 6-z3/6-z25	SC/PCSET	ASSOCIATION WITH 6-z3/6-z25	SC/PCSET	ASSOCIATION WITH 6-z3/6-z25
2-3 {90}	6-z3/6-z25	4-16 {t045}	6-z25	3-10 {369}	6-z3/6-z25
4-7 {2367}	6-z3	3-11 {47e}	6-z25	3-11 {047}	6-z25
3-11 {037}	6-z25	4-22 {0249}	6-z25	4-27 {57t1}	6-z25
3-11 {259}	6-z25	3-10 {903}	6-z3/6-z25	3-2 {578}	6-z3/6-z25
		4-20 {7803}	6-z25	4-12 {0236}	6-z3
		4-18 {78e2}	No association	3-3 {134}	6-z3
		3-4 {56t}	6-z3/6-z25		
		4-22 {5790}	6-z25		
Total pc content: 7-25 {0235679} NE 7-35		Total pc content 11-1 {23456789te0}		Total pc content: 11-1 {0123456789t}	

Similar to the A-type canons, the diatonic genus controls linear interactions in Canon B at the local level, but—unlike the A-type canons—not at the global level. As we have seen, the majority of the moment-to-moment vertical adjacencies hold membership in the diatonic genus, while several are inter-generic.¹⁸ The succession of boundary sets associated with the tenor line segments of Canon B indicates that the diatonic genus and the *octatonic* genus influences the pitch level at which the tenor-line formations begin

(and end) their respective unfoldings. The concomitant boundary sets of the palindrome (tenor, mm. 1-8, *a* and *a'*) form the diatonic sets 4-26 {9025} and 5-35 {57902}—{9025} is a subset of {57902}, which is a subset of the near-diatonic pcset 7-25 {0235679} produced by the collection of vertical adjacencies in subsection *a*. The octatonic genus, however, affects the pitch level of linear formations in mm. 9-12 (subsection *b*). The boundary sets derived from the third tenor segment (altered I_4) yields the near-octatonic pcset 7-26 {0134579}.¹⁹ This is supported by the vertical adjacencies found in mm. 9-12, *all* of which are primary members of the octatonic genus: 3-10, 3-11, 4-27, 3-2, 4-12, and 3-3 (see table 2.4). Finally, the pcset produced through the union of the boundary sets, 8-11 {01234579}, is near-chromatic (NE 8-1), which alludes to the primary chromatic association of sc 6-z3.

The linear formations in Canon B express a progression of transformational processes beginning with the series, which is realized as serial units and derivative formations associated with sc 6-z3, or as diatonic formations that hold more abstract relationships with the series through its diatonic attributes. The counterpoint underlying the moment-to-moment interactions of the simultaneous unfoldings of the linear formations is shaped by interval collections that produce sets that are primarily associated with the diatonic genus in subsections *a* and *a'*, and by sets that are primarily associated with the octatonic genus in subsection *b*. Ultimately, the entire succession of vertical adjacencies expresses the aggregate. Thus, the pre-compositional potential of the series becomes manifest on many levels in Canon B: through transformational processes, the chromatic, the diatonic, and the octatonic attributes of the series are exploited locally and globally, at the musical surface and at higher structural levels.

Canon C

Canon C, the Canon that begins at R18 and spans nine measures, is similar in several respects to the A-type canons and to Canon B.²⁰ The segments discovered through analysis and illustrated in example 4.10 articulate serial units and non-serial formations

¹⁸See table 2.5: "Pan-generic and inter-generic scs of 7-1/7-35/8-28."

¹⁹ Set-class 7-26 is NE to 7-31; 6-z49 intersects.

that derive pcs from the pcsets associated with sc 6-z3 or from diatonic collections. In addition, the diatonic genus is clearly expressed in the vertical adjacencies associated with the boundaries of the interacting linear segments.

Similar to Canon A, the tenor line of Canon C comprises three discrete serial units (I₅, RI₈, and P₉), each of which is articulated through the scansion of the text (each unit carries a phrase of text) and metric placement (each unit is clearly separated in time). The pcsets associated with the first and last serial units (I₅ and P₉) of the tenor line are Rp-related, while the middle unit, RI₈, shares only three pcs with I₅ and four with P₉. The segmentation of the instrumental lines is closely coordinated with the three divisions of the tenor part—with the exception of the ‘cello part, all voices comprise three segments. Thus, the present analysis partitions Canon C into three subsections: *a b a'* (mm. 1-4, 4-7, and 7-9).

The succession of segment-types for each of the three instrumental voices of Canon C is summarized in table 4.9 (below; see example 4.10). Unlike the A-type canons and Canon B, there are two serial formations in the Ob.1 line (I₁₀ and P₉, *a* and *a'*). Otherwise, serial units are expressed once only in the other instrumental lines: I₈, Ob.2 (*b*); P₅, ‘cello (*a'*). The patterned deployment of linear formations in Ob.1 and Ob.2 are similar: serial unit – diatonic set – serial unit or pcset derived from a serial unit. The Ob.1 line comprises the succession I₁₀, 5-23 {4679e}, and P₉; the Ob.2 line comprises I₈, 7-35 {679e024}, and 5-2 {12346}—a subset of {I₁₀}. Notice the relationship between the first segment of Ob.1 and the final segment of Ob.2: pcs derived from I₁₀ in Ob.1 are represented in the 5-2 segment of Ob.2. Similar relationships are expressed elsewhere: the 5-2 segment that initiates the ‘cello line is derived from the second serial unit in the tenor line (RI₈); pcset {4679e}, derived from the 5-23 segment in Ob.1 is a subset of pcset {679e024} derived from the 7-35 segment in Ob.2.

²⁰ Stravinsky, *Cantata*, 19-20 (R18-R20).

Example 4.10. Ricercar II: Pitch reduction of Canon C

Boundary sets →

10-4 {e012345789}

6-32 {024579}

5-35 {02479}

4-23 {0257}

6-226 {89e134}

(R)

(a)

(b)

(a')

18

19

15 <9|e98te9|e2>

R18 <524021e0240>

P9 <19e120e19e8>

110 <26421342647>

5-23 <79e7967e74>

5-2 <19e120e19e8>

18 <0420e120425>

7-35 <47679e02>

5-2 <124642461343>

ss {110}

P5 <9579e879574>

4-1 <4656767675>

ss (P2)/(11)

5-2 <421e02>

ss {18}

3-11 2-3 4-27 2-5 {904} {e2} {6902} {e4}

4-26 3-7 3-7 4-22 4-26 {e247} {247} {257} {2579} {4790}

4-23 3-9 3-11 {0257} {027} {914}

4-20 {348e}

3-11 3-4 {148} {348}

Ten.

Ob.1

Ob.2

Vc.

1

2

3

4

5

6

7

8

9

Table 4.9. Ricercar II: Summary of instrumental segment-types in Canon C

	<i>a</i> , mm. 1-4		<i>b</i> , mm. 4-6	<i>a'</i> , mm. 7-9
Oboe 1	I ₁₀ serial		5-23 {4679e} diatonic	P ₉ serial
Oboe 2	I ₈ serial		7-35 {679e024} diatonic	5-2 {12346} ss {I ₁₀ }
'Cello	5-2 {e0124} ss {I ₈ }	4-1 {4567} ss {P ₂ }/(I ₁)	8-23 {9te02457} diatonic	P ₅ serial

The pcsets derived from the vertical adjacencies of Canon C, shown below the staff system in example 4.10, are primarily associated with the diatonic genus. Of the seventeen pcsets listed in table 4.10, only one is not a subset of 6-z25 (i.e., 3-3 {145}, m.7). The supersets derived from the vertical-adjacency pcsets and the boundary sets for each of the three sections also reflect the strong diatonic orientation of the vertical aspect of Canon C, and indicate that two diatonic collections in particular—8-23 and 7-30 (NE 7-35)—influence vertical interaction. The vertical adjacencies of subsection *a* form into the diatonic octad 8-23 {45679e02}, which is a superset of the concomitant boundary set 5-35 {02479} shown above the staff system in example 4.10. The combined vertical adjacencies of subsection *b* produce the diatonic hexachord 6-32 {024579}, a superset of the concomitant boundary set 4-23 {0257}, a subset of 8-23 {45679e02} representing the vertical adjacencies of subsection *a*, and the same pcset as the boundary-set superset for subsections *a* and *b*. The superset of the vertical adjacencies from subsection *a'* is the near-diatonic pcset 7-30 {89e1345}; the boundary set for this section is the diatonic hexachord 6-z26 {89e134}.

The characteristic diatonic-chromatic interaction that influences much of the pitch organization in Ricercar II resonates in the relationships among linear formations of Canon C. This interaction, however, is less apparent in the vertical dimension since the succession of processes that transform the series into serial units, segments derived from pcsets associated with serial units, and segments associated the diatonic aspect of the series is mitigated primarily by two large diatonic collections in Canon C: the diatonic octad 8-23 and the near-diatonic heptad 7-30. Even though these sets coalesce into the

chromatic pcset 11-1 {e0123456789}, a superset of the boundary superset 10-4 {e012345789}, the subsections of Canon C are partially defined through the moment-to-moment diatonic vertical adjacencies that form into large, well-defined diatonic pcsets.

Table 4.10. Ricercar II: Generic associations of vertical adjacencies in Canon C

<i>a</i> , mm. 1-4		<i>b</i> , mm. 4-6		<i>a'</i> , mm. 7-9	
SC/PCSET	ASSOCIATION WITH 6-z3/6-z25	SC/PCSET	ASSOCIATION WITH 6-z3/6-z25	SC/PCSET	ASSOCIATION WITH 6-z3/6-z25
3-11 {904}	6-z25	3-7 {247}	6-z25	3-11 {914}	6-z25
2-3 {e2}	6-z3/6-z25	3-7 {257}	6-z25	3-3 {145}	6-z3
4-27 {6902}	6-z25	4-22 {2579}	6-z25	3-11 {148}	6-z25
2-5 {e4}	6-z3/6-z25	4-26 {4790}	6-z25	4-20 {348e}	6-z25
4-26 {e247}	6-z25	4-23 {0257}	6-z25	3-4 {348}	6-z3/6-z25
4-27 {e257}	6-z25	3-9 {027}	6-z25		
Total pc content: 8-23 {45679e02}		Total pc content 6-32 {024579} ss 8-23 {45679e02}		Total pc content: 7-30 {89e1345} NE 7-35	

Canon D

Canon D—beginning at R25 and spanning nine measures—evinces chromatic-diatonic interaction within its constituent linear formations and diatonic attenuation of the vertical interactions of these formations, which in turn effects compositional continuity among the Canons as a group. Canon D is also unique among the Canons because of the range of transformational types and the selection of segment types expressed in each of the vocal and instrumental lines.²¹

²¹ Stravinsky, *Cantata*, 21-22 (R25-R28).

The tenor part in Canon D comprises three discrete segments, each of which carries a separate phrase of text, and each of which expresses a *different* segment-type: serial (P_0); non-serial (5-23); or altered serial (altered P_{11}). As is shown in example 4.11 (and table 4.11), the tenor line is unique with respect to the tenor lines of the other Canons because the second segment *is not* a serial unit nor is it associated with a serial unit.²² The segmentation of the instrumental lines is closely coordinated with the boundaries of the tenor-line segments. Thus, Canon D is partitioned into three subsections: *a*, *b*, *c* (mm. 1-3, 3-6, and 6-10).

The unusual design of the tenor line warrants further comment. The second segment of the tenor line, the non-serial 5-23 <90e979e90e2>, holds a weak relationship with the series since they both share the same number of ordered pitch classes (11), but holds strong relationships to other linear formations found in this and other blocks. The sc 5-23 representing this segment is articulated by linear formations in both types of ritornello blocks, as well as by clearly defined segments within the linear formations of the A-type canons, Canons B and C, and in the ‘cello line of Canon D. The pcset derived from the 5-23 segment, 5-23 {79e02}, in combination with the pcset associated with P_0 {e02345} yields the near-diatonic octad 8-22 {79e02345}—sc 8-22 is represented in the Fl.2 line of Rit².

The altered P_{11} unit that constitutes the third segment (mm. 6-8) of the tenor line is simultaneously presented in the Ob.1 line. Similar to the transformational processes that altered the P_4 unit found in Canon B, the alteration of P_{11} in Canon D entails a pc substitution at o.p.1: in this case, pc3, found at o.p.1 of P_{11} , substituted by pc2:

<i>Order position:</i>	1	2	3	4	5	6	7	8	9	10	11
P_{11} :	3	e	1	3	4	2	1	3	e	1	t
Altered P_{11} :	2	e	1	3	4	2	1	3	e	1	t

Once again, this distortion alters the serial unit in terms of order, but does not alter the pc content of P_{11} : both the segment “altered P_{11} ” and the serial unit upon which it is modeled yield 6-z3 {te1234}.

²² Ibid. The non-serial segment is the only segment in the tenor lines of the Canons that is not highlighted by a bracket in the score.

The succession of segment-types illustrated in example 4.11 for each of the three instrumental voices of Canon D is summarized in table 4.11. Similar to the other Canons, each instrumental line includes segments that express serial units, are derived from the pcsets that represent serial units, or are derived from diatonic pcsets. Unlike the other Canons, *each* instrumental line contains two serial units instead of one. In addition, there are three segments that are unusual with respect to the types of segments identified through the foregoing analyses of the instrumental lines of the Canons. Two of these are the palindromic segments (labeled “Palindrome” in example 4.11): the 5-24 segment in the Ob.2 line (mm. 3-5) and the 4-11 segment in the ‘cello line (m.7):

Axis

Ob.2, 5-24 (mm. 3-5): 7 5 7 0 e 0 9 7 9 0 e 0 7 5 7

Vc., 4-11 (m.7): 7 9 e 0 e 9 7

Of course, these reflection-symmetric pc formations are not without precedent. Such localized palindromic formations—expressed as constituent segments within a single line—recall similar constructions typical of the tenor line in the Cantus Cancrizans and the palindromic dispositions of serial units in the tenor line of the Canon B, and forecasts the palindromic construction found in the tenor line of Canon E (below).

Table 4.11. Ricercar II: Summary of instrumental segment-types in Canon D

	<i>a</i> mm. 1-3	<i>b</i> mm. 3-6			<i>c</i> mm. 6-9			
Oboe 1	P ₀ serial	5-23 {579e0} diatonic	6-z3 {e02345} = {P ₀ }	5-2 {9e012} ss {P ₉ }	Altered P ₁₁ serial			
Oboe 2	4-11 {79e0} ss {P ₇ }/{I ₃ } (diatonic)	I ₁₀ serial			Altered P ₂ serial = 6-1 {234567}		4-11 {2357} ss {P ₃ }/{I ₁₁ } (diatonic)	
‘Cello	I ₈ serial	P ₀ serial			4-11 {79e0} ss {P ₇ }/{I ₃ } (diatonic)	5-2 {24567} ss {P ₂ }	5-2 {5678t} ss {I ₂ }	5-3 {679te} ss {P ₇ }
							5-23 {8te13} diatonic	

The third segment of special interest is the altered P_2 in the Ob.2 line that spans mm. 6-9. Like the other altered serial units found in Canon D and Canon B, the operation of pc substitution affects a distortion of the original model. The transformation of P_2 in this instance, however, involves several substitutions (at o.p.1, 9, 10, and 11), which results in the transformation of the pcset and the set class that represents the un-altered serial unit from 6-z3 {124567} to 6-1 {234567}:²³

Order position:	1	2	3	4	5	6	7	8	9	10	11	
P_2 :	6	2	4	6	7	5	4	6	2	4	1	6-z3 {124567}
Altered P_2 :	5	2	4	6	7	5	4	6	3	5	2	6-1 {234567}

The pcsets derived from the vertical adjacencies of Canon D, shown below the staff system in example 4.11, are primarily associated with the diatonic genus. Of the twenty-five pcsets listed in table 4.12, twenty-one pcsets are members of the diatonic genus, three are subsets of 6-z3 only, and one is not a subset of either 6-z25 or 6-z3 (i.e., 4-18 {9034}, m.5).²⁴ While the diatonic genus generally affects the interval content of the vertical adjacencies produced through the constituent segments of the interacting linear formations, the chromatic genus becomes manifest through the accretions of the pcsets representing these sonorities. As shown in table 4.12, the two vertical adjacencies in subsection *a* yield the diatonic tetrachord 4-20 {e047}, while the supersets produced by the vertical adjacencies of subsections *b* and *c* express near-completion of the aggregate—10-2 {e012345679} and 11-1 {te012345678}, respectively. The boundary sets, however, point toward diatonic attenuation of the vertical interactions at a higher level (example 4.11). The union of the diatonic boundary superset for subsections *a* and *b*, 7-35 {e024579}, and the near-diatonic boundary set of subsection *c*, 5-21 {7te23}, produces the diatonic nonachord 9-9 {9te023457}.²⁵

The juxtaposition of segments that express serial units, segments derived from serial units, and segments derived from diatonic sets within the linear formations of Canon D

²³ Stravinsky, *Cantata*, 22 (before R27). This segment is highlighted with a bracket in the score, indicating that it is a serial unit.

²⁴ Set-class 4-18 is a member of the octatonic genus.

²⁵ Set-class 5-21 is NE to 5-27; sc 9-9 is the characteristic nonachord of the diatonic genus.

continues to evoke the chromatic-diatonic interaction that is a fundamental characteristic of the series. Moreover, the altered P_2 unit and the 4-11 segments represent unique realizations of the pre-compositional potential of the series. The radical transformation of P_2 and its concomitant sc 6-z3 into altered P_2 , represented by sc 6-1, points up the strong association the series holds with the chromatic genus since sc 6-z3, already a primary member of the chromatic genera, is also NE to sc 6-1, the characteristic hexachord of the chromatic genus. In contrast, the three 4-11 segments identified in example 4.11 express the relationship the series holds with the diatonic genus since each segment produces a pcset that intersects with two serial units—labeled as {P}/{I}-pairs in example 4.11—and sc 4-11 is a subset of the diatonic sc 6-z25 (see table 4.11).

Table 4.12. Ricercar II: Generic associations of vertical adjacencies in Canon D

<i>a</i> , mm. 1-3		<i>b</i> , mm. 3-6		<i>c</i> , mm. 6-9	
SC/PCSET	ASSOCIATION WITH 6-z3/ 6-z25	SC/PCSET	ASSOCIATION WITH 6-z3/ 6-z25	SC/PCSET	ASSOCIATION WITH 6-z3/ 6-z25
3-11 {047}	6-z25	4-23 {7902}	6-z25	2-5 {27}	6-z23/6-z25
2-1 {e0}	6-z23/6-z25	4-22 {5790}	6-z25	3-11 {7e2}	6-z25
		3-11 {047}	6-z25	3-7 {025}	6-z23/6-z25
		3-2 {e02}	6-z23/6-z25	4-27 {9e25}	6-z25
		4-27 {1479}	6-z25	2-4 {26}	6-z23/6-z25
		4-18 {9034}	No association	3-9 {e46}	6-z25
		3-6 {246}	6-z23/6-z25	4-12 {1457}	6-z3
		4-11 {e024}	6-z23/6-z25	4-14 {1348}	6-z25
		4-22 {79e2}	6-z25	3-3 {347}	6-z3
				3-11 {37t}	6-z25
				3-9 {8t3}	6-z25
				3-3 {t12}	6-z3
3-11 {t15}	6-z25				
		3-11 {37t}	6-z25		
Total pc content: 4-20 {e047}		Total pc content 10-2 {e012345679}		Total pc content: 11-1 {te012345678}	

The deployment and the pc content of the inter-generic 4-11 sets are also significant. The pcsegs 4-11 <7090e0> and 4-11 <2357> enclose the two serial units (I₁₀ and altered P₂) of the Ob.2 line. This arrangement derives from the serial design since the series itself can be divided into two equal sections about a center-point (axis), each of which express sc 4-11 (example 4.1). The left boundary of the palindromic 4-11 <79e0e97> coincides with the left boundary of subsection *c* and initiates the succession of non-serial segments that follow the two serial units (I₈, P₀) in the 'cello line. Finally, the pcset 4-11 {79e0} representing <7090e0> and <79e0e97> establishes an important link with the boundary superset of subsections *a* and *b*, 7-35 {e024579}, while pcset 4-11 {2357} expresses three pcs of the boundary set for subsection *c*, 5-21 {7te23}—{237} intersects.

The diatonic attenuation of the vertical interaction among the linear formations of Canon D is expressed locally through the moment-to-moment vertical adjacencies that coincide with segment boundaries and globally through the boundary sets defined by segmentation of the tenor line. Similar to Canon C, the local and large-scale manifestations of the diatonic genus in the vertical dimension in conjunction with the large chromatic sets produced through the accretions of pcsets derived from vertical adjacencies associated with the subsections instantiates the chromatic-diatonic interaction that is characteristic of the pitch organization in Ricercar II.

Canon E

Canon E, which begins at R33 and spans twelve measures, continues to instantiate the characteristic chromatic-diatonic interaction found throughout Ricercar II.²⁶ This interaction, however, appears to be more polarized in Canon E than in the other Canons. The segments discovered through analysis in Canon E express serial units, while the non-serial formations are primarily associated with diatonic pcsets, only one of which is also related to pcsets associated with serial units. In addition, the diatonic formations found in the instrumental lines of Canon E are clearly expressed in the vertical adjacencies associated with the boundaries of the interacting linear segments as well in the boundary sets associated with the constituent segments of the tenor line.

²⁶ Stravinsky, *Cantata*, 23-24 (R33-R36).

Example 4.12 is a pitch reduction of Canon E. Similar to Canon B, the three successive segments of the tenor line are serial units, two of which form into a palindrome based on P forms— RP_0 and P_0 —followed by an I form (I_4). Unlike Canon B, the tenor-line units are clearly delineated: each is non-elided, and each carries a separate phrase of text. Thus, the present analysis partitions Canon B into three subsections: *a*, mm. 1-3; *a'*, mm. (3)4-6; *b*, mm. 7-12 (example 4.12). The division is reinforced through the close coordination of the boundaries of the linear formations of the instrumental and the boundaries of the tenor-line serial units.

The succession of segment-types for the instrumental lines of Canon E, illustrated in example 4.12, is summarized in table 4.13. Unlike the other Canons, the Ob.1 line yields one serial unit (RI_8) while the Ob.2 line and the 'cello line each yield two serial units (RP_0 and RP_6 , and RI_8 and P_1 , respectively). The serial units articulated through the instrumental lines yield pcsets that are in Rp relationships with the tenor-line segments. These include the RI_8 in Ob.1 and RP_0 in the tenor, RI_8 in Ob.2 and P_0 in the tenor (with RP_0 in Ob.1), and P_1 in the 'cello with I_9 in the tenor (see table 4.2).

Except for the 5-8 segment in the Ob.1 line (mm. 4-6), the non-serial segments of the instrumental lines express diatonic collections that hold literal inclusion relationships with the boundary sets shown above the staff system in example 4.12 and, as will be discussed below, with two 7-35 pcsets derived from the vertical adjacencies associated with subsections *a* and *a'*, and subsection *b*. The first segment of the 'cello line, which yields pcset 4-11 {4579} (a subset of $\{P_5\}$ and $\{I_1\}$), and the first segment of the Ob.2 line, which yields 6-33 {24579e}, are subsets of the boundary superset for sections *a* and *a'*, 7-35 {e024579}. The diatonic segments found in the instrumental lines of subsection *b* as well as the boundary set for that subsection are *all* literally inclusion-related to the diatonic octad 8-23 {te013568} articulated by the final segment of the Ob.1 line. The only non-diatonic formation among the non-serial formations, the 5-8 segment in the Ob.1 line (mm. 4-6), <5e7859879e>, yields the chromatic pcset 5-8 {5789e}.²⁷

The pcsets derived from the vertical adjacencies of Canon E, shown below the staff system in example 4.12, are all members of the diatonic genus. Moreover, these pcsets

²⁷ Set-class 5-8 is a primary member of the chromatic genus (table 2.4).

coalesce into two diatonic heptads—7-35 {e024579}, from subsections *a* and *a'*; 7-35 {013568t}, from subsection *b*—which are simultaneously articulated by the corresponding diatonic linear formations (table 4.14, example 4.12). Of the ten pcsets listed in table 4.14, all are subsets of 6-z25—five of these are also subsets of 6-z3. The diatonic heptad 7-35 {e024579}, derived from the union of the pcsets representing the vertical adjacencies of subsections *a* and *a'*, is also expressed as the boundary superset of these subsections and as linear formations (4-11 {4579} and 6-33 {24579e}, discussed above). The diatonic heptad 7-35 {013568t}, derived from the union of the pcsets representing the vertical adjacencies of subsection *b*, is expressed in the diatonic segments of subsection *b* as 7-35 {013568t} (Ob.1 and 'cello), as a subset, 5-35 {68t13} (Ob.2), as a superset, 8-23 {te013568} (Ob.1), and as a subset in the boundary set for subsection *b*, 5-23 {13568}.

Table 4.13. Ricercar II: Summary of instrumental segment-types in Canon E

	<i>a</i> , mm. 1-3	<i>a'</i> , mm. (3)4-6	<i>b</i> , mm. 7-12	
Oboe 1	RP ₈ serial	5-8 {5789e} chromatic	7-35 {013568t} diatonic	8-23 {te013568} diatonic
Oboe 2	6-33 {24579e} diatonic	RP ₀ serial	RP ₆ serial	5-35 {68t13} diatonic
'Cello	4-11 {4579} {P ₅ }/{I ₁ } (diatonic)	RI ₈ serial	P ₁ serial	7-35 {013568t} diatonic

While the near absence of non-serial linear formations derived from sc 6-z3 makes Canon E unique among the Canons, the tenor-line design in addition to the diatonic quality of the vertical adjacencies establish a relationship between Canon E and the Cantus Cancrizans. The palindromic RP₀-P₀ formation articulated by the tenor line alludes to the palindromic P₀-RP₀ formation found in each of the Cantus Cancrizans. Furthermore, the set classes representing two of the three boundary sets of Canon E—scs 5-27 and 5-23—are expressed as the supersets formed by the sonorities that coincide with

the boundaries of the simple and composite symmetrical formations of the Cantus Cancrizans.

Table 4.14. Ricercar II: Generic associations of vertical adjacencies in Canon E

<i>a</i> , mm. 1-3		<i>a'</i> , mm. (3)4-6		<i>b</i> , mm. 7-12	
SC/PCSET	ASSOCIATION WITH 6-z3/6-z25	SC/PCSET	ASSOCIATION WITH 6-z3/6-z25	SC/PCSET	ASSOCIATION WITH 6-z3/6-z25
3-11 {47e}	6-z25	4-13 {e245}	6-z23/6-z25	3-11 {158}	6-z25
3-8 {59e}	6-z23/6-z25	3-4 {e04}	6-z23/6-z25	3-5 {056}	6-z3/6-z25
4-26 {4790}	6-z25			4-26 {t136}	6-z25
				3-11 {158}	6-z25
				4-11 {1356}	6-z23/6-z25
Total pc content: 7-35 {e024579}				Total pc content: 7-35 {013568t}	

The exploitation of the diatonic attributes of the series is more pronounced in Canon E than in the other Canons of Part 2. The vertical interactions among the constituent linear formations of Canon E are controlled by two diatonic collections—7-35 {e024579} and 7-35 {013568t}—that are also literally represented in the non-serial segments of the instrumental lines. The inter-generic sc 5-z12—the pentachord that intersects the chromatic sc 6-z3 and the diatonic sc 6-z25—symbolizes the point of departure along the transformational pathways that links the series and its concomitant chromatic sc 6-z3 with diatonic linear formations and sonorities (see below). Yet Canon E, among *all* of the blocks in Ricercar II, is the only one that articulates 5-z12 as a discrete structural entity. The boundary set for subsection *a'*—pcset 5-z12 {e0245}—is a subset of {P₀} and its NE-partner {I_g}, both of which participate as serial units in subsection *a'* (i.e., P₀, RP₀, and I_g). Thus Canon E, for the first time in Ricercar II, makes explicit the connection that relates the series, P₀, to diatonic pitch objects through sc 5-z12.

THE CANTUS CANCRIZANS, THE RITORNELLI, AND THE CANONS:
THREE TRANSFORMATIONAL NETWORKS

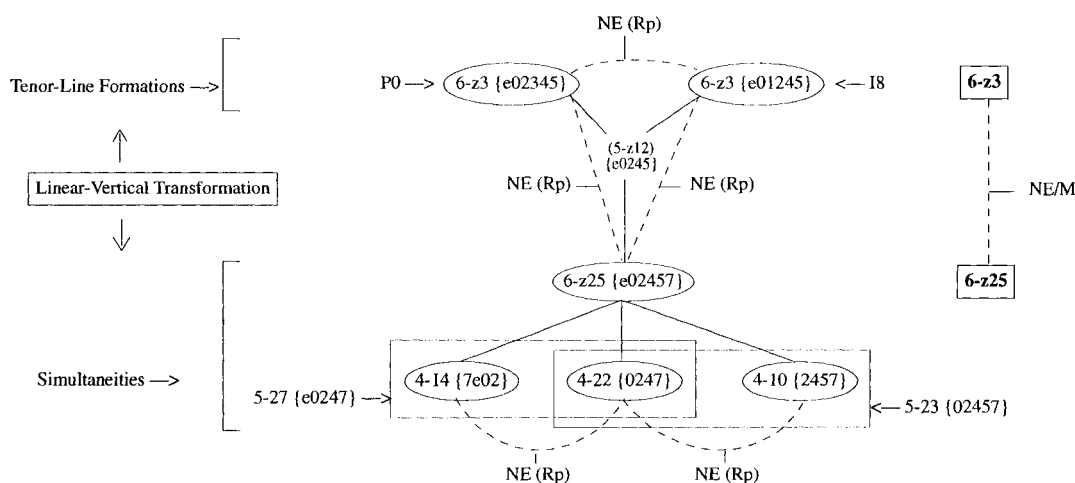
Figures 4.1, 4.2, and 4.3 are transformational networks that interconnect the linear and vertical formations identified through the foregoing analyses of the three Cantus Cancrizans (figure 4.1), the ritornelli (figure 4.2), and the Canons (figure 4.3). Encircled set-class labels represent all of their respective member pcsets derived from the multifarious linear formations and simultaneities; set-class labels enclosed in parentheses represent important nodes of interconnection, but are not actually articulated at the musical surface. Nodes that are connected by solid lines represent scs in abstract inclusion-relations; nodes that are connected by broken lines indicate relations between scs defined by NE or M transformations. Set-classes are arranged in each figure according to their appearance as linear formations and/or as simultaneities (the brackets and labels in the left margin indicate this). Solid (or broken) lines that connect scs representing linear formations to scs representing simultaneities symbolize linear-vertical transformations; that is, the transformation of a pcseg into a simultaneity, or vice versa.

The network depicted in figure 4.1 illustrates the pathways by which the prime ordering of the series (P_0) transforms into diatonic simultaneities in the Cantus Cancrizans. The tenor line is comprised of two serial units, P_0 and I_8 , and their retrograde forms, represented in figure 4.1 as two chromatic pcsets: $\{P_0\}$, 6-z3 {e02345}; $\{I_8\}$, 6-z3 {e01245}. The pentad 5-z12 {e0245}, shown in parentheses, establishes the NE (Rp) relationship between $\{P_0\}$ and $\{I_8\}$ and the NE (Rp) relationship between $\{P_0\}$, $\{I_8\}$, and the diatonic hexachord 6-z25 {e02457}, the pcset to which all of the simultaneities that coincide with the boundaries of the tenor-line serial units belong. These simultaneities express one of three pcsets: 4-22 {0247} and two of its NE (Rp) partners, 4-14 {7e02} and 4-10 {2457}. The NE tetrachord-pairs coalesce into two diatonic pentads, scs 5-27 and 5-23, which reappear as articulated linear formations and/or simultaneities in the ritornelli and the Canons.

Hence, the Cantus Cancrizans are realizations of the transformation of the series and sc 6-z3 into diatonic formations through the NE and linear-vertical transformations. Moreover, the M transformation—one of the symmetries underlying the model of generic

set-class space—draws the chromatic sc 6-z3 and the diatonic sc 6-z25 into a strong partnership that is independent of sc intersection (NE). Thus, the M-partnership between 6-z3 and 6-z25 symbolizes the global phenomena of chromatic-diatonic interaction that is found throughout Ricercar II, while the NE partnership symbolizes the compositional-transformational point-of-departure from formations associated with the chromatic sc 6-z3 to formations associated with the diatonic sc 6-z25. This transformational duality, the transformational relationship of sc 6-z3 and sc 6-z25 through NE or M processes, is symbolically represented in the right margin of figure 4.1.

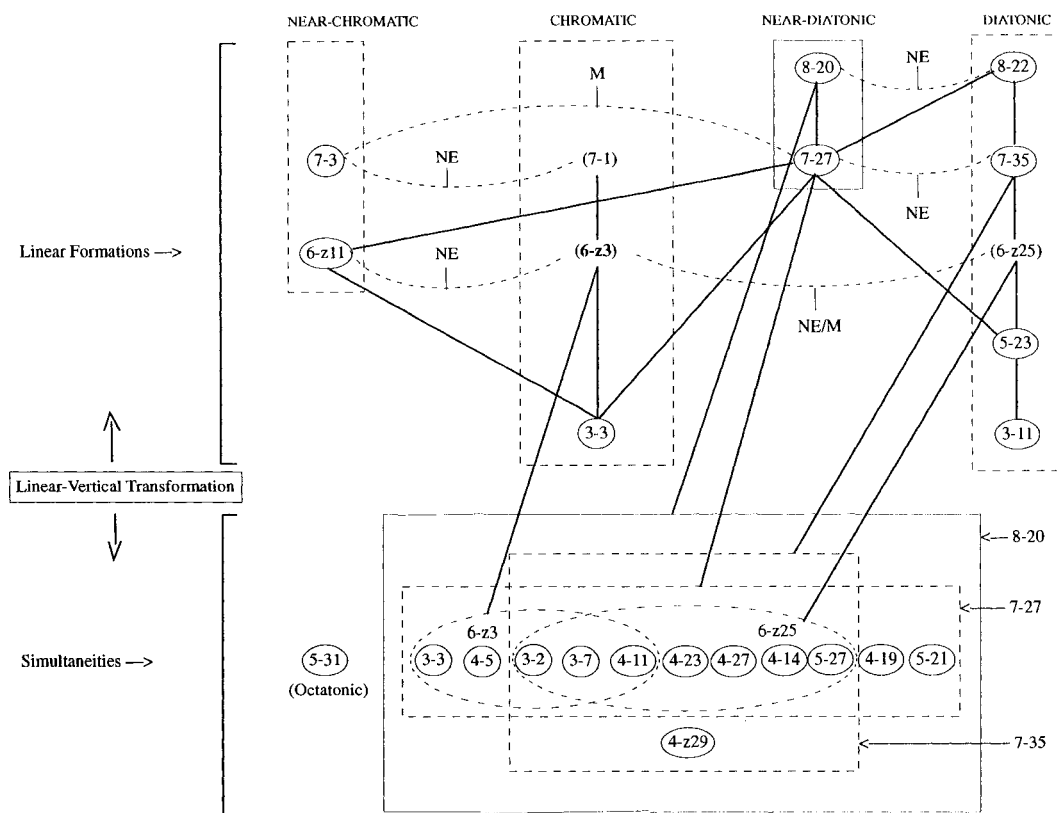
Figure 4.1. Ricercar II: Transformational network, Cantus Cancrizans



The network depicted in figure 4.2 illustrates the transformational pathways among the various linear and vertical formations of the ritornelli blocks (Rit¹ and Rit²). The diatonic formations introduced in the Cantus Cancrizans through the generic and linear-vertical transformations of the series and sc 6-z3 undergo further transformations in the ritornelli so that diatonic and near-diatonic linear and vertical formations become the predominant textural components, while only a few near-chromatic linear and vertical formations allude to the serial unit through generic association. Set-classes 6-z3 and 6-z25, shown among the linear formations in parentheses, are not articulated at the musical surface in the ritornelli: sc 6-z3, in bold typeface, represents the series; the 6-z3/6-z25 pair represents the transformational link between the chromatic and the diatonic genera.

Set classes derived from linear formations are arranged according to their generic associations. The scs representing the tenor lines of Rit¹ and Rit²—scs 7-27 and 8-20, respectively—are near-diatonic because of their NE-partnerships with the primary diatonic scs 7-35 and 8-22. The near-chromatic scs 7-3 (the M-partner of 7-27) and 6-z11 are NE to scs 7-1 and 6-z3, respectively (7-1 does not appear at the musical surface in the ritornelli). Set-class 3-3 is the only subset of 6-z3 that is expressed as a linear formation in the ritornelli.

Figure 4.2. Ricercar II: Transformational network, ritornelli



In figure 4.2, scs representing simultaneities derived from the successive moment-to-moment linear interactions in the ritornelli are grouped together in a complex Venn diagram according to inclusion-relations with significant linear formations.²⁸ In this

²⁸ These scs are derived from the sc/pcset labels shown *immediately below* the staff system in examples 4.6 and 4.7.

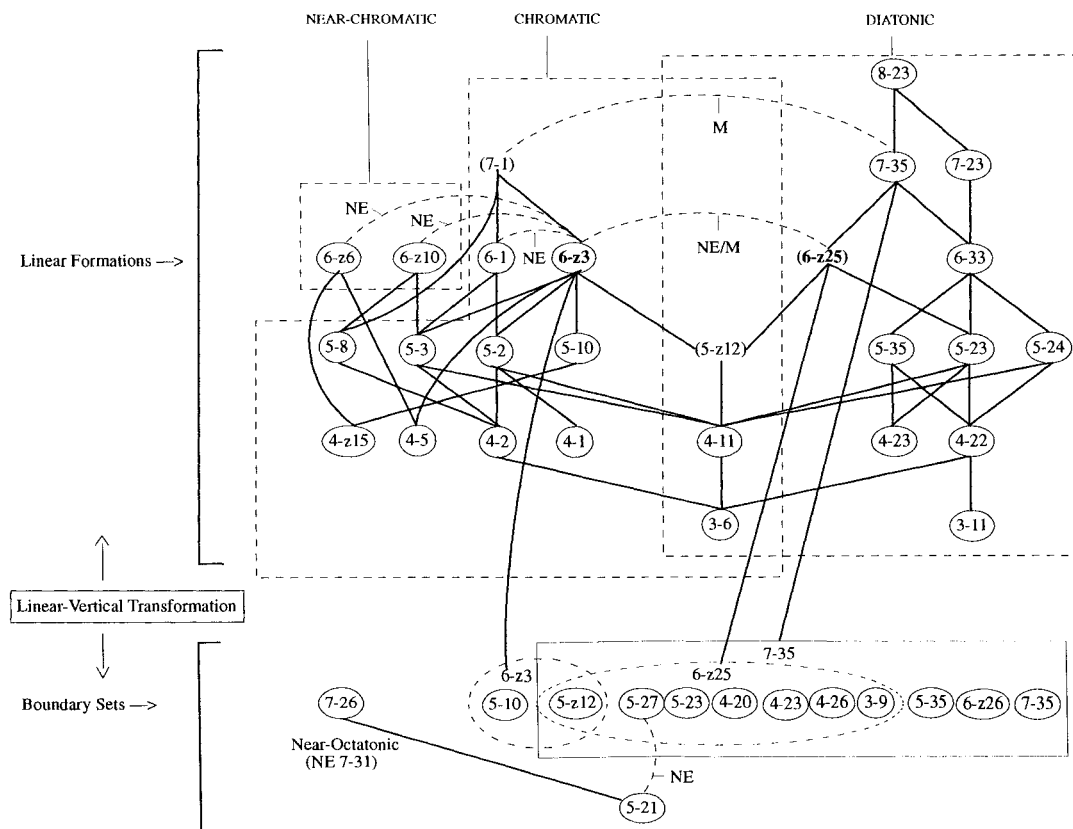
model, all of the simultaneities (except one) represent linear-vertical transformations of subset-classes of the tenor-line formations: with the exception of the octatonic pentad 5-31, all of the simultaneities are inclusion-related to sc 8-20 representing Rit^2 -tenor (enclosed by the solid-lined rectangle) and—with the additional exception of 4-z29—to sc 7-27 representing Rit^1 -tenor (enclosed in the long broken-line rectangle).²⁹

Similar to the Cantus Cancrizans, the contrapuntal texture of the ritornelli is controlled by interval relations that evince diatonic characteristics rather than chromatic. The majority of the scs enclosed by the sc 8-20 rectangle are sub-scs of the diatonic septad 7-35 (enclosed by the broken-line rectangle interlocking the 7-27 enclosure), while only a few represent vertical expressions of subset-classes derived from sc 6-z3. This in turn points up the diatonic attenuation of the counterpoint underlying the interactions of the constituent linear formations of the ritornelli. Vertical expressions of sc 6-z25 found in the Cantus Cancrizans, scs 4-14 and 5-27, are also found in the ritornelli along with five other sub-scs of 6-z25. Thus, the compositional continuity between the ritornelli and the Cantus Cancrizans is primarily realized through the vertical expressions of the diatonic genus and only abstractly through the transformation of RP_0 into the Rit^1 tenor line.

The Canons represent the synthesis and development of compositional features that are characteristic of the Cantus Cancrizans and the ritornelli: each Canon expresses chromatic-diatonic interaction; the linear formations of the Canons express serial units and non-serial formations that derive from serial units or diatonic pcsets; the vertical interaction of the linear formations that constitute each Canon is controlled by the diatonic genus. The transformational network depicted in figure 4.3 shows all of the scs derived from the linear formations and the boundary sets of the Canons (the A-type Canons, and the non-recurring Canons B, C, D, E) and illustrates the transformational pathways among these scs. Set classes representing linear formations are grouped together according to their generic associations, and are vertically arranged according to their cardinality.

²⁹ Set-class 5-31, a primary member of the octatonic genus, is depicted in figure 4.2 as having no transformational relationship with any of the linear or vertical formations, although it is a superset-class of sc 3-3.

Figure 4.3. Ricercar II: Transformational network, Canons



In figure 4.3, all of the linear formations that express serial units or hexachordal pcsets that belong to sc 6-z3 are subsumed by a single representation of sc 6-z3, which in turn minimizes the status of the serial unit so that serial and non-serial formations are no longer polarized. This results in a model of set-class relations in which linear formations belong primarily to one of two groups—chromatic or diatonic. In this model, the number of member scs in each genus is nearly equivalent: 12 diatonic scs and 14 chromatic and near-chromatic scs—the diatonic and chromatic groups share scs 4-11 and 3-6, which are subsets of 5-z12, the sc that links 6-z3 and 6-z25. All of the diatonic scs are characteristic or primary members of the diatonic genus, while the chromatic group contains two near-chromatic scs, 6-z6 and 6-z10, that are NE to sc 6-z3 but are not subsets of sc 7-1 (sc 7-1 is in parentheses since it does not literally appear at the musical surface).

The scs representing the vertical interactions of the linear formations in figure 4.3 are limited to boundary sets (i.e., the pairs of vertical adjacencies that correspond to the boundaries of the tenor-line segments).³⁰ As shown in figure 4.3, the majority of boundary sets are inclusion-related to the diatonic heptad 7-35. Set-class 5-10, a subset of 6-z3, is depicted in this model as belonging to the chromatic genus even though it is also a characteristic member of the octatonic genus. The reason for this particular instance of analytical bias has to do with the lack of representation of large, characteristic octatonic scs in the Canons (and elsewhere in *Ricercar II*). Set-class 7-26, the only large collection derived from the boundary sets that has near-octatonic membership (NE to sc 7-31) is not inclusion-related to sc 5-10. Set-class 5-21, a subset of 7-26, is non-generic; in the present model, it is shown in the context of a near-diatonic sc (NE 5-27). Thus, while the constituent linear formations of the Canons evince chromatic-diatonic interaction, set classes that primarily evince diatonic characteristics control the vertical interactions among these formations.

CONCLUSION: PRECOMPOSITIONAL POTENTIAL AND COMPOSITIONAL REALIZATION IN
RICERCAR II THROUGH CANONICAL AND NON-CANONICAL TRANSFORMATIONS
OF SET-CLASS 6-Z3

In the present chapter, we investigated the precompositional potential of the prime ordering of the series (P_0) through various segmentation strategies, including successive partitioning by trichord and imbrication by trichord, tetrachord, and pentachord. In doing so, we identified the set classes associated with each serial sub-segment, discovered the underlying symmetrical design of the series, established the primary generic association of sc 6-z3 (representing the series) as chromatic, and explored the relationships sc 6-z3 holds with the diatonic and octatonic genera through two of its pentachordal subsets, 5-z12 and 5-10, neither of which is articulated as a pccseg of the series. Once again considering the deployment of the constituent pcs, we noted that the serial design evinces

³⁰ It has already been established that the majority of vertical adjacencies identified in the analyses of

a strong diatonic quality though tonal allusion, and concluded that the series holds a strong relationship with both the chromatic and the diatonic genera, represented in set-class space by the NE/M partnership of scs 6-z3 and 6-z25.

The preceding analyses elucidate the transformational pathways that lead from the precompositional stage to the realization of pitch materials of *Ricercar II*. Each of the constituent blocks of *Ricercar II* exploits the precompositional potential of the series in various ways and at various levels. The symmetry that underlies serial design is expressed through the formal disposition of the blocks, through the palindromic formations of the *Cantus Cancrizans*, and through the canonical transformations of the prime ordering of the series into the serial units found in the *Cantus Cancrizans* and the *Canons*. Symmetry is also expressed through the highly abstract transformations of serial units into non-serial linear formations and simultaneities. These transformations in particular exploit pc resources derived from sc 6-z3 rather than the ordered pc and interval successions that define the series and its derivative P, I, and R forms.

Serial theory effectively models the transformation of the series (the prime ordering) into serial units and near-serial units, but not the transformation of serial units into non-serial linear formations and simultaneities. While the relationship of a serial unit to a chromatic or near-chromatic non-serial formation can be established through inclusion-relations with sc 6-z3 or one of its super-scs/sub-scs, the transformation of the series into diatonic (non-serial) formations entails the compositional exploitation of sc 5-z12, which in turn results in the creation of linear entities that do not have surface relationships with serial units. Even though sc 5-z12 is rarely articulated at the musical surface, it represents the transformational link from the chromatic genus, in which sc 6-z3 is a primary member, to the diatonic genus, in which many of the linear formations and the majority of vertical adjacencies hold membership.

The apparent compositional discontinuities expressed at the musical surface in *Ricercar II* are generally the result of the analytic bias that dichotomizes serial and non-serial formations within the context of a hierarchy in which the serial unit holds the highest analytical status while all non-serial linear formations are reduced to the status of

the *Canons* belong to the diatonic genus.

“filler” and simultaneities become “by-products” of linear interaction. The present study, however, rejects this model and posits that set-class 6-z3, and not the series, represents the transformational point-of-departure from which non-serial linear formations and simultaneities derive pc content that is literally or abstractly related to sc 6-z3 and its member pcsets or subsets, to the chromatic genus in which sc 6-z3 is a primary member, or to the inter-generic pentachordal subset-classes of sc 6-z3. In other words, *Ricercar II* is more than Stravinsky’s “first serial essay”; it is an essay on the potentials of thematic transformation that transcends the boundaries of order relations and genus. In this model, the apparent compositional discontinuities become reduced to a single, continuous principle: that is, the composer has the prerogative to interpret creatively and exploit the precompositional resources of the series, unrestricted by the conventions of the classical twelve-tone model, as suits his vision of the work without compromising his aesthetic or artistic values.

CHAPTER FIVE

“MUSICK TO HEARE,” FROM
THREE SONGS FROM WILLIAM SHAKESPEARE

INTRODUCTION

Stravinsky composed *Three Songs from William Shakespeare* for mezzo-soprano, flute, clarinet, and viola during the latter part of 1953. Dedicated to the “Evenings on the Roof,” *Three Songs* premiered in Los Angeles on March 8, 1954, with Robert Craft conducting.¹ Similar to the serial interludes of *Orpheus* and *Ricercar II* from the *Cantata*, *Three Songs* exemplifies Stravinsky’s idiosyncratic use of serial techniques.² The present study undertakes an analysis of “Musick to heare” and proposes a theory of pitch organization based on symmetry transformations and set-class transformation that transcends the serial model and allows for serial and non-serial, genera-specific pitch-class objects to interact within a continuous compositional environment.

Classical twelve-tone theory provides a means for modeling pitch structure in “Full fadom five” (second in the cycle), but not for “Musick to heare” and “When Dasies pied” (first and last in the cycle, respectively). The four-part contrapuntal texture of “Full fadom five” expresses a seven-note diatonic series that undergoes canonical and non-canonical transformation. Both “Musick to heare” and “When Dasies pied,” however, feature a primary line (vocal part) that expresses elements of serial design while the

¹ White, *Stravinsky*, 474; Igor Stravinsky [Stravinsky], *Three Songs from William Shakespeare* (New York: Boosey & Hawkes, 1954), 3.

² Vlad, *Stravinsky*, 181. “Musick to heare” is a “setting of Shakespeare’s eighth sonnet, in praise of music”; “Full fadom five” is a “setting of Ariel’s song from Act II of *The Tempest*”; “When Dasies pied” “sets the stanzas from the last act of *Love’s Labour’s Lost*.”

composition of the secondary instrumental lines is limited to concatenations of cellular units derived from the primary line.

"Musick to heare," the subject of the present study, exhibits a delicate, transparent contrapuntal texture that is mainly two-part: the primary line—initiated by the flute at the beginning of the song and continued in the vocal part—is set in counterpoint with an instrumental line that is a composite of two or three instrumental parts (example 5.3, below). Stravinsky scholars recognize that the constituent linear formations are, in some way, serially organized, although their notions of what constitutes the series vary. All agree that there is a normative four-note unit (a four-element pcseg derived from the chromatic sc 4-2) found throughout the instrumental and vocal lines of the song. While some call this four-note unit "the series," others consider it to be a component of larger, "quasi-serial" formations—that is, a component of extended, patterned formations that structurally transcend the four-note "series" (i.e., the 4-2 unit).³ In addition, many have contemplated the diatonic "scalar" formations found at the beginning and the end of the song, and the vertically adjacent pc-int7 dyads that mark the endings of each section (see below). While most agree that these diatonic formations allude to some of the emblematic formations of the tonal tradition, there is no consensus regarding their interaction with and relationship to the chromatic linear formations.

The present study adopts the analytic position that the 4-2 unit is not a series, but is the primitive of several symmetrical linear formations. This attitude leads the investigation of pc relations in "Musick to heare" towards the elucidation of large-scale symmetrical formations in the primary line—that is, the flute introduction and the vocal line—and the linear formations derived from the composite of the instrumental counterpoint. As will be demonstrated, the symmetrical formations of the primary line display a high degree of *invariance* with one another, while the formations of the instrumental lines exhibit a high degree of *variance* with the formations of the primary

³ Ward-Steinman, *Serial Techniques*, 25. Ward-Steinman adopts the position that the 4-2 unit constitutes the series: "Robert Craft, Roman Vlad, and Lawrence Morton all profess it [the series] to be a series of twelve notes—the first twelve played by the flute, six of which are different. But they could not have looked beyond the first page-and-a-half of the score, for this analysis quickly breaks down . . . The only logical choice for the basic series is the first *four* notes played by the flute . . ." Perle, on the other hand, proposes that "several forms of the four-note set are linearly combined into larger quasi-serial formations." Perle, *Serial Composition*, 56.

line and with one another. Thus, the present study examines the processes that govern transformations among the constituent 4-2 units of the primary line in order to discover the how these processes influence the design of the secondary, contrapuntal line. Finally, the present study diffuses the apparent dichotomy between the chromatic 4-2 unit and the diatonic formations found in this movement through the apparatus of transformational analysis.

THE “OBJECT-THEME”: THE 24-NOTE “SERIES,”
THE 12-NOTE “SUB-SERIES,” AND THE 4-2 UNIT

Example 5.1 is a pitch reduction of the first twenty-four notes—herein called the *object-theme* or *theme*⁴—presented by the flute from the beginning of “Musick to heare” up to R.1 (mm. 1-8).⁵ Analysis reveals that the theme articulates a symmetrical formation comprising six tessellations of a four-note modular unit derived from the chromatic tetrachord sc 4-2, beginning with pcseg <e79t>. This is illustrated through the successions of 4-2 pcsegs enclosed within solid-lined rectangles in example 5.1. An alternative but complementary segmentation strategy entailing imbrication by 4-2 pcsegs, which demonstrates the deeper symmetrical complexity of the theme, is also illustrated in example 5.1 by the succession of overlapping solid-lined and broken-lined rectangles enclosing 4-2 pcsegs. This consistent, intense linear patterning invokes the geometric metaphor of the *strip pattern*: that is, a pattern that forms when a figure undergoes repetition through symmetry transformation (or a combination of symmetry transformations) in *one direction* (that is, in one dimension).⁶

As illustrated in example 5.1, the patterned succession of tessellated 4-2 pcsegs generates a twenty-four note series, which divides into two non-dodecaphonic twelve-note *sub-series*, herein called sub-series *a* and *b*: sub-series *b* maps onto sub-series *a* by T₀I. Although the theme—that is, the 24-note series—is not twelve-tone, it does exhibit a

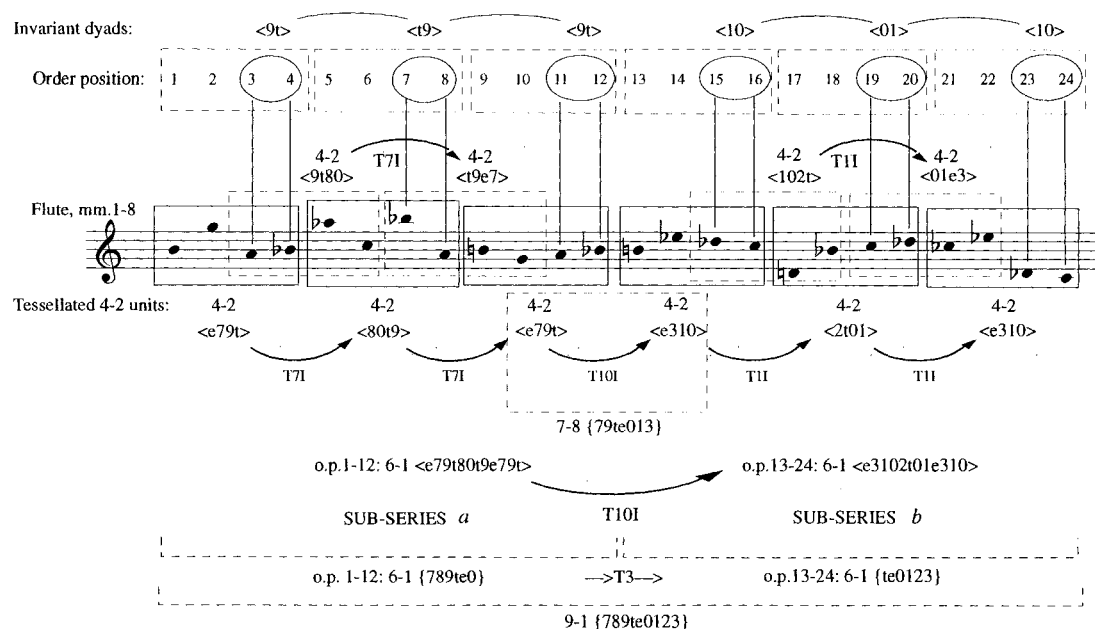
⁴ The terms *object-theme* and *theme* are used in preference to the term *prime ordering*. The terms *object* and *image* invoke the spatial-geometric analogy presented in Chapter 2.

⁵ Stravinsky, *Three Songs*, 3.

⁶ See Chapter 2 (“Symmetry, Groups, Functions, Mapping, and Patterns in Mathematics”).

high degree of chromaticism. The entire 24-note series yields pcset 9-1 {789te0123}, while each sub-series yields the chromatic hexachord 6-1: sub-series *a*, o.p.1-12 {789te0}; sub-series *b*, o.p.13-24 {te0123}. The union of the respective right and left boundary 4-2 pcsegs of sub-series *a* and *b* yields pcset 7-8 {79te013}, which is NE to the chromatic heptachord sc 7-1 (shown below the staff in example 5.1).⁷

Example 5.1. "Musick to heare": The *object-theme*



Example 5.1 also indicates the TnI transformations between successive 4-2 units (below the staff for tessellated 4-2 pcsegs, and above the staff for the overlapping 4-2 pcsegs discovered through imbrication). Notice that the adjacent (tessellated) 4-2 units in each of the 12-note sub-series share a dyad: 2-1 {9t} for sub-series *a*; 2-1 {01} for sub-series *b* (example 5.1, above the staff). The set of integers formed by the collection of index numbers associated with each TnI transformation in example 5.1—that is, $n = (7,$

⁷ Forte, *Atonal Music*, 73; Hantz, "What You Hear is What You Get": 51. Forte applies imbrication by 4-2 tetrachords to an excerpt of the vocal line from "Musick to heare" in order to show successive and interlocking interval constructions. Hantz considers the 4-2 unit to constitute the serial unit, but recognizes the significance of the twenty-four note theme formed by the six "three-interval-class pattern [i.e., the 4-2 unit, ICS <4-2-1>] in the sequence: P0, I9, P0, I0, P3, I0. These six patterns can be grouped in (at least) two ways: as alternating prime and inversion forms, or as two groups of three patterns each [i.e., the 4-2 series or the 12-note sub-series] . . ."

10, 1)—is equivalent to the pcset 3-10 {7t1}. Interestingly, the symmetrical PCIS <3-3> derived from 3-10 {7t1} reinforces the symmetry of the theme at a deeper structural level—the primitive of this symmetry, pc-int3, is derived from sc 4-2.

As will become clear, the pitch structure of the instrumental lines of “Musick to heare” is inextricably linked to the precompositional potentials of the theme. Although there are no mappings or near-mappings of the 24-note theme onto the instrumental linear formations, the features of pc invariance and the formation of 6-1 pcsets among adjacent 4-2 units that are intrinsic to thematic design also govern transformations among the adjacent 4-2 units of the instrumental lines of Sections A – D. In addition, a set of transformations exists that establishes a relationship between the first 4-2 unit and the first six order positions of sub-series *a*, the 5-23 pcsegs found in the Introduction and Section D, and the formal-delineating 2-5 dyads (see below).

FORMAL PLAN

Table 5.1 summarizes the formal plan of “Musick to heare.” The movement comprises an instrumental introduction in which the 24-note series unfolds in the flute part (mm. 1-8, herein called the Introduction), and four sections comprising a vocal line and instrumental accompaniment (herein called Sections A, B, C, and D). The Introduction and the four vocal sections conclude with a vertically adjacent dyad, a perfect fifth (sc 2-5), emphasized in part by duration and metric placement (also see example 5.3).

Table 5.1. “Musick to heare”: formal plan showing delineating dyads (2-5 pcsets)

Section:	Introduction	A	B	C	D
Mm:	1-8	9-21	22-33(34)	35-43	44-50
2-5 pcsets:	{70}	{70}	{6e}	{27}	{70}

Each vocal section carries a complete couplet of verse. Thus text structure, in addition to the symmetry transformations discussed below, is a determinant in the linear designs of the vocal part, which in turn influences the design of the instrumental parts

(see below). Table 5.2 reproduces the text of Shakespeare's sonnet as it appears in the score.⁸

Table 5.2. "Musick to heare": Text and form

(Section)

- | | |
|---|--|
| A | Musick to heare, why hear'st thou musick sadly, Sweets with sweets warre not, joy delights in joy:
Why lov'st thou that which thou receav'st not gladly Or else receav'st with pleasure, with pleasure thine annoy? |
| B | If the true concord of well tunes sounds, By Unions married do offend thine eare,
They do but sweetly chide thee who confounds In singlenesse the part that thou should'st beare: |
| C | Mark how one string, sweet husband to another, strikes each in each by mutual ordering;
Resembling sier, and child, and happy mother, Who all in one, one pleasing note do sing: |
| D | Whose speechless song being many seeming one,
sings this for thee thou single wilt prove none. |

THE OBJECT-THEME AND ITS FOUR IMAGES: THE STRUCTURE OF THE VOCAL LINE

The theme—that is, the 24-note series—presented by the flute in mm. 1-8 is articulated four more times in the vocal part, which corresponds to the four couplets of Shakespeare's sonnet. Each articulation of the theme entails translational symmetry, which undergoes further transformation through *distortion*. In other words, there exists a near-mapping of the ordered pitch-class elements of the original theme (the *object-theme*) onto the ordered pitch-class elements of its four transformations (or *image-themes*).⁹

Example 5.2 is a pitch reduction of the flute's presentation of the object-theme (the 24-note series) and the entire vocal line comprising the four image-themes. The labels used herein for each image-theme corresponds to the sectional labels given above: Object-theme and Introduction; Image-theme A and Section A; Image-theme B and

⁸ Stravinsky, *Three Songs*, 3-5.

⁹ See Chapter 2 ("Stretching, Shrinking, and Substitution"). See also Hantz, "What You Hear is What You Get": 51. Hantz points up the role of the 24-note theme in the vocal line: "The vocal line is, for the most part, a succession of repetitions of the original group of six patterns." Hantz, however, does not explain nor illustrate this crucial statement.

Section B; etc. The order-position numbers 1-24 are indicated above and below the staves so that the relationship of the constituent pc of the image-themes to the object-theme is clear. A variety of symbols is used to illustrate the specific transformational processes that effect each of the distortions: crossed arrows indicate position exchanges among dyads; slurs and broken-lined boxes (with labels) indicate repetitions or omissions; solid-lined boxes (with labels) indicate substitutions; circular enclosures indicate Tn or TnI transformation of a 4-2 unit (the curved arrow indicates the direction of the transformation from object to image).

Example 5.2. “Musick to heare”: Transformation of the object-theme into the image-themes

The musical score for Example 5.2 is organized into two sub-series, 'a' and 'b', each with 12 order positions. The object-theme (Flute, mm. 1-8) is shown at the top. Below it are four image-themes: A (Vocal, R1-R3), B (Vocal, R4-R5), C (Vocal, R7-R8), and D (Vocal, R9). The score uses various symbols to indicate transformations: crossed arrows for position exchanges, slurs and dashed boxes for repetitions or omissions, solid boxes for substitutions, and circular enclosures for Tn or TnI transformations. Specific annotations include: (o.p. 11-12 repeated), (o.p. 21-22 repeated), (o.p. 21-22: pc substitution), (o.p. 21-24 omitted), (o.p. 1 omitted), (o.p. 17, 20 repeated), and (Appendage to Image-theme B = o.p. 1-9).

Example 5.2 demonstrates that the distortion of each translation of the object-theme occurs in the images of sub-series *b* (i.e., op. 13-24), while sub-series *a* is virtually unaffected. Image-theme A (mm. 9-21) articulates the entire object-theme, with the exception of the repetition of o.p. 11-12 <9t> and 21-22 <e3>. Image-theme B features some slight variations of the object-theme: o.p. 13 and o.p. 16 are exchanged; the 4-2 unit

at o.p.17-20 transformed by T_{11} (compare to example 5.1); the pitch classes associated with o.p. 21 and 22 are substituted; o.p. 23 and 24 are omitted. A partial reiteration of sub-series *a* (o.p.1-9) is appended to the end of image-theme B (at R.6). Image-theme C displays the highest degree of distortion: o.p.1 is omitted (but its presence is implied by the final pc, pc11, of the appendage to Image-theme B); the 4-2 unit at o.p.13-16 is transformed by T_1 ; the 4-2 unit at o.p.17-20 is transformed by T_3I (o.p.17 and 20 are exchanged); the 4-2 unit at o.p.21-24 is omitted. Image-theme D is nearly invariant to the object-theme: there is one slight variation created through the interpolation of pcs 2 and 1 between o.p.20-21 (shown as a repetition of o.p. 17 and 20).

Irrespective of the processes that effect the distortions of the 24-note theme within the sections of this movement, the symmetry of the object-theme is preserved on another level. That is, the transformation of the object-theme into the four images does not significantly disrupt the patterned deployment of the normative 4-2 unit established in the Introduction. Example 5.3 (described below) demonstrates that each image-theme continues to yield tessellated 4-2 units (except for the elided 4-2 units in Section B, mm. 28-29, and Section D, mm. 48-49). Moreover, each 4-2 unit expresses the ICS <4-2-1>, with the exception of two units that participate in the elisions, and the fourth 4-2 unit of Section B.¹⁰ As will be demonstrated, tessellations of 4-2 units that normally express the ICS <4-2-1> intrinsic to the design of the object-theme function as salient organizational features of the design of the instrumental lines.

THE STRUCTURE OF THE INSTRUMENTAL LINES

Example 5.3 is a pitch reduction of “Musick to heare.” The rehearsal numbers provided in the example coincide with the beginning of each Section. Bar lines are indicated in the example by ticks; measure numbers, which do not appear in the score,

¹⁰ The reader can, with ease, derive the ICS for each 4-2 unit identified in example 5.3. Of the 4-2 units that do not express ICS <4-2-1>, the two that participate in the elisions in Sections B and D (vocal part) express ICS <1-4-2> and <1-2-4>, respectively—both patterns are permutations of <4-2-1>. The ICS <3-2-2> expressed by the fourth 4-2 unit in the vocal line of Section B, however, is not a permutation of <4-2-1>. An explanation for this marked departure from the normal presentation of a 4-2 unit lies in word painting: the 4-2 unit <031e>coincides with the words “do offend.”

are provided at the beginning of each system. Throughout example 5.3, the top staff reproduces the object-theme (flute, Introduction, mm. 1-8) and the four image-themes (vocal, mm. 9f); the lower staff reproduces the instrumental counterpoint.

Brackets and sc-pcseg labels indicate the segmentation of the various linear formations. Beginning with Section A, each pcseg label representing a 4-2 unit in the instrumental counterpoint is reproduced below the staff as a normative four-note unit in which repeated pcs are eliminated so that the transformations among the progression of adjacent 4-2 units can be established (indicated by arrows that link the adjacent 4-note pcsegs shown below the staff). The operators that transform adjacent 4-2 units (Tn or TnI labels), the set of invariant pcs shared by the adjacent 4-2 units, and the sc-pcset derived from their union are also shown below the staff (below the arrows).

The analytic strategy used herein reveals that—in addition to the object-theme presented in the Introduction—the entire vocal line and the instrumental counterpoint can be segmented into 4-2 units, with the exception of the composite clarinet-violin lines in the Introduction and in Section D that yield the 5-23 units (see below). Except for two units, each 4-2 unit in the instrumental part expresses the ICS <4-2-1>, which is consistent with the constituent tessellated 4-2 units of the object-theme (the ICS patterns are not shown in the examples). The two exceptions are 4-2 <4573> at the beginning of section B (viola), and 4-2 <4526> near the end of Section D (flute). The ICS <1-2-4> derived from these units is expressed by the four 4-2 units—derived through imbrication—that overlap the tessellated 4-2 units of the 24-note object-theme.

The Introduction (example 5.3) expresses the object-theme (flute) in counterpoint with a composite linear formation derived from the clarinet and viola parts. As illustrated in the example, this formation articulates a succession of elided palindromes, concluding with a statement of the primitive, the diatonic pentad 5-23 <02457>. The 5-23 <02457> unit forecasts the sc 2-5 simultaneity that delineates the Introduction and each of the Sections (shown in example 5.3 by the broken-lined boxes and 2-5 pcset labels). The boundary pcs of the prograde 5-23 unit <07> are literally represented in the vertical adjacency at the end of the Introduction and Sections A and D as {70}, and abstractly represented at the end of Sections B and C as {6e} and {27}, respectively. Thus, the boundary pcs of the 5-23 pcsegs associated with the Introduction and the final section

undergo linear-vertical transformation, which are expressed as the stable sonorities that mark the completion of each couplet of verse.

Example 5.3. "Musick to heare": Pitch reduction

Introduction

Flute

Clarinets, Viola

Palindrone

Section A

9 Vocal

Instruments

16

4-2 <e79t> 4-2 <80t9> 4-2 <e79t> 4-2 <e310> 4-2 <2t01> 4-2 <e310>

5-23 <02457> 5-23 <75420> 5-23 <02457> 5-23 <75420> 5-23 <02457> 5-23 <02457>

4-2 <e79t> 4-2 <3e1212> 4-2 <80t9> 4-2 <04212121> 4-2 <e79t9t> 4-2 <3e1212>

<3e12> T3I {12} 6-1 {e01234} <0421> T3I {12} 6-1 {e01234} <3e12> T5I {23} 6-8 {e12346}

<3e1204213e12> = T4 <e79t80t9e79t> from sub-series a (o.p.1-12)
6-1: {e01234} = T4 {789te0} = T4 {sub-series a}

4-2 <264263> 4-2 <e310> 4-2 <5134> 4-2 <2t01> 4-2 <595976> 4-2 <e3e310> 4-2 <84848467>

<2643> T7I {34} 6-1 {123456} <5134> T10I {5} 7-8 {1345679} <5976> T1I {67} 6-1 {456789} <8467> RT11I {47} 6-1 {345678}

<2643513459768467> = T6 <80t9e79te310t01> from the object-theme (o.p.5-20)
9-1: {123456789} = T6 {789te0123} = T6 {object-theme}

(Example 5.3 continues)

(Example 5.3 continued)

R4 Section B

22 (Vocal)

(Instruments)

4-2 <e79t> 4-2 <4573> 4-2 <80t9> 4-2 <e79t> 4-2 <031e>

<4573> RT3 {7} 7-2 {345678t} <6t87> T1I {67} 6-8 {35678t} <7356> T1II {56} 6-1 {345678} <7356>

28

4-2 <19e0> 4-2 <4865> 4-2 <e08t> 4-2 <7353535356> 4-2 <e79t> 4-2 <6t87> 4-2 <80t9> 4-2 <7356> 4-2 <e79t>

<4865> T1II {56} 6-1 {345678} <7356> T1I {67} 6-8 {35678t} <6t87> T1I {67} 6-8 {35678t} <7356> T1 {67} 6-1 {345678}

2-5 {6e}

<735648657356> = T8 <e79t80t9e79t> from sub-series a (o.p. 1-12)
6-1: {345678} = T8 {789te0} = T8 {sub-series a}

R7 Section C

35 (Vocal)

(Instruments)

4-2 <e79t> (continued from m.34) 4-2 <80t9> 4-2 <e79t> 4-2 <t20e> 4-2 <1532> 4-2 <8467> 4-2 →

4-2 <8484848467> 4-2 <5976> 4-2 <6t87> 4-2 <9578>

<8467> T1I {67} 6-1 {456789} <5976> T1 {67} 6-1 {56789t} <6t87> T3I {78} 6-1 {56789t} <9578> T1I {78} 6-1 {456789} <8467> T10I {46} 6-z4 {234678}

2-5 {27}

(Example 5.3 continues)

(Example 5.3 continued)

R9 Section D

44 (Vocal)

(Flute) → 4-2 <2643> 4-2 <e79t> 4-2 <80t9> 4-2 <e79t> 4-2 <e310> 4-2 <2t01> 4-2 <21e3> 4-2 <e312> 4-2 <6t87>

<2643> T7I {34} 6-1 {123456} <5134> RTI {45} 6-1 {123456} <5426> RT0I {6} 7-8 {245678t} <6t87>

(Clarinet, Viola) 5-23 <02457> 5-23 <75420> 5-23 <02457> 5-23 <75420> 5-23 <75420> 5-23 <02457>

Palindrome Palindrome Palindrome Palindrome

Sections A, B, and C articulate the image-themes (vocal part) in counterpoint to the instrumental line, which is constructed entirely of contiguous 4-2 units. Section D is the only section set in 3-part counterpoint—it articulates the final image-theme in the vocal part accompanied by a succession of 4-2 units (flute) and a modified reiteration of the 5-23 palindromes found in the Introduction (clarinet and viola).

Although the 24-note object-theme is not reproduced in the instrumental lines, transformations of large sub-segments are articulated in a few instances. These are indicated by the broken-lined rectangular enclosures and pcsegs below the staff in example 5.3. In section A, the succession comprising the first three 4-2 units is derived from sub-series *a* (o.p.1-12, transposed T_4 and distorted through repetition of elements). The succession of the four 4-2 units found in the second half of Section A that follows is derived from o.p.5-20 of the object-theme (transposed T_6 and distorted through repetition of elements). In section B, sub-series *a* is expressed in the succession of three 4-2 units in mm. 26-31 (o.p.1-12, transposed T_8 and distorted through repetition of elements).

Irrespective of the absence of complete images of the object-theme in the counterpoint, the precompositional potential of the object-theme is realized in other ways, resulting in new linear formations in which 4-2 units continue to participate as

components but the succession of transformational operators is changed. Two features—intrinsic to the design of the 24-note object-theme—influence transformations among adjacent the 4-2 units in the instrumental lines (compare examples 5.1 and 5.3):

- (1) Each transformation results in partial invariance (usually a dyad of sc 2-1, or a monad).¹¹
- (2) Each pair of adjacent 4-2 units yields a larger chromatic or near-chromatic set, usually a hexachord: sc 6-1, sc 6-8 (NE 6-1), sc 7-2 (NE 7-1), or sc 7-8 (superset of 6-2, NE 6-1). This is also true of pcsets produced through the union of the boundary 4-2 units that terminate and initiate the instrumental line of each section (shown below the broken-lined boxes enclosing the terminating dyadic sonorities in example 5.3): these pcsets belong to sc 6-1 or 6-z4 (NE 6-1).

In addition to the transformational factors derived from the object-theme, the influence of the 5-23 pcseg is expressed by the set of values of *n* derived from each T_n and T_nI transformation among the adjacent 4-2 units in the instrumental counterpoint in Sections A – D. This set of *n*-values yields the near-diatonic pcset 7-24 {te01357}: sc 7-24 is a super-sc of 5-23, and an NE partner of its abstract complement, sc 7-23.

The interaction of the transformational factors derived from the object-theme and the 5-23 pcseg ultimately controls the pc content of the instrumental lines resulting in pc invariance or near-invariance (Rp) among pairs of 4-2 units so that the total pc content derived from each of the instrumental lines yields large chromatic set classes that are inclusion-related or NE to the set classes associated with the 12-note sub-series and the 24-note object-theme—sc 6-1 and sc 9-1, respectively. The union of the six pcsets formed by adjacent 4-2 units in the instrumental line of Section A yields the near-aggregate, 11-1 {e0123456789}. The union of the first three of these pcsets yields sc 7-2, a superset-class of sc 6-1 (representing the 12-note sub-series); the union of the last three pcsets yields sc 9-1 (representing the 24-note object-theme):

¹¹ In the two 12-note sub-series, the dyad exchanged between contiguous tetrachords occurs on order positions 3 and 4 of *each* tessellated 4-2 unit (example 5.1). The exchange is by no means consistent in the instrumental 4-2 units in Sections A – D: of the twenty-three 4-2 units, approximately one-half exchange dyads between the third and fourth order positions, six involve exchanges between the first and last order positions, and two units exchange a monad.

Section A (instrumental line)

$$\begin{aligned} 6-1 \{e01234\} \cup 6-1 \{e01234\} \cup 6-8 \{e12346\} &= 7-2 \{e012346\}; \\ 6-1 \{123456\} \cup 7-8 \{1345679\} \cup 6-1 \{456789\} &= 9-1 \{123456789\}. \end{aligned}$$

The unions of the pcsets formed by adjacent 4-2 units in the instrumental line of Sections B, C, and D yields sc 7-2 (a superset-class of sc 6-1), sc 7-1 (a superset-class of sc 6-1), and sc 9-2 (NE to sc 9-1, the sc representing the 24-note object-theme), respectively:

Section B (instrumental line)

$$\begin{aligned} 7-2 \{345678t\} \cup 6-8 \{35678t\} \cup 6-1 \{345678\} \\ \cup 6-1 \{345678\} \cup 6-8 \{35678t\} \cup 6-8 \{35678t\} \\ = 7-2 \{345678t\} \end{aligned}$$

Section C (instrumental line)

$$\begin{aligned} 6-1 \{456789\} \cup 6-1 \{56789t\} \cup 6-1 \{56789t\} \cup 6-1 \{456789\} \\ = 7-1 \{456789t\}. \end{aligned}$$

Section D (instrumental line)

$$\begin{aligned} 6-1 \{123456\} \cup 6-1 \{123456\} \cup 7-8 \{245678t\} \\ = 9-2 \{12345678t\} \end{aligned}$$

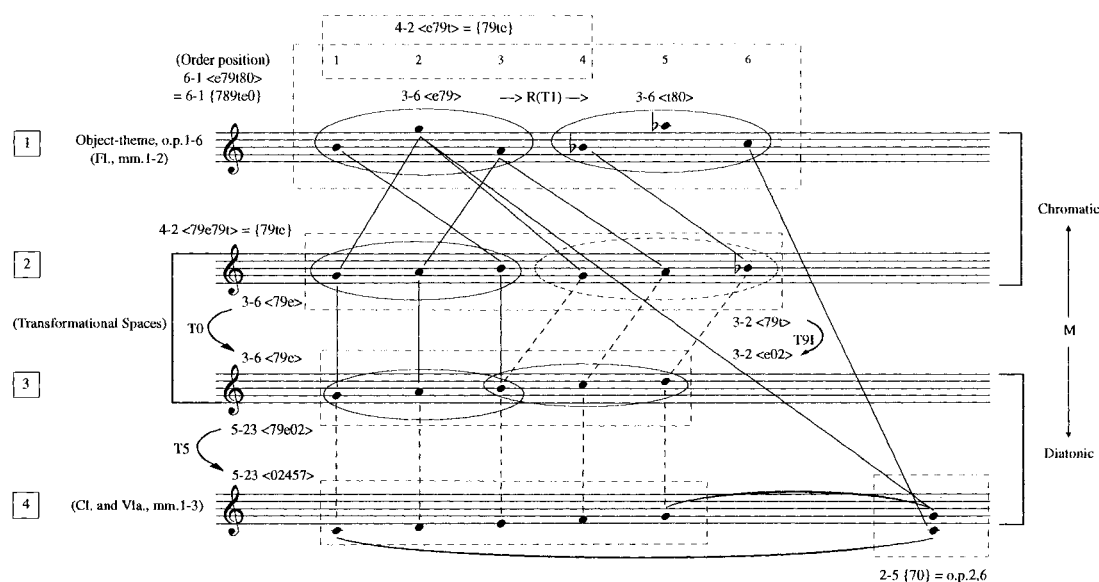
In addition to these set-class expressions of the 12-note sub-series and the 24-note object-theme, the pcset formed through the union of invariant sets (dyads and monads) derived from adjacent instrumental 4-2 units (including boundary units) yields a chromatic octad, 8-1 $\{12345678\}$.

THE RELATIONSHIP OF THE 5-23 PCSEGS TO THE OBJECT-THEME

The diatonic 5-23 pcsegs articulated in the Introduction and in Section D (clarinet and viola) seem incongruous with the prevalent chromatic linear formations comprised of tessellated 4-2 units (example 5.3). Yet, as we have seen, these quintessentially diatonic formations make significant contributions to the formal structure of “Musick to heare”: the 5-23 pcsegs in the Introduction adumbrate the sc 2-5 simultaneities that terminate each section of the movement (the sc 2-5 dyads shown in example 5.3); the re-introduction of the 5-23 pcsegs in Section D (the final section) signals the end of the movement. Moreover, the 5-23 pcseg holds a transformational relationship with the 4-2 unit and exploits a subtle diatonic attribute found in the first six order positions of the object-theme.

Example 5.4 illustrates the transformational pathways that establish the relationship of the 5-23 <02457> unit and the sc 2-5 simultaneity to the first six elements of the 24-note object-theme and the first 4-2 unit, <e79t>, o.p.1-4. Staff 1 (example 5.4) is a pitch reduction of o.p.1-6 of the object-theme, 6-1 <e79t80>, segmented into two diatonic trichords, 3-6 <e79> and 3-6 <t80> (the second 3-6 pcseg is the RT₁ transform of the first). Staff 4 is a pitch-class reduction of the initial (prograde) form of the 5-23 pcseg <02457> and its relationship to sc 2-5 (enclosed in the broken-lined box and labeled 2-5 {70}). The two lines connecting pcs from Staff 1 to the pcs of the sc 2-5 simultaneity in Staff 4 point up a relationship between o.p.1-6 and pcset 2-5 <07>: pc7 appears at o.p.2; pc0 appears at o.p.6; pcset 6-1 {789te0}, representing o.p.1-6 (and the pc content of the 12-note sub-series *a*) spans pc-int7—the first and last of the pcset are pc7 and pc0.

Example 5.4. “Musick to heare”: Transformation of the theme into the 5-23 pcseg



Staves 2 and 3 depict the transformational processes that link the initial 4-2 unit <e79t> (o.p.1-4, labeled above Staff 1) to pcseg 5-23 <02457>. Together, these staves—labeled “Transformational Spaces”—represent a conceptual space in which transformations among the compositional pc objects shown in Staves 1 and 4 take place. The 4-2 unit <e79t> contains two trichords that are subset-classes of sc 5-23: 3-6 {79e} and 3-2 {79t}, shown separately on Staff 2. Staff 3 depicts the non-transformed 3-6

{79e} elided to 3-2 {e02}, a transformation of 3-2 {79t}. The resultant 5-23 {79e02} pcset is reinterpreted as a pcseg <79e02>, which is transposed (T₅) to produce the 5-23 <02457> pcseg shown on Staff 4.

"MUSICK TO HEARE": CONCLUSION

The present chapter posits that the 4-2 unit is the primitive of a large-scale, well-defined symmetrical linear formation, a *strip pattern*, comprising a series of twenty-four notes which in turn functions as the subject or theme of “Musick to heare.” In spatial-geometric terms, the theme is made analogous to an *object*. The object-theme is subjected to the transformational processes of translational symmetry and distortion, which in turn generate a complex strip pattern—the complete primary line—comprising the object-theme and the four image-themes. The 4-2 unit also constitutes the primitive of a succession of strip patterns articulated in the instrumental parts that are neither images of the thematic strip patterns nor images of one another, but do hold subtle relationships with the object-theme through the assemblage of processes that govern transformations among successive 4-2 units. In addition, the present chapter resolves the dichotomy between the diatonic formations (the 5-23 pcseg and the sc 2-5 simultaneities) and the chromatic 4-2 units through a model of transformational processes that brings these disparate formations into a closer relationship. While the primary function of the diatonic formations is to define significant formal events, their generic affiliation seems completely discontinuous with the otherwise chromatic environment established through the complex concatenations of 4-2 units. Thus, the transformational models put forth herein allow these genus-specific formations to interact within a unified analytic framework.

The modeling of the theme of “Musick to heare” as a strip pattern evokes the image of a highly regular, symmetrical structure. While this image can be realized through the pitch and pc reductions shown in example 5.1, the designed invariance of the pattern is mitigated through several compositional processes, including the partial degradation of the pattern through distortion (the processes used, in addition to translation, to create the

images of the theme), the marked departure from the pattern in the construction of the counterpoint, and the actual pitch and temporal dispositions of the various pc objects at the musical surface. While symmetry pervades many of the details pertaining to the compositional design, the final work of musical art hides many of these details.¹²

While the strip-patterned formations of “Musick to heare” are unique in the context of the repertoire considered in this dissertation, linear formations constructed from concatenations of serial units are found in several other instances, although such formations often display a high degree of variance—that is, they are irregular in terms of their internal symmetries.¹³ *In Memoriam Dylan Thomas*, the subject of the next and final analytical chapter, employs a five-note series. Although the analytic attitude of the present study accepts this unit as a series (but not the 4-2 unit of “Musick to heare”!), the five-note series can both stand alone as a complete, articulate formation, or participate as a component within larger formations.

¹² For example, the division of the 24-note theme into two 12-note sub-series is analogous to the structure of Shakespeare’s prose into couplets. Yet, there is clearly an absence of close coordination between the unfolding of each half of a couplet and the unfolding of each 12-note sub-series.

¹³ For example, the linear formations articulated in the Cantus Cancrizans of *Ricercar II* are highly regular, but not the composite linear formations of the tenor and instrumental line found in the Canons.

CHAPTER SIX

IN MEMORIAM DYLAN THOMAS

INTRODUCTION

In the early 1950s, Dylan Thomas and Igor Stravinsky planned to collaborate on an opera, with Thomas as the librettist and Stravinsky the composer. Sadly, Thomas unexpectedly fell ill and died in New York City on November 9, 1953 before their plans could come into fruition.¹ In response, Stravinsky composed the elegy *In Memoriam Dylan Thomas: Dirge Canons and Song* in February and March 1954. Stravinsky chose Thomas's elegy on the death of his father, the poem "Do not go gentle into that good night," as the text for the Song, the centerpiece of *In Memoriam*. The performing forces—tenor voice, trombone quartet and string quartet—are divided into two ensembles: the Song is scored for tenor and string quartet; the antiphonal instrumental Dirge Canons—Prelude and Postlude—are scored for double quartet. *In Memoriam Dylan Thomas* premiered in Los Angeles on September 20, 1954 as part of the Monday Evening Concerts, with Robert Craft conducting.²

The sectional formal design, Dirge Canons—Song—Dirge Canons, is analogous to similar patterns expressed within small- and large-scale linear formations. Reminiscent of the formal plan underlying *Ricercar II*, the three sections of *In Memoriam* comprise smaller, recurring and non-recurring sections, or blocks. Each block is a discrete sub-formal unit that derives its identity through row form selection and deployment in addition to text, texture, and timbre.

¹ White, *Stravinsky*, 476-78.

² *Ibid.*, 476.

The linear formations of *In Memoriam*—with few exceptions—are constructed entirely of serial units, making this work unique among the pieces considered in this dissertation.³ Unlike the 4-2 unit in “Musick to heare,” the five-note serial unit of *In Memoriam* often stands as a discrete linear formation. Nonetheless, serial units are also subsumed within larger linear formations, herein called *super-serial formations*, which are found throughout the Song and the Dirge Canons. Super-serial formations vary widely in their composition; their definition and deployment is intrinsic to the expression of Thomas’s poem. While the analytical technique of row tracing reveals that Stravinsky subjects the series to the standard transformational operations typical of classical serialism, it does not effectively model the design of the super-serial formations nor predict the pitch-class environments in which the multifarious linear formations interact. Thus, the present study examines the precompositional potential of the series in the context of the model of generic set-class space through the apparatus of transformational analysis and explores ways by which aspects of the serial design emerge as important linear and vertical structural elements, and as formal determinants.

THE SERIES

Stravinsky uses a short five-note series as the subject for *In Memoriam* in which each element is a unique pc drawn from the chromatic pentad 5-1 {01234}.⁴ Although sc 5-1 is both a characteristic member of the chromatic genus and the complement to the chromatic cynosural sc 7-1, the composer has chosen a permutation of the chromatic pentad {01234} that evinces characteristics of the octatonic, diatonic, and chromatic genera. Example 6.1 is a pitch reduction of the series, P₀ <43012>, which is introduced

³ That is: “Musick to heare,” Ricercar II, and the serial interludes of *Orpheus*.

⁴ The coincidence of the relationship of the number of order positions in the series and the cardinality of the sc expressed by the series to the ten syllables typically found in each line of the song is not accidental (see below). An immediate precedent of this technique is found in “Full fadom five,” the second of *Three Songs from William Shakespeare*, where the seven-note row is analogous to the seven syllables found in each of the lines of the interior stanzas.

Robert Gauldin and Warren Benson, “Structure and Numerology in Stravinsky’s *In Memoriam Dylan Thomas*,” *Perspectives of New Music* 23 (1985): 166-85. Gauldin and Benson uncover the expressions of the number 5 in this work and explore its role as a structural determinant.

by the second tenor trombone at the beginning of the Dirge Canons (prelude).⁵ The series P_0 contains three pcsegs, each of which holds affinity with one of the three genera (example 6.1): o.p.1-4 <4301> yield the octatonic tetrad 4-3 {0134}; o.p.2-5 <3012> yield the chromatic tetrad 4-1 {0123}; the non-adjacent elements at o.p.1, 3, 5 <402> yield the diatonic trichord 3-6 {024}.⁶ Of these three pcsegs, two are members of the characteristic scs for their genera: sc 4-3, octatonic; sc 4-1, chromatic.⁷ The discovery of these genus-specific pcsegs adumbrates the generic interactions that occur within the predominately chromatic environment of *In Memoriam*. As will become clear, each of the three pcsegs re-emerges in important structural roles.

Example 6.1. *In Memoriam*: The series, P_0

Order position: 1 2 3 4 5

3-6 <402>

4-3 <4301>

4-1 <3012>

5-1 <43012>

⁵ Stravinsky, *In Memoriam*, 4.

White, *Stravinsky*, 480. Stravinsky himself identifies serial units in the score at the first set of Dirge Canons (prelude) with brackets and labels. Stravinsky, however, did not intend to leave these analytical annotations in the fair copy.

Reminiscent of the score of *Ricercar II* (see Chapter 4), Stravinsky's annotations point up the unfolding of a serial unit and indicate the type of transformation to which the unit has been subjected. The label "Theme" is an analogy for the series (P_0); the abbreviation "Th." (Theme) indicates a transposition of P_0 . Labels for the transformational operators of transposition, inversion ("Inversion"; "Inv."), retrograde ("Riversion"; "R."), and retrograde-inversion ("R. Inv.") do not include transpositional operators.

⁶ White, *Stravinsky*, 479, n.1; Straus, *Post Tonal Theory*, 175. The design of the series P_0 <43012> has many precedents in Stravinsky's pre-1954 oeuvres. White compares the *In Memoriam* series to the "row" (the 4-2 unit) of "Musick to heare," and notes the similarity: "In each case Stravinsky has confined his note [sic] row within the span of a major third [pc-int4]. In the Shakespearean sonnet he has divided the third into only four notes; but in the *In Memoriam* Dylan Thomas composition he has used all the five chromatic notes." Straus points out the significance of the 4-3 pcseg in Stravinsky's pre-1951 compositions: for example, 4-3 "was the basic idea for his [Stravinsky's] *Symphony of Psalms*."

⁷ See table 2.3.

Table 6.1. *In Memoriam*: P and I forms of the series and their concomitant pcsets

P FORM	PCSEG	PCSET (5-1)	I FORM	PCSEG
0	<4 3 0 1 2>	{01234}	8	<0 1 4 3 2>
1	<5 4 1 2 3>	{12345}	9	<1 2 5 4 3>
2	<6 5 2 3 4>	{23456}	10	<2 3 6 5 4>
3	<7 6 3 4 5>	{34567}	11	<3 4 7 6 5>
4	<8 7 4 5 6>	{45678}	0	<4 5 8 7 6>
5	<9 8 5 6 7>	{56789}	1	<5 6 9 8 7>
6	<t 9 6 7 8>	{6789t}	2	<6 7 t 9 8>
7	<e t 7 8 9>	{789te}	3	<7 8 e t 9>
8	<0 e 8 9 t>	{89te0}	4	<8 9 0 e t>
9	<1 0 9 t e>	{9te01}	5	<9 t 1 0 e>
10	<2 1 t e 0>	{te012}	6	<t e 2 1 0>
11	<3 2 e 0 1>	{e0123}	7	<e 0 3 2 1>

Set-class 5-1, the sc expressed by the series, is inversionally symmetric. Since each member pcset of sc 5-1 is invariant under one value of TnI, there is a one-to-one relationship between the twelve P forms and the twelve I forms of the series. Thus, the row-form pairs in this relationship are permutations of one another but not necessarily of the series P_0 .⁸ Table 6.1 lists the twenty-four P and I forms of the series and their concomitant pcsets according to the P and I pairs that express inversional invariance (i.e., P_0 and I_8 , P_1 and I_9 , P_2 and I_{10} , etc.).⁹ As illustrated in table 6.1, P_0 and I_8 are inversionally invariant—that is, $\{P_0\} = \{I_8\}$ —and are, therefore, permutations of each other. Moreover, some of the interior features of the serial design are preserved between pairs of inversionally invariant row forms. Example 6.2 compares order relationships in P_0 and I_8 . The first two ordered pairs in P_0 exchange position when transformed into I_8 (the chromatic dyads <43> and <01>, respectively, at o.p.1-2 and 3-4); the final element

⁸ In classical twelve-tone music, all serial transformations are permutations of the series since the series contains all twelve pcs.

⁹ Straus, *Introduction to Post-Tonal Theory* (Englewood Cliffs, New Jersey: Prentice Hall, 1990), 143. A similar table with *identical* row-form labels derived from the moveable system of row labeling in which the prime ordering is assigned the integer 0 is given in this first edition of Straus's *Post-Tonal Theory*. In the second edition, Straus uses the fixed system of labeling in which the prime ordering is assigned the integer derived from the first pc. Thus, the label for P_0 <43012> used in Straus's first edition and in the present study is re-labeled P_4 in the second edition. Straus, *Post-Tonal Theory* (2d ed.), 174-78.

(pc2 at o.p.5) remains unchanged. Thus, I_8 is a close representation of P_0 through the property of inversive invariance and through order relationships.¹⁰

The exploration of the precompositional potential of the series reveals two salient features that will prove to be significant in the ensuing analyses of the Song and the Dirge Canons. First, as mentioned above, the series comprises three pcsegs that hold specific generic affiliations. Thus, the following analyses will examine ways in which the chromatic, diatonic, and octatonic genera shape pitch structure in this work. Second, the chromatic sc 5-1, the sc representing the series, is inversionally symmetric. This property is exploited in three general ways:

- (1) Literally, through the invariant row-form partnership (e.g. P_0/I_8 , where I_8 represents P_0);
- (2) Literally, as a means of providing variation among certain linear formations and controlling pc density by exploiting *or* avoiding local deployments of invariant row-form partners;
- (3) Symbolically, through the expression of symmetric designs at the micro- and macro-formal levels.

As we shall see, symmetrical processes manifest themselves in the formal disposition of the blocks in the Dirge Canons and the Song. On a smaller scale, symmetrical processes influence the selection and deployment of row forms within the various super-serial formations.

¹⁰ This recalls a similar relationship between P_0 and I_8 in *Ricercar II* (see Chapter 4). Unlike sc 5-1, however, sc 6-z3—the sc representing the series in *Ricercar II*—does not possess the property of inversive symmetry.

Example 6.2. *In Memoriam*: The relationship of P_0 to I_8

Order position: 1 2 3 4 5

PO <43012> 2-1 <43> 2-1 <01> pc 2

I8 <01432> 2-1 <01> 2-1 <43> pc 2

Order position relative to P_0 : 3 4 1 2 5

SUPER-SERIAL FORMATIONS

Although serial units are often treated as discrete linear formations in the Dirge Canons and the Song, they are usually deployed as the constituents of more extensive linear formations, such as those that carry the lines of text. The serial unit of five elements does not offer the composer enough resources with which to complete the articulation of an entire line of text or to develop an extended instrumental line beyond the devices of repetition and rhythmic manipulation of the elements within a single unit (see below). Thus, the *super-serial formation*—that is, a linear formation that materializes from the conjunction of two or more serial units—offers a solution to the limitations imposed by a short series (this technique recalls the twenty-four note “theme” developed from the 4-2 unit in “Musick to heare”). Such formations typically unfold as a continuous entity within the confines of a single block. In addition to formations that comprise a single serial unit, super-serial formations contribute to the definition and delineation of the various blocks that constitute the Song and the Dirge Canons and provide additional thematic interconnections among the various blocks and sections of this work.

The composition of super-serial formations varies widely; formations encompass as few as two and as many as five serial units. Similar to the thematic strip patterns and the irregular linear formations in “Musick to heare,” the super-serial formations of *In*

Memoriam fall into two general types: recurring thematic formations and non-recurring irregular formations. For example, thematic super-serial formations—defined by the selection and deployment of their constituent serial units—are associated with the recurring lines “Do not go gentle into that good night” and “Rage, rage against the dying of the light” (below). Other super-serial formations, however, express divergent internal designs and, therefore, present a unique analytic challenge. Thus, we will examine the thematic formations associated with the two recurring lines of text and the intervallic characteristics of the tetrachordal pcsegs derived from the series in order to develop models for the multifarious super-serial formations found throughout the Song and the Dirge Canons.

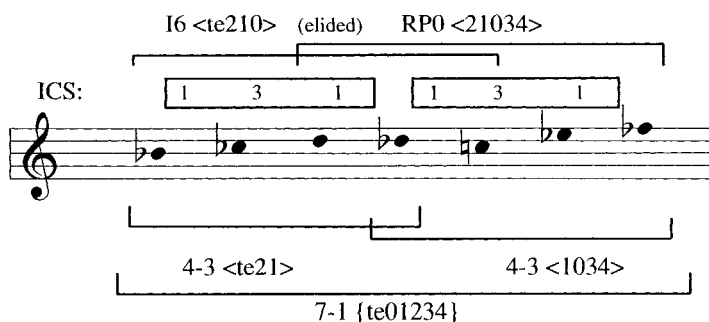
Examples 6.3 and 6.4 are pitch reductions of the thematic super-serial formations associated with the lines “Do not go gentle into that good night” (herein called “Do not go”) and “Rage, rage against the dying of the light” (herein called “Rage”), respectively. Both formations consist of an I form elided to RP_0 : $I_6 + RP_0$, “Do not go”; $I_{11} + RP_0$, “Rage.” The palindromic interval-class succession (ICS) produced through the linear juxtaposition of the constituent serial units provides a numerical visualization of the inversive symmetry that underlies the transformational relationship of the I and RP forms (given above the staff in the examples).¹¹ A corollary of this design is expressed through the symmetric deployment of the octatonic 4-3 pcsegs shown below the staff in examples 6.3 and 6.4.

“Do not go” and “Rage” embody two of the three generic pc objects inherent to the series. Both formations yield large chromatic collections—7-1 {te01234} and 8-1 {012134567}, respectively—and both express the octatonic 4-3 pcseg in the reflection-symmetric object-image relationship. As will become clear, almost all of the super-serial formations yield chromatic collections, but the symmetry relations of the boundary serial units vary as do the generic associations of the tetrachordal pcsegs that initiate and terminate each formation. Thus, the multifarious super-serial formations found in this work fall into four general categories that are defined in part by the symmetry relationship of the boundary serial units (translation or reflection) and by the generic

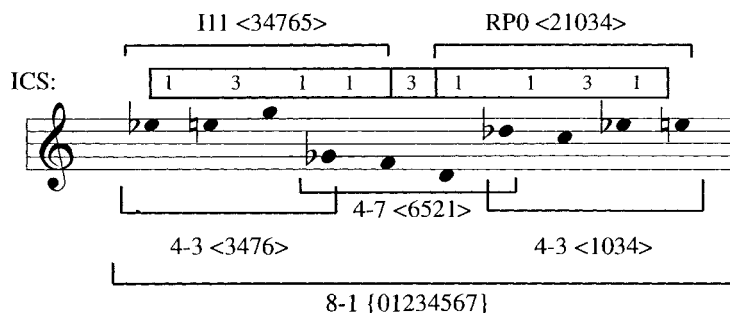
¹¹ Recall examples 2.12, 2.13 and 2.14 in which the ICS establishes numerical constants among transformations of pcsegs and pcsets.

tetrachordal set-classes generated by the boundary serial units (octatonic 4-3 or chromatic 4-1).¹²

Example 6.3. *In Memoriam*: “Do not go”



Example 6.4. *In Memoriam*: “Rage”



The interval-class successions (ICS) derived from the ordered pitch-class interval successions (PCIS) of P_0 and RP_0 , and I_8 and RI_8 are:

P_0/RP_0 :	$\langle 43012 \rangle$	$\langle 21034 \rangle$	I_8/RI_8 :	$\langle 01432 \rangle$	$\langle 23410 \rangle$
PCIS:	$\langle 11-9-1-1 \rangle$	$\langle 11-11-3-1 \rangle$	PCIS:	$\langle 1-3-11-11 \rangle$	$\langle 1-1-9-11 \rangle$
ICS:	$\langle 1-3-1-1 \rangle$	$\langle 1-1-3-1 \rangle$	ICS:	$\langle 1-3-1-1 \rangle$	$\langle 1-1-3-1 \rangle$

The ICS derived from P_0 and I_8 is $\langle 1-3-1-1 \rangle$, which of course remains true for any P or I unit.¹³ Therefore, the ICS $\langle 1-3-1-1 \rangle$ represents any P or I unit, and the ICS $\langle 1-1-3-1 \rangle$

¹² This analytic technique is similar to that used towards the elucidation of the symmetries among the constituent serial units of the Cantus Cancrizans in *Ricercar II* (see Chapter 4). The main difference here is that the classification of the super-serial formations of *In Memoriam* based on boundary events is intended to provide a means of comparing non-contiguous large-scale formations rather than illustrating localized contiguous linear symmetries.

represents any RP or RI unit. Each generic tetrachordal pcseg yields a distinctive ICS: ICS <1-3-1>, derived from the octatonic 4-3 pcseg (e.g., P₀, o.p.1-4), and ICS <3-1-1>, derived from the chromatic 4-1 pcseg (e.g., P₀, o.p.2-5). Moreover, the group comprising the four basic serial transformations (P, RP, I, and RI) yields *three* unique tetrachordal ICSs, all of which are rotations of the <1-3-1> pattern:

- (1) <1-3-1>, derived from the first four elements of the prograde forms (P and I) and the last four elements of the retrograde forms (RP and RI);
- (2) <1-1-3>, derived from the first four elements of the retrograde forms (RP and RI); and
- (3) <3-1-1>, derived from the last four elements of the prograde forms (P and I).

Thus, ICS <1-3-1> is associated with the PCIS that yields the octatonic 4-3 pcseg, and ICSs <1-1-3> and <3-1-1> are associated with the PCISs that yield the chromatic 4-1 pcseg.

All super-serial formations are labeled according to the genus to which the two boundary tetrachords belongs—that is, the generic tetrachordal pcseg found at o.p.1-4 of the initial (or left) boundary units and at o.p.2-5 of the terminal (or right) boundary unit—and by the symmetry expressed by the boundary tetrachords. Table 6.2 lists the four super-serial types and their descriptors (R-OO, R-CC, T-OC, T-CO), and summarizes their relationship to the various potential combinations of P, RP, I, and RI forms.¹⁴ As shown in the table, four *prograde-retrograde* combinations will produce the R-OO type, four *retrograde-prograde* combinations will produce the R-CC type, four *prograde-prograde* combinations will produce the T-OC type and four *retrograde-retrograde* combinations will produce the T-CO type. The thematic super-serial formations Do-not go tenor and “Rage,” for example, are both reflection-symmetric/octatonic-octatonic (R-OO) according to table 6.2.

The series itself provides the basic model for the translation-symmetric-type super-serial formations, T-OC and T-CO. Since the boundary tetrads that define the translation-

¹³ Of course, the transformations of these successions are general properties of any (ordered) pc segment and its constituent intervals under the four serial transformations (Pn, RPn, In, RIn).

¹⁴ The acronyms “OO,” “CC,” “OC,” and “CO” stand for *octatonic-octatonic*, *chromatic-chromatic*, *octatonic-chromatic*, and *chromatic-octatonic*, respectively. The letters “R” and “T” are abbreviations for *reflection-symmetric* and *translation-symmetric*, respectively.

symmetric/octatonic-chromatic (T-OC) type emerge, in order, from the interlocking tetrachordal pcsegs of the series, all T-OC formations entail a distortion of the series through interpolation (stretching). The interpolated material in such formations completes, at least, the serial unit associated with each boundary tetrad. The translation-symmetric/octatonic-chromatic type (T-CO), then, emerges from the retrograde forms of the series.

Table 6.2. *In Memoriam*: Super-serial types

REFLECTION-SYMMETRIC			
Boundary Serial Units	ICS	Boundary SC Type	Descriptor
(P + RP) or (I + RI) or (P + RI) or (I + RP)	<u>1-3-1-1</u> → 1- <u>1-3-1</u>	octatonic/octatonic	R-OO
(RP + P) or (RI + I) or (RP + I) or (RI + P)	<u>1-1-3-1</u> → 1- <u>3-1-1</u>	chromatic/chromatic	R-CC
TRANSLATION-SYMMETRIC			
Boundary Serial Units	ICS	Boundary SC Type	Descriptor
(P + P) or (I + P) or (P + I) or (I + I)	<u>1-3-1-1</u> → 1- <u>3-1-1</u>	octatonic/chromatic	T-OC
(RP + RP) or (RI + RP) or (RP + RI) or (RI + RI)	<u>1-1-3-1</u> → 1- <u>1-3-1</u>	chromatic/octatonic	T-CO

Example 6.5 traces the transformation of P_0 into the T-OC super-serial formation comprising P_0 , I_{10} , and P_9 presented by the second tenor trombone at the beginning of the Prelude (see example 6.21, *Dirge Canons*, Block 1).¹⁵ This formation is particularly significant since it has a thematic function—it introduces P_0 —and it embodies the processes that transform P_0 into the translation-symmetric super-serial formations. Staff 1 of example 6.5 illustrates the segmentation of P_0 <43012> into the octatonic 4-3 and the chromatic 4-1 tetrads (also refer to example 6.1, above). Staves 2 and 3, labeled

¹⁵ Stravinsky, *In Memoriam*, 4 (the first set of *Dirge Canons*, before A). Example 6.21, which comprises the analytic graphs for the complete set of *Dirge Canons*, will be discussed in detail later in the present chapter.

“Transformational Spaces,” depict the transformational processes that link P_0 to the super-serial T-OC formation in which it participates. Staff 4 presents the resultant linear formation, T-OC <430123654109te> as a pitch reduction. Notice that Stravinsky’s transformation of P_0 into P_9 maps each element of the prime ordering of the series onto the P_9 unit by the same ordered pitch-interval—that is, each mapping entails transformation by p-int -3.¹⁶ This, in turn, preserves the pitch-contour of the prime ordering and makes clear that the P_9 unit (as are all other P forms) is a simile of P_0 , the primary thematic unit (or, as Stravinsky calls it, the “Theme”).

Example 6.5. *In Memoriam*: Transformation of P_0 into the T-OC-type formation

The diagram illustrates the transformation of the prime unit P_0 into the T-OC-type formation across four staves:

- Staff 1:** P_0 <43012> (Prelude, mm. 1-2, Ten. Tbn. 2). It shows the initial prime unit and its transformation into the octatonic boundary tetrad 4-3 (labeled (o.p.1-4)→) and the chromatic boundary tetrad 4-1 (labeled ←(o.p.2-5)).
- Staff 2:** (Transformational Spaces). It shows the transformational spaces between the prime unit and the T-OC formation.
- Staff 3:** It shows the transformational spaces between the prime unit and the T-OC formation, with labels for "boundary serial units completed" and "INTERPOLATIONS (point of elision)".
- Staff 4:** T-OC <430123654109te> (Prelude, mm. 1-5, Ten. Tbn. 2). It shows the resultant linear formation, segmented into P_0 <43012>, $I10$ <23654>, and P_9 <109te>.

Example 6.6 traces the transformation of RP_0 into the translation-symmetric/chromatic-octatonic (T-CO) super-serial formation comprising RP_8 and RI_7 expressed by the first bass trombone at the beginning of the Prelude.¹⁷ Staff 1 depicts the retrograde of the P_0 unit introduced by the second tenor trombone at the beginning of the Prelude (the pitch-level has been retained in the example). Staff 2 illustrates both the transformation as RP_8 as it appears in the score and the segmentation of RP_8 into the chromatic and octatonic tetrads. Once again, Stravinsky’s transformation of RP_0 into

¹⁶ See Chapter 2: “Symmetry Transformations and Mappings as Music-Theoretic Processes.”

¹⁷ Stravinsky, *In Memoriam*, 4 (before A).

RP₈ maps each element by a single ordered pitch-interval, which preserves the contour of the “Riversion” of the “Theme” in pitch space (i.e., each mapping entails transformation by p-int -4). Staves 3 and 4 depict the transformational processes that link RP₈ to the super-serial T-CO formation in which it participates, T-CO <t98e01230e> (staff 5).

Example 6.6. *In Memoriam*: Transformation of RP₀ into the T-CO-type formation

The diagram illustrates the transformation of RP₀ into the T-CO-type formation across five staves:

- Staff 1:** RP₀ <21034>. A dashed box highlights a sequence of notes.
- Staff 2:** RP₈ <t98e0> (Prelude, mm.3-4, BassTbn. I). A dashed box highlights a sequence of notes. An arrow labeled "(o.p.1-4) →" points from Staff 1 to Staff 2. A label "4-1 <t98e>, ICS <1-1-3>" is placed between the staves. A curved arrow labeled "RP₀ → RP₈ T₈" points from Staff 1 to Staff 2.
- Staff 3:** (Transformational Spaces). A dashed box highlights a sequence of notes. A label "(chromatic boundary tetrad 4-1)" points to a specific interval. A label "4-3 <98e0>, ICS <1-3-1>" is placed between Staff 2 and Staff 3. A label "← (o.p.2-5)" points from Staff 3 to Staff 2. A label "(octatonic boundary tetrad 4-3)" points to a specific interval.
- Staff 4:** A dashed box highlights a sequence of notes. A label "boundary serial units completed" points to a specific interval. A label "RP₈ → RP₈ (T₀)" points to a specific interval. A label "RP₈ → RP₁₇ (n = 11)" points to a specific interval.
- Staff 5:** T-CO <t98e01230e> (Prelude, mm.3-5, BassTbn. I). A dashed box highlights a sequence of notes. A label "RP₈ <t98e0>" points to a specific interval. A label "RP₁₇ <1230e>" points to a specific interval.

Reflection-symmetric super-serial formations (R-OO and R-CC) derive from a basic two-unit formation comprising either a complete prograde unit and a complete retrograde unit (R-OO), or a complete retrograde unit and a complete prograde unit (R-CC). In the ensuing analyses, it will become clear that reflection-symmetric formations are found in only one of the ten constituent blocks of the Dirge Canons (Prelude and Postlude), while the Song is replete with such formations. As we have seen, “Rage” comprises two non-elided units, while the two units of “Do not go” are elided, sharing three of the five order positions. Of these two important thematic formations, the present study adopts “Rage” as the basic model for the reflection-symmetric super-serial formations (R-OO and R-CC) since the constituent units are clearly articulated and the correspondence between the ten syllables of the line of text and the ten ordered pcs of the super-serial formation is

nearly one-to-one (see below).¹⁸ In this context, “Do not go” is a distortion—shrinking—of “Rage,” which is effected through elision (compare examples 6.3 and 6.4).

Example 6.7 illustrates the transformation of P_0 into the R-OO super-serial formation comprising I_6 elided to RP_0 —that is, the thematic “Do not go.”¹⁹ Staff 1 depicts the P_0 unit introduced by the second tenor trombone at the beginning of the Prelude. Staff 2 depicts the basic R-OO formation as a palindrome comprised of P_0 and RP_0 , and indicates the characteristic octatonic boundary tetrads. Staff 3 illustrates the transformation of P_0 into I_6 , and adjusts the pitch level at which both component units are expressed in the score. At this point, the basic model could remain articulated (e.g., “Rage”), or undergo stretching (distortion though interpolation)—we will see instances of this in the ensuing analyses. Instead, the two units are elided, which effects the distortion of the basic R-OO model (shrinking). Staff 4 is a pitch reduction of the “Do not go,” the formation that results from these transformational processes.

Example 6.7. *In Memoriam*: Transformation of P_0 into the R-OO-type formation

The diagram illustrates the transformation of the P_0 unit into the R-OO-type formation across four staves:

- Staff 1:** Shows the P_0 unit <43012> from the Prelude (mm. 1-2, Ten. Tbn. 2). It identifies octatonic boundary tetrads (T0) and (RT0).
- Staff 2:** Shows the basic R-OO formation as a palindrome of P_0 and RP_0 (<21034>). It includes labels for "octatonic boundary tetrad", "Potential for Interpolation", and "RP0 → RP0 (T0)".
- Staff 3:** Illustrates the transformation of P_0 into I_6 (n=2). It shows the elision of the two units, with labels for "ELISION" and "RP0 → RP0 (T0)".
- Staff 4:** Shows the final "Do-not-go Tenor R-OO" formation <te21045> from the Song (mm. 3-4, Tenor). It includes labels for "ELISION" and "RP0 → RP0 (T0)".

At the bottom, a bracket indicates the transformation from I_6 <te210> to RP_0 <21034>.

¹⁸ Stravinsky, *In Memoriam*, 5-6, after R1 (first iteration of “Rage, rage against the dying of the light.” “Rage” is one example of a one-to-one correspondence between ten syllables and ten pcs.

¹⁹ Ibid., 5 (Song, before R1). Although “Rage” represents the best candidate for the model of reflection-symmetric super-serial formations, the “Do not go” formation is the one that introduces Thomas’s primary textual idea.

The reflection-symmetric/chromatic-chromatic (R-CC) formation is also a transformation of the basic two-unit R-OO model since the transformation of an R-OO formation into a R-CC formation simply entails the reversal of the order in which the two component units of the R-OO formation are presented. Example 6.8 illustrates the transformation of P_0 into the R-CC super-serial formation comprising RP_{10} , RI_9 , and P_9 presented by the second tenor trombone in the final block of the Prelude.²⁰ (Once again, the second tenor trombone introduces an important thematic formation.) Staff 1 depicts the P_0 unit introduced by the second tenor trombone at the beginning of the Prelude. Staff 2 depicts the basic R-CC formation as a palindrome comprised of RP_0 and P_0 , and indicates the characteristic chromatic boundary tetrads. Staff 3 illustrates the transformations of RP_0 into RP_{10} , and P_0 into P_9 . Notice that Stravinsky again preserves the contour of each formation in pitch-space: the contour of P_0 is preserved in p-space through the mapping of P_0 onto P_9 by p-int -3 ; similarly, the contour of RP_0 is preserved in p-space through the mapping of RP_0 onto RP_{10} by p-int -2 . The basic two-unit R-CC model then undergoes distortion through the interpolation of the RI_9 unit. The resultant formation, R-CC $\langle 0et123452109te \rangle$, is shown on Staff 4 as a pitch reduction.

Example 6.8. *In Memoriam*: Transformation of P_0 into the R-CC-type formation

The example consists of four staves illustrating the transformation of the P_0 unit into the R-CC-type formation:

- Staff 1:** Shows the P_0 unit $\langle 43012 \rangle$ (Prelude, mm. 1-2, Ten. Tbn. 2). It includes a "chromatic boundary tetrad" and a transformation (T_0) .
- Staff 2:** Shows the basic R-CC formation as a palindrome comprised of RP_0 and P_0 . It includes a "chromatic boundary tetrad" and a transformation (T_0) . The transformation spaces are indicated as $RP_0 \rightarrow RP_{10}$ and $P_0 \rightarrow P_9$.
- Staff 3:** Shows the transformations of RP_0 into RP_{10} and P_0 into P_9 . The transformation spaces are indicated as $RP_0 \rightarrow RP_{10}$ and $P_0 \rightarrow P_9$.
- Staff 4:** Shows the resultant formation, R-CC $\langle 0et123452109te \rangle$ (Prelude, at D, Ten. Tbn. 2). It includes an "INTERPOLATION" section and a "chromatic boundary tetrad". The formation is shown as a pitch reduction of the basic two-unit R-CC model.

²⁰ Ibid., 4 (Dirge Canons, Prelude, at D).

As we have seen, super-serial formations exhibit a variety of internal designs. Each R-symmetric formation represents a distortion of the basic “Rage” model through stretching (interpolation of a serial unit or units into the basic two-unit model) and shrinking (elision of the elements of the basic two-unit model). Each T-symmetric formation represents the stretching of a single serial unit through interpolation (involving at least the completion of the two basic constituent serial units). The selection and deployment of the constituent serial units, the presence (or absence) of pitch-class palindromes and invariant row-form pairs, as well as the elision or articulation of successive units, are also significant in the shaping of super-serial formations, irrespective of the number of constituent serial units. Thus, these features engender descriptors of the super-serial formations associated with the various blocks in addition to the classification system based on boundary-set type and their symmetry relations. Table 6.3 lists and defines the super-serial descriptors that are used in the ensuing analyses.

Table 6.3. *In Memoriam*: Summary of super-serial descriptors

ABBREVIATION	EXPLANATION
R-OO	— Reflection symmetric: octatonic sc 4-3 boundaries (left boundary unit is always prograde, right boundary unit is always retrograde)
R-CC	— Reflection symmetric: chromatic sc 4-1 boundaries (left boundary unit is always retrograde, right boundary unit is always prograde)
T-OC	— Translation symmetric: octatonic sc 4-3 left boundary, chromatic sc 4-1 right boundary (both boundary units are prograde)
T-CO	— Translation symmetric: chromatic sc 4-1 left boundary, octatonic sc 4-3 right boundary (both boundary units are retrograde)
(i)	— Linking interval between two units (no elision; the units are articulated)
(e)	— Elision of two units (<i>shrinking</i>)
(x)	— Internal serial unit or units, where <i>x</i> is replaced by the number of internal units (<i>stretching</i> through interpolation; elision or linking intervals not indicated)

THE ANALYTICAL GRAPHS

The analytical graphs presented in the current chapter are similar in style to the others found in the preceding chapters. Nonetheless, the style of presentation used herein needs to be reviewed so that minor differences and new terminology can be brought to the reader's attention.

All of the graphs are pitch reductions of complete blocks or sub-blocks in which all of the pitches are accounted for. Measures are indicated by ticks (measure numbers are not provided). For the Dirge Canons, rehearsal letters are provided above each block; for the song, rehearsal numbers (or the proximity to a number) are provided in the title of the example. Each staff represents a complete linear formation—that is, an unfolding of a single serial unit or a super-serial formation. The beginning of each serial unit is flagged by a unit label and the pcseg representing the pitch successions derived from the score—this holds for the constituent serial units of the super-serial formations. Labels are also provided for *altered* serial formations and non-serial formations: for altered formations, the serial unit label prefixed by “Altered,” the pcseg derived from the score, and a comment regarding the alteration; for non-serial linear formations, the sc and pcseg and/or pcset label. In regard to super-serial formations, the graphs also point up certain internal details such as elisions (*elided*) and symmetries among successive units (reflection—*pc palindrome*; translation—*repeated*). When applicable, super-serial descriptors are provided in the right margin (R-OO, R-CC, T-OC, T-CO). In examples 6.19 and 6.20, the super-serial formations found in the tenor part articulate two smaller super-serial formations, thus additional super-serial descriptors are provided above the tenor staff (the reasons for this are discussed below).

The sc and pcset derived from each serial and super-serial formation is given in the right margin. Where applicable, brackets and sc-pcset labels representing simultaneities that arise through instantaneous vertical interaction are given below the system. In such cases, pitches are connected through slurs in order to show their participation in the simultaneity. The pitch-class collection derived from the constituent linear formations of each block (or sub-block) is represented by an sc-pcset label (always below the simultaneity labels). In the analytical graphs derived from the ritornelli of the Song

(below), stems and beams, and broken lines are used solely for the purpose of illustrating important structural connections between the diatonic elements of the serial units expressed by Vn.1 and the sonorities in which they participate.

SONG: “DO NOT GO GENTLE . . .”

In Memoriam Dylan Thomas is a triptych in which the centerpiece, the Song, is enclosed by the Dirge Canons (Prelude and Postlude). Since the Song is the object of this work of art and was composed before the Dirge Canons, the present study addresses the Song before the Dirge Canons.²¹ As we will see, the structure of Thomas’s poem provides Stravinsky with many of the pre-compositional and formal elements of the Song. The design of the series, the deployment of serial units into super-serial units and other aspects of small- and large-scale formal design mirror text structure. In turn, many of the local and large-scale structural and formal elements of the Song are extended to the compositional design of the Dirge Canons. In the ensuing discussions, we will examine the relationship of the poem to the Song, explore the structural attributes of the constituent blocks and sub-formal units, and notice the diversity of super-serial formations within the analytic framework of the four super-serial types. In doing so, we will observe the extent to which the chromatic, octatonic, and diatonic genera—intrinsic to the serial design—influence interactions between simultaneous expressions of serial and super-serial formations.

Song: Formal Plan

The extent to which Stravinsky articulates large and small formal divisions, in addition to the scansion and pacing of the lyrics and the design of the pitch objects in which they are set, reflects his sensitivity towards Thomas’s poem. Table 6.4 reproduces Thomas’s poem (a villanelle) as it appears in the score and illustrates the relationship of

²¹ White, *Stravinsky*, 477.

the six stanzas to the form of the Song.²² The column to the left of the poem lists the sections, or blocks, according to the type or basic function of each block: Ritornello (scored for string quartet), and Stanza (scored for tenor voice and strings).

Table 6.4. *In Memoriam*, Song, “Do not go gentle”: Text and form

BLOCK TYPE	TEXT	SYLLABLES PER LINE	LINE TYPE
RITORNELLO 1	(Strings, before R1)		
STANZA 1	Do not go gentle into that good night, Old age should burn and rave at the close of day; Rage, rage against the dying of the light.	10 10 10	“Do not go” NRL Rage
RITORNELLO 2	(Strings, R2)		
STANZA 2	Though wise men at their end know dark is right, Because their words had forked no lightning they Do not go gentle into that good night.	10 10 10	NRL NRL “Do not go”
RITORNELLO 3	(Strings, R4)		
STANZA 3	Good men, the last wave by, crying how bright Their frail deeds might have danced in a green bay, Rage, rage against the dying of the light,	10 10 10	NRL NRL “Rage”
RITORNELLO 4	(Strings, before R6)		
STANZA 4	Wild men who caught and sang the sun in flight, And learn, too late, they grieved it on its way, Do not go gentle into that good night.	10 10 10	NRL NRL “Do not go”
RITORNELLO 5	(Strings, before R8)		
STANZA 5	Grave men, near death, who see with blinding sight Blind eyes could blaze like meteors and be gay, Rage, rage against the dying of the light.	10 11 10	NRL NRL “Rage”
STANZA 6	And you, my father, there on the sad height, Curse, bless, me now with your fierce tears, I pray. Do not go gentle into that good night. Rage, rage against the dying of the light.	10 10 10 10	NRL NRL “Do not go” “Rage”
RITORNELLO 6	(Strings, after R12)		

²² Dylan Thomas, “Do not go gentle into that good night,” from *Collected Poems of Dylan Thomas* (J.M. Dent & Sons Ltd., n.d.) reproduced in Stravinsky, *In Memoriam*, i, and Song, 5-9.

As indicated in table 6.4, the poem is introduced by the string ritornello (Ritornello I). The string ritornelli clearly delineate each stanza with the exception of the fifth and sixth stanzas. Thus, six string ritornelli balance the six vocal sections (one for each stanza) resulting in the division of the Song into twelve discrete blocks. This quasi-antiphonal arrangement becomes the principle underlying the formal deployment of the blocks of the Dirge Canons.

The Ritornelli

The ritornelli have two important functions: one is dramatic, the other, thematic. The delineation of the stanzas by the string ritornelli facilitates a moment of poignant reflection, while the absence of a ritornello between the last two stanzas accelerates the delivery of the poem, underscoring the dramatic villanelle and its message of defiance. The Song concludes with Ritornello 6 in which Stravinsky provides a metaphor for death through a subtle transformation that entails the exchange of linear materials between Vn.I and the viola (see below).

Examples 6.9, 6.10, 6.11 are pitch reductions of Ritornello 1, 4, and 6, respectively.²³ As shown in example 6.9, the series, P_0 , is introduced by Vn.I in Ritornello 1. Each ritornello expresses the same four prograde serial units: the two violins and the viola present one unit each— P_0 , P_9 , and I_{10} , respectively (Vn.I and Vla. exchange units in Ritornello 6)—and the ‘cello presents a super-serial formation comprising I_7 elided to P_9 . Although the ‘cello’s formation seems substantially different from the single-unit formations expressed by the other strings, there are subtle connections that bring these apparently disparate formations into a closer relationship. The ‘cello formation is a T-OC type (shown in the right margin of the examples), which denotes a transformation from a single prograde unit into a super-serial formation though the processes depicted in example 6.5 (above). Since the violins and viola each express a single serial unit, their

²³ Only three of the six ritornelli are selected for discussion in the present study. Ritornello 1 is similar to Ritornello 2 and 3, Ritornello 4 represents similar variations found in Ritornello 5, and Ritornello 6 is unusual with respect to the other five because of the exchange of material between Vn.1 and the viola.

respective formations yield pcsets that belong to sc 5-1, while the elided T-OC formation yields sc 7-1, the abstract complement of sc 5-1.

Example 6.9. *In Memoriam*, Song: Ritornello 1 (before R1)

The musical score for Ritornello 1 is shown with four staves: (Vn.I), (Vn.II), (Vla.), and (Vc.). Above the staves, a bracket labeled "o.p.1,3,5: 3-6 <402>" spans the first two staves. The Vn.I staff has a label "P0 <43012>" pointing to a specific note. The Vn.II staff has a label "P9 <109te>" pointing to a specific note. The Vla. staff has a label "110 <23654>" pointing to a specific note. The Vc. staff has a label "I7 <e0321>" pointing to a specific note, followed by an "elided" section, and then a label "P9 <109te>" pointing to a specific note. To the right of the staves, there are four pcset labels: "< 5-1 {01234}" for Vn.I, "< 5-1 {9te01}" for Vn.II, "< 5-1 {23456}" for Vla., and "< 7-1 {9te0123} T-OC" for Vc. Below the staves, there is a large bracketed pcset "10-1 {9te0123456}" which is composed of several smaller pcsets: "3-7 {e24}", "3-4 {e34}", "4-13 {0136}", "3-6 {135}", "3-7 {025}", "4-17 {9014}", and "4-z15 {te24}".

The pcset expressed by each linear formation is characteristically chromatic (sc 5-1 or 7-1) and the pcset representing the entire collection of pcs expressed by each ritornello is 10-1 {9te0123456}, yet the simultaneities that form through linear interactions express scs that are strongly aligned to the octatonic and diatonic genera. In the ensuing analyses, we will explore how genera influence the linear and vertical design of the ritornelli. In doing so, we will observe the special structural role of the 3-6 pcseg that is embedded within the series, and discover how the octatonic genus and the serial octatonic pcseg 4-3 organizes the compositional design at a deep structural level.

Even though the ritornelli are identical in terms of serial-unit content and deployment (with the exception of Ritornello 6), there is considerable variation in the metric placement and length of each ritornello as well as rhythmic variation within the constituent linear formations. This, in turn, creates variations among the sonorities that arise from the instantaneous vertical interactions of the simultaneously unfolding lines. Irrespective of the rhythmic adjustments that the composer makes to each constituent linear formation, however, two important structural features emerge that remain

consistent throughout the ritornelli. First, there is a prevalence of inter-generic octatonic-diatonic coordination between the elements of the embedded 3-6 pcseg expressed by Vn.1 (for P_0 , <402>) and their concomitant vertical adjacencies. Second, the majority of set-classes derived from the simultaneities hold strong affiliations with the octatonic and the diatonic genera: they are either exclusively diatonic or octatonic, inter-generic octatonic-diatonic, diatonic-chromatic, or octatonic-chromatic, or pan-generic.²⁴

Table 6.5 lists all of the scs derived from the pcsets representing the simultaneities discovered through the analysis of Ritornello 1 (example 6.9), Ritornello 4 (example 6.10) and Ritornello 6 (example 6.11). The table provides the PCIS for each sc, and indicates its membership(s) to each genus through the number of member sets for that sc that occur in the cynosural sc. The results are shown in the last two columns: the second-to-last column indicates the generic, inter-generic, or pan-generic affiliations (*D*, *C*, and *O* denote diatonic, chromatic, and octatonic membership, respectively); the last column indicates the primary generic affiliation. In order to determine the primary generic affiliation, the number of members each genus contains for any one of the scs in addition to the characteristic generic interval successions expressed in the PCIS for each sc are taken into consideration. Thus, the numbers representing generic membership and PCISs that are shown in bold typeface are the factors that decided the primary generic affiliation for each of the scs listed. According to table 6.5, scs 3-3, 3-10, 4-13, 4-z15, and 4-17 are primarily octatonic, and scs 3-4, 3-6, 3-7, 3-11, 4-14, and 4-23 are primarily diatonic.²⁵

Example 6.9 (above) illustrates the deployment of serial and super-serial formations in Ritornello 1, and the simultaneities that direct their moment-to-moment interactions. Three pcsets in particular—3-7 {e24}, 3-7 {025}, and 4-z15 {te24}—take on a special structural significance since they are inclusion-related *and* their deployment coincides with the elements of pcseg 3-6 <402> embedded in the P_0 unit expressed by Vn.I, which defines the boundaries of Ritornelli 1 – 5.²⁶

²⁴ See Chapter 2 (Theory and Methodology: “A Model of Set-Class Space . . .”).

²⁵ The int-pair derived from the PCIS of sc 3-11, <3-4>, has the potential to generate scs 7-35, 8-23, and 9-9, all of which are large characteristic scs of the diatonic genus, including the cynosure (see example 2.18). Thus, sc 3-11 is inherently more associated with the diatonic genus than the octatonic genus.

²⁶ Aside from the thematic importance of P_0 in this context, the registration of P_0 clearly defines its presentation—that is, it is clearly a soprano line.

Table 6.5. *In Memoriam*, Song, Ritornelli: Simultaneities and generic affiliation

SET-CLASS	PCIS	GENUS/NUMBER OF MEMBER SCS			GENERIC, INTER-GENERIC, PAN-GENERIC	PRIMARY GENERIC AFFILIATION
		<i>Diatonic</i> 7-35	<i>Chromatic</i> 7-1	<i>Octatonic</i> 8-28		
3-3	<1-3>	—	6	8	C-O	Octatonic
3-4	<1-4>	4	4	—	D-C	Diatonic
3-6	<2-2>	3	3	—	D-C	Diatonic
3-7	<2-3>	8	4	8	D-C-O	Diatonic
3-10	<3-3>	1	1	8	D-C-O	Octatonic
3-11	<3-4>	6	—	8	D-O	Diatonic
4-13	<1-2-3>	2	2	8	D-C-O	Octatonic
4-14	<2-1-3>	4	—	—	D	Diatonic
4-z15	<1-3-2>	—	2	8	C-O	Octatonic
4-17	<3-1-3>	—	—	4	O	Octatonic
4-23	<2-3-2>	4	—	—	D	Diatonic

Example 6.10 (Ritornello 4) illustrates the variations in vertical adjacencies that result from the compositional re-interpretation of Ritornello 1. In Ritornello 4, the realignment of the constituent linear formations results in the displacement of sc 3-7—representing the left boundary sonority of Ritornello 1—by pcset 3-6 {024}, the linear-vertical transformation of pseg 3-6 <402>. In addition to the diatonic 3-6 pcset, the sonorities that coincide with the other pcs of the 3-6 <402> pseg from P_0 (Vn.I) hold membership in the diatonic genus: 3-4 <015> is inter-generic diatonic-chromatic, and 4-23 <9e24> is exclusively diatonic. Notice that sc 3-7 <e24>, the sc that coincides with the boundaries of P_0 in Ritornello 1, is abstractly included in 4-23 <9e24> as 3-7 <9e2> and literally included as 3-7 <e24>.

Example 6.11 illustrates the deployment of serial and super-serial formations in Ritornello 6. The serial units voiced by the first violin and the viola in the first five ritornelli, P_0 and I_{10} , are exchanged in Ritornello 6 so that I_{10} now functions as the structural soprano. Notice the boundary pcs of P_0 , {24}, remain invariant for I_{10} , while the order of their presentation is reversed: <42> to <24>, respectively. Although there are differences in the way that the elements of the linear formations are vertically aligned in comparison to Ritornelli 1 and 4, the simultaneities that direct the moment-to-moment

interactions of the linear formations continue to evince diatonic and/or octatonic characteristics. Similar to Ritornello 1, sc 3-7 is expressed as the left boundary and midpoint sonorities of the 3-6 pcseg in the Vn.I line (i.e., 3-6 <264> from I_{10}). While the first 3-7 pcset {e24} remains invariant with the pcset found at the analogous position in Ritornello 1, the second 3-7 pcset {136} is a transposition (T_1) of the 3-7 {025}. The diatonic pcset 4-14 {9e04} has displaced the octatonic pcset 4-z15 {te24} as the right boundary sonority of the Vn.I unit, but the octatonic 4-z15 {te24} is re-established as the right boundary sonority associated with P_0 , which is now in the viola. Thus, Ritornello 6 abstractly conjoins the diatonic right-boundary sonority of Ritornello 4 (sc 4-14 instead of sc 4-23) with the octatonic right-boundary sonority of Ritornello 1.

Example 6.10. *In Memoriam*, Song: Ritornello 4 (before R6)

o.p.1,3,5: 3-6 <402>

(Vn.I) P_0 <43012>

(Vn.II) P_9 <109te>

(Vla.) II_0 <23654>

(Vc.) I_7 <e0321> (elided) P_9 <109te>

<- 5-1 {01234}

<- 5-1 {9te01}

<- 5-1 {23456}

<- 7-1 {9te0123} T-OC

(3-7 {e24}) 3-6 {024} 3-4 {015} 3-11 {914} 4-17 {9014} 4-23 {9e24}

10-1 {9te0123456}

The six ritornelli express the linear-vertical transformations of the generic pcsegs derived from the series into vertical adjacencies. Moreover, these generic expressions suggest that P_9 , I_{10} , and I_7+P_9 (T-OC) were selected as the contrapuntal units to P_0 because of the potential of the various alignments of their simultaneous expressions to produce sonorities that evince octatonic and diatonic characteristics. Figure 6.1 depicts the network that traces the transformations among the constituent units, illustrates the

five pcsets that would arise from the successive vertical interactions of the four serial units if they were aligned in note-against-note counterpoint, and reveals the generic interconnections among the serial units in the order that they appear in the score for Ritornelli 1 – 5.

Example 6.11. *In Memoriam*, Song: Ritornello 6

o.p.1,3,5: 3-6 <264>

(Vla.) I10 <23654>

(Vn.II) P9 <109te>

(Vla.) P0 <43012>

(Vc.) I7 <e0321> (elided) P9 <109te>

Interval vectors and pcsets:

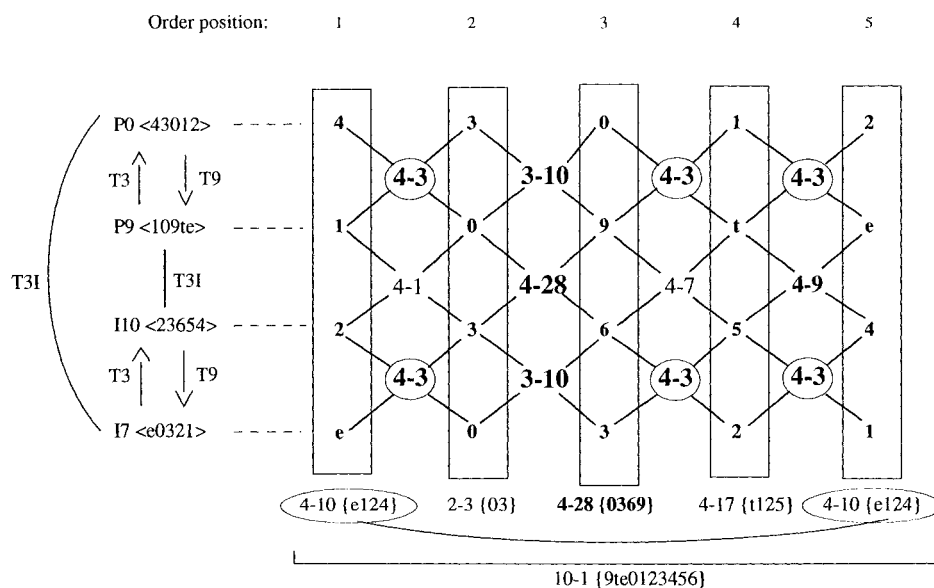
- <5-1> {23456}
- <5-1> {9te01}
- <5-1> {01234}
- <7-1> {9te0123} T-OC
- 3-7 {e24}
- 3-7 {136}
- 3-7 {035}
- 4-14 {9e04}
- 4-z15 {te24}
- 3-3 {034}
- 3-10 {036}
- 10-1 {9te0123456}

The network that establishes the transformational pathways among the four serial units— P_0 , P_9 , I_{10} , and I_7 —is shown in the left margin of figure 6.1. The n values derived from the transpositional operators and the index numbers associated with the transposition-inversion operators express ic_3 , a characteristic interval of the octatonic genus and the most plentiful interval class in the interval vector for $sc\ 8-28$, [448444].

The four serial units are realized as pc integer successions to the right of each unit label and its concomitant pcseg. All of the pcsets derived from the union of the successive order positions of the four serial units shown in figure 6.1 yield pcsets that hold membership in the octatonic genus (shown below each vertical rectangle). The pcset 4-10 {e124} that forms at o.p.1 and o.p.5 is pan-generic, but its strongest affiliation is octatonic. The SIA <3-9> of the dyad 2-3 {03} at o.p.2 expresses the same values for n derived from the T_n and T_nI operators shown in the transformational network. The pcset

4-28 {0369}, created through the union of the midpoint pcs of the serial units (o.p.3), is the abstract complement of the octatonic cynosure, sc 8-28. The pcset 4-17 {t125} at o.p.4 is exclusive to the octatonic genus.

Figure 6.1. *In Memoriam*, Song: Transformations and generic interconnections among the constituent serial units of the ritornelli



The lattice-like network that interconnects order position pairs among adjacent serial units in figure 6.1 illustrates the uniformity of octatonic expression that arises through the juxtaposition of the four units. Each tetrachordal sc depicted in the lattice arises from the union of pcs found at adjacent order positions in adjacent serial units. Octatonic scs are shown in bold typeface; sc 4-3, the characteristic tetrad of the octatonic genus, is also encircled. The lattice yields six manifestations of sc 4-3: three occur at o.p.1-2, 3-4, and 4-5 between the two P forms, and three occur at the analogous positions in between the two I forms. Two instances of the quintessentially octatonic sc 3-10 appear at o.p. 2-3, P forms, and at the analogous position, I forms. The tetrads formed between P₉ and I₁₀ yield octatonic scs, 4-28 and 4-9, and two chromatic scs, 4-7 and 4-1 (the sc expression of the serial chromatic tetrad).

The remarkable quantity of octatonic expressions arising from the linear-vertical interaction of chromatic linear formations within the predominantly chromatic

environment depicted in figure 6.1 is one manifestation of the inherent pan-generic quality of the serial design. Another manifestation of this design is found in the actual compositional deployment of the pcs derived from the four serial units. Similar to the manner in which Stravinsky controls the intense precompositional symmetrical patterning of the object and image themes in “Musick to heare,” through distortions and compositional disposition at or near the musical surface, the intense symmetrical octatonic expressions that abstractly bind the four serial units together in the ritornelli are diluted through compositional realization. The four serial units depicted in figure 6.1 are never articulated as mono-rhythmic simultaneities in the actual composition, which is a possibility that Stravinsky assiduously avoids.

The I₇-P₉ super-serial formation found in the ‘cello line has a special function: it provides the means with which to mitigate the intense symmetry created through the transformational processes that led the composer to select the four serial units—P₀, P₉, I₁₀, and I₇—as the basic resources for the ritornelli. The refinement of the moment-to-moment interactions of the linear formations in Ritornelli 1, 4, and 6 allows Stravinsky to exploit the pan-generic quality of the series and generate a variety of sonorities without compromising the octatonic-diatonic qualities established thorough the strategic placement of sc 3-7 and 4-z15 that coincide with the boundary and midpoint of P₀ in Ritornello 1. This, in turn, highlights the embedded diatonic 3-6 pcseg by providing each of the three elements with vertical support through sonorities that hold affinity with the diatonic genus—scs 3-4, 3-7, 4-14, 4-23—as well as the vertical expression of the P₀ 3-6 pcseg <402> found in Ritornello 4.

The Stanza Blocks

The *stanza blocks*—that is, the blocks of the Song that provide the vehicles for the stanzas of Thomas’s villanelle—exhibit a variety of super-serial formations that unfold within a predominately chromatic environment. The simultaneities that arise through the vertical interactions of the constituent linear formations within the stanza blocks do not evince the intense octatonic-diatonic characteristics typical of the simultaneities found in

the ritornelli. Nonetheless, there are few distinct expressions of octatonic and diatonic simultaneities that are related to the form of the Song.

Table 6.4 (above) indicates the number of syllables associated with each line of text, and categorizes each line into one of three types: the thematic, or recurring “Do not go” and “Rage” lines, and the developmental, or non-recurring lines (*NRL*). Of the six stanzas, the first five contain three lines each and the final stanza contains four. Each line contains ten syllables, except for the fifth stanza, in which the line containing the word “meteors” has eleven syllables.²⁷ Each stanza contains one of two thematic lines: “Do not go gentle into that good night” and “Rage, rage against the dying of the light.” The first and last stanzas express both lines, while the interior stanzas alternately conclude with “Do not go . . .” and “Rage, . . .”

In the ensuing analyses, each of the six stanza blocks is divided into two sub-blocks: the sub-blocks that express the thematic “Do not go” and “Rage” lines, herein called “*Do not go*” blocks and “*Rage*” blocks, and the sub-blocks that express the *pairs* of non-thematic, non-recurring lines, herein called *NRL* blocks. As will become clear, the basis of this division lies in the types of pc objects typically found in these blocks in addition to the nature of the line(s) of text they carry.

Text Setting and Serial/Super-Serial Formations

The simple numerical relationship that exists between the five elements of the series and the ten syllables normally found in each line of the Thomas’s poem suggests the one-to-one mapping of five syllables of text onto five serial elements as an approach to text setting. This technique is used by the composer for the articulation of the non-recurring lines in the final stanza. Stravinsky also employs a flexible approach to text setting that allows the repetition of ordered elements within a single serial unit (where a repeated element accommodates several syllables), or the construction and employment of super-serial formations that subsume two or more elided and/or non-elided serial units. In many instances, super-serial formations provide the vehicle for two lines of text. In general,

²⁷ This is according to Stravinsky’s syllabification of the word “meteors,” which is rendered in the score as “me-te-ors.” Although this is the standard syllabification, a reading of the poem independent of the score suggests that the syllables “te-ors” elide easily into a single syllable (a diphthong), which in turn preserves the symmetry of 10 syllables per line.

Stravinsky aligns the beginnings and endings of lines of text to the boundaries of the component serial unit(s) in the vocal part. This is true of the “Rage” blocks, the “Do not go” blocks (except in Stanza 2), the single NRL formation in Stanza 1, and the pairs of non-recurring lines that constitute the NRL blocks 2 – 6.

“Do not go” Blocks

The “Do not go” blocks associated with Stanzas 1, 3, and 6 are nearly uniform in their design, while the “Do not go” block associated with Stanza 2 expresses some remarkable variations. Example 6.12 is a pitch reduction of the “Do not go” block that carries the first line of poetry. The line of poetry, carried by the thematic T-OO formation comprised of I_6 elided to RP_0 (above), is set in counterpoint with RI_4 (in this instance, RI_4 is voiced by the ‘cello and Vn.I). Similar to the ritornelli, the super-serial formation yields sc 7-1, which is the abstract complement of sc 5-1, the sc representing the series. As shown in the example, the unfolding of the 4-3 right-boundary tetrad of the super serial formation coincides with the unfolding of the 4-3 pcseg of RI_4 . The total pitch-class content of this “Do not go” block (and those of Stanzas 3 and 6) is 9-1 {89te01234}.

Example 6.12. *In Memoriam*, Song: “Do not go” block, Stanza 1 (before RI)

Example 6.13 is a pitch reduction of the “Do not go” block associated with Stanza 2. The thematic super-serial formation in the tenor has been altered by substituting the first pc of I_6 , pc10, with pc8, which in turn transforms the pcset associated with this formation from 7-1 {te01234} to an NE-partner, 7-3 {8e01234}. The contrapuntal RI_4 unit, now in the ‘cello line, has been subsumed within a T-CO formation comprising RP_7 (elided from

preceding NRL-block) and RI_4 . In addition, a second contrapuntal unit, RI_5 , is articulated by the viola. Irrespective of these changes, certain features remain consistent with the other three “Do not go” blocks: the octatonic tetrad $sc\ 4-3$ appears as the right boundary in all three formations, and the block does not yield the aggregate.

Example 6.13. *In Memoriam*, Song: “Do not go” block, Stanza 2 (before R4)

(Tenor) (elided) Altered I6 <8e210> RP0 <21034> 4-3 {0134} <7-3 R-OO {8e01234}>

(Vla.) RI5 <e01t9> 4-3 {9t01} <5-1 {9te01}>

(Vc.) (elided) RP7 <987te> RI4 <te098> 4-3 {89e0} <6-1 T-CO {789te0}>

10-1 {789te01234}

“Rage” Blocks

Similar to the ritornelli, the diatonic genus affects the vertical interactions among the constituent linear formations of the “Rage” blocks. As we shall see, this is unusual with respect to the NRL blocks (discussed below). Example 6.14 is a pitch reduction of the “Rage” block from Stanza 1.²⁸ The thematic R-OO formation in the tenor part (discussed above) is complemented by a similar formation in the ‘cello part: P_{11} elided to RI_7 (T_6I transform of the tenor line). All instrumental voices simultaneously reinforce the first element of the thematic tenor line, $pc3$. Each of the five constituent lines yields a chromatic pcset, except for the Vn.II formation. The non-generic pcset 5-22 {78e23} expressed by Vn.II contains elements derived from the serial units unfolding in other voices. The viola line comprises $pc3$ followed by RI_{11} , which yields pcset 6-2 {356789}.

²⁸ The “Rage” blocks are identical. Thus, example 6.14 will serve to represent all four instances (Stanzas 1, 3, 5, and 6).

Although the total pc content of the “Rage” blocks produces the near-aggregate 11-1 {e0123456789}, the three pcsets shown below the staff indicate diatonic influence. The pcset 5-27 {e0247} contains the diatonic P₀ 3-6 <402> as a subset; both pcsets 5-27 and 4-14 are exclusive to the diatonic genus, while the terminal sonority—4-8 {e0245}—is inter-generic diatonic-chromatic.

Example 6.14. *In Memoriam*, Song: “Rage” block, Stanza 1 (after R1)

(Tenor) 11-1 <34765> RP0 <21034>

(Vn.I) P11 <32e01>

(Vn.II) 5-22 {78e23}

(Vla.) pc 3 R11 <78965> (elided) R17 <1230e>

(Vc.) P11 <32e01> (elided) R17 <1230e> 4-8 {e045}

pc3 5-27 {e0247} 4-14 {1568} 4-8 {e045}

11-1 {e0123456789}

<- 8-1 {01234567} R-00

<- 5-1 {e0123} R-00

NRL Blocks

The six NRL blocks, which provide the vehicles for the non-recurring lines of Thomas’s poem, are diverse in their design. In contrast to the thematic, quasi-stable ritornelli, the “Do not go” blocks, and the “Rage” blocks, the NRL blocks develop the thematic materials of the Song. As a group, the NRL blocks utilize all four forms of the super-serial formations; individually, each NRL block exhibits a unique design in terms of texture and timbre. Nonetheless, the six NRL blocks exhibit two stable structural features: (1) each NRL block completes the aggregate; (2) the tenor part always expresses super-serial formations.

Examples 6.15 – 6.20 are pitch reductions of the NRL blocks. The first words of each 10-syllable non-recurring lines of text are provided in the examples under the tenor part so that the deployment of the component serial units and the super-serial formations in

which they participate are shown in relationship to the poem. The pcsets derived from the constituent tenor and instrumental linear formations of each NRL block (shown to the right of each staff) reveal that no single instrumental or vocal line expresses 12-1 (with one exception), which means that the principle of aggregate *non*-completion influences serial-unit selection in the construction of super-serial formations. In order to fulfill this objective, the design for each linear formation exploits the potential of inversional invariance among inversionally symmetric serial units, the property of near invariance (or pc intersection) among serial units within close transpositional relationships, or ensures invariance through contiguous or interrupted translation-symmetric or reflection-symmetric deployments of pc objects.

The first NRL block is exceptional in its basic construction since it combines the initial “Do not go” block with the first non-recurring line so that aggregate completion is achieved (example 6.14). From an analytical point of view, this is logical since Stanza 1 does not have a pair of non-recurring lines and this tactic does not invalidate the general observations made above with respect to all six NRL blocks. Rather, example 6.14 demonstrates the basic features common to all of NRL blocks, and adumbrates the unique articulations of the lines of text in tenor parts for NRL blocks 5 and 6. In the first NRL block, the constituent formations of the tenor and instrumental lines coalesce into two reflexive-symmetric super-serial formations: R-OO, tenor, and R-CC, strings. Aggregate non-completion in the tenor line is achieved through inversional invariance (the RP_0/RI_8 pair) and in the instrumental lines through the invariant dyad shared by RI_4 and P_5 . Although neither of the smaller blocks nor the combined linear formations expresses 12-1, the concatenation of the two smaller blocks completes the aggregate.

Example 6.16 illustrates the second NRL block (Stanza 2). The translation-symmetric T-CO formation in the tenor line subsumes four non-elided units— RP_7 , RI_2 , RP_{11} , and RI_7 —into a single structure upon which the two lines of text unfold. Notice that the end of the first line and the beginning of the second are not coordinated with the boundaries of the interior serial units. Thus, the two lines of text bind the four disparate units into one formation. The viola line mimics the tenor line through its presentation of a basic two-unit T-CO formation: the non-elided component units, RP_3 and RI_{10} , are T_8I transforms of the first two units in the tenor formation. The R-OO formation expressed

by the 'cello represents the stretching of the basic R-OO model (see example 6.4)—the interpolated material is an altered form of RP₂ in which pc1 has replaced pc2 at o.p.3.

Example 6.15. *In Memoriam*, Song: DNG + NRL blocks, Stanza 1 (before and after R1)

Example 6.16. *In Memoriam*, Song: NRL block, Stanza 2 (before and after R3)

The NRL block associated with Stanza 3 is the most complex of in terms of its construction. The analytic graph (example 6.17) illustrates many of the large and small details, including the palindromes found in the tenor and Vn.I lines, the translation-symmetric deployment of P₀ in the tenor line, as well the many elisions between component units in the vocal and instrumental parts. The third NRL block uses the full string quartet in addition to the tenor (the final NRL block is also scored this way) and yields three T-OO formations (also true of the final NRL block). The viola line produces

12-1, which is the only instance of aggregate completion in a super-serial formation in the entire work. Example 6.17 also demonstrates that diatonic-octatonic sonorities are expressed at the beginning of each full measure, which is indicative of diatonic-octatonic influence over the vertical interactions among the serial/super-serial formations: pcsets 3-11 {e26} and 4-27 {t036} are inter-generic diatonic-octatonic, while pcset 5-27 {79e04}—the same sc expressed vertically in the “Rage” blocks—is exclusive to the diatonic genus.

Example 6.17. *In Memoriam*, Song: NRL block, Stanza 3 (before and after R5)

The musical score for Example 6.17 consists of five staves: Tenor, Vn.I, Vn.II, Vla., and Vc. The Tenor staff has lyrics: "(Good men, ...)" and "(Their frail deeds ...)". Above the Tenor staff, annotations include: "R14 <te098> RP0 <21034> <- pc palindrome -> P0 <43012> -> repeated -> P0 <43012>" and "(elided)". To the right of the Tenor staff is the label "<- 9-1 {89te01234} R-CC". The Vn.I staff has annotations: "P0 <43012> I10 <23654> (elided)" and "RP2 <43256> I2 <67t98> <- pc palindrome -> RI2 <89t76> (elided)". To the right is "<- 11-1 {0123456789t} R-OO". The Vn.II staff has annotations: "I2 <67t98> (elided)" and "RP6 <8769t>". To the right is "<- 5-1 {6789t} R-OO". The Vla. staff has annotations: "P9 <109te> (elided) P7 <et789> I1 <56987> RP2 <43256>". To the right is "<- 12-1 (!) R-OO". The Vc. staff has annotations: "R15 <e01t9> (elided)" and "R13 <9te87>". To the right is "<- 7-1 {789te01} T-CO". At the bottom, three brackets group measures: "3-11 {e26}", "4-27 {t036}", and "5-27 {79e04}", with the label "12-1" centered below them.

Example 6.18 is a pitch reduction of the NRL block associated with Stanza 4. Both the tenor and viola lines are reflection-symmetric R-OO types, while the components of the Vn.I line are organized as a T-OC formation. The analytic graph points up some significant details pertaining to the interior organization of the various super-serial formations, such as elisions in the tenor, Vn.I and viola lines, and the pc palindrome in the viola line. The ‘cello expresses a formation that is completely non-serial but is clearly derived from the chromatic serial 4-1 pcseg. The ‘cello pcset 4-1 {9te0} is the literal complement of the viola pcset 8-1 {12345678}—together, they yield 12-1. The deployment of the 4-1 pcset in the ‘cello line, however, suggests that these pcs are also introduced to complete diatonic and octatonic sonorities that mark the unfoldings of

certain interior serial units. The diatonic sonority 3-9 {027} coincides with simultaneous entries of I_{10} and I_3 (tenor and Vn.I), the octatonic sonority 4-z15 {9e23} coincides with the point of elision between I_3 and I_5 (Vn.1) and the inter-generic sonority 3-11 {914} coincides with the entry of P_0 (tenor). The coordination of the 4-1 pcseg in the 'cello line, the instantaneous vertical interactions involving the boundaries of serial units, and the diatonic-octatonic sonorities that influence these interactions instantiates a localized expression of the pre-compositional generic interaction that is a characteristic of serial design.

Example 6.18. *In Memoriam*, Song: NRL block, Stanza 4 (R6)

(Tenor) I7 <e0321> I8 <01432> (elided) I10 <23654> (elided) P0 <43012> (elided) RI8 <23410> (elided) <8-1 {e0123456}> R-OO
 (Wild men who ...) (And learn, ...)
 (Vn. I) I2 <67t98> I3 <78et9> (elided) I5 <9t10e> (elided) P7 <et789> <8-1 {6789te01}> T-OC
 (Vla.) P1 <54123> <- pc plalindrome -> RP1 <32145> (elided) R10 <67854> <8-1 {12345678}> R-OO
 (Vc.) <0tet9t90> = 4-1 {9te0} ss {P8}/{P9}/{I4}/{I5} <4-1 {9te0}> non-serial
 Vla. + Vc. yields 12-1
 3-9 {027} 4-z15 {9e23} 3-11 {914}
 12-1

Example 6.19, the analytic graph for the fifth NRL block (Stanza 5), shows that the super-serial formations expressed by the tenor, the first violin and the 'cello are all translation-symmetric T-OC, which distinguishes this block sharply from the other NRL blocks, which express at least one R-OO formation. Moreover, the two non-recurring lines of text each coincide with the beginning of a new serial unit (reminiscent of the “Do not go” + NRL block of Stanza 1). This, in turn, suggests that the tenor T-OC formation comprises two articulated interior super-serial formations, the T-OC and R-CC formations shown in brackets above the tenor part in the example. Two inter-generic sonorities, the pcsets 3-11 {914} and 3-11 {158} shown below the staff, mark the axis of the $RP_1 - P_1$ palindrome that constitutes the second of these formations (i.e., the R-CC formation).

Example 6.19. *In Memoriam*, Song: NRL block, Stanza 5 (R8)

(Tenor) I6 <te210> (elided) I8 <01432> RP1 <32145> <- pc palindrome --> P1 <54123> <- 8-1 {te012345} T-OC
(Grave men, near death ...) (Blind eyes could ...)

(Vn. I) I1 <56987> (elided) I3 <78et9> RP8 <198e0> <- pc palindrome --> P8 <0e89t> <- 8-1 {56789te0} T-OC
(Grave men, near death ...) (Blind eyes could ...)

(Vc.) I6 <te210> (elided) I8 <01432> <- 7-1 {te01234} T-OC
(Grave men, near death ...) (Blind eyes could ...)

3-11 {914} 3-11 {158} 12-1

The final NRL block (Stanza 6) recalls the formal design of the first NRL block: that is, the juxtaposition of two discrete blocks, each expressing one complete line of text, and neither expressing sc 12-1. Example 6.20, a pitch reduction of the sixth NRL block, illustrates the division of the block into two well-defined sub-blocks in which the two ten-syllable lines are strictly aligned with the deployment of the constituent serial units of the tenor line.²⁹ In order to maintain the formal symmetry established through the antiphonal disposition of the ritornelli and the stanza blocks without interrupting the flow from the fifth into the sixth stanza and compromising the intensity of the declamation, Stravinsky uses a variation of Ritornello 1 as the accompaniment to the first 10-syllable line of the final NRL block.³⁰ As shown in the example, the selection and deployment of the instrumental serial units makes the first sub-block nearly identical to Ritornello 1: the characteristic 3-7 {e24} marks the beginning of the sub-block and the total pc content of the sub-block remains invariant with the ritornelli (10-1 {9te0123456}). The tenor line does not add any new pcs to the ritornello since it is mapped directly onto each of the ordered elements of the 'cello line.

²⁹ In fact, the text setting in this section of the poem is syllabic—there is consistent one-to-one mapping of each syllable to each serial element.

³⁰ Gauldin and Benson, "Structure and Numerology in Stravinsky's *In Memoriam*": 169. Gauldin and Benson observe the juxtaposition of the ritornello and the line that begins this stanza, but do not reach these conclusions.

The materials of the second sub-block yield sc 12-1, which in turn continues the pattern of aggregate completion established by the previous five NRL blocks. Taken as a complete unit, the sixth NRL block expresses four super-serial formations and one formation comprised of a single serial unit (example 6.20). Of the super-serial formations, three are reflection-symmetric R-OO (vocal, Vn.I., Vc.) and one is translation-symmetric T-OC (Vla.).

Example 6.20. *In Memoriam*, Song: NRL block, Stanza 6 (before and after R10)

Sub-Block 1 = Ritornello 1 Sub-Block 2

(Tenor) 17 <e0321> (T-OC) P9 <109te> 18 <01432> (R-OO) RI9 <34521> <— 9-1 {9te012345} R-OO
(And you, my father, ...) (Curse, bless, me ...)

(Vn.I) P0 <43012> RP8 <t98e0> <— 9-1 {89te01234} R-OO

(Vn.II) P9 <109te> <— 5-1 {9te01}

(Vla.) I10 <23654> P7 <e1789> <— 10-1 {23456789te} T-OC

(Vc.) I7 <e0321> P9 <109te> RI10 <45632> <— 10-1 {9te0123456} R-OO

3-7 {e24}

10-1 {9te0123456} 12-1

12-1

Table 6.6 summarizes the super-serial formations identified through the analyses of the NRL blocks. The location and instrumentation of each formation is given in the left column; the sc-pcset each formation yields is shown in the right column. Each super-serial formation is represented by the ICS of its boundary serial units, the type of internal design it displays (see table 6.3), and its super-serial type.

Table 6.6. *In Memoriam*, Song: Summary of NRL-block super-serial formations

STANZA 1: DNG* + NRL			12-1 (aggregate completed)	
*(needs DNG to complete aggregate)				
Tenor	1311 (1) 1131	R-OO	7-1 {te01234}	
Vc/Vn.I + Vla.	1131 (i) 1311	R-CC	8-1 {56789te0}	
STANZA 2: NRL + NRL			12-1 (aggregate completed)	
Tenor	1131 (2) 1131	T-CO	10-1 {6789te0123}	
Vla.	1131 (i) 1131	T-CO	6-1 {234567}	
Vc.	1311 (i) 1131	R-OO	10-1 {9te0123456}	
STANZA 3: NRL + NRL			12-1 (aggregate completed)	
Tenor	1131 (2) 1311	R-CC	9-1 {89te01234}	
Vn.I	1311 (3) 1131	R-OO	11-1 {0123456789t}	
Vn.II	1311 (e) 1131	R-OO	5-1 {6789t}	
Vla.	1311 (2) 1131	R-OO	12-1 (!)	
Vc.	1131 (e) 1131	T-CO	7-1 {789te01}	
STANZA 4: NRL + NRL			12-1 (aggregate completed)	
Tenor	1311 (3) 1131	R-OO	8-1 {e0123456}	
Vn.I	1311 (1) 1311	T-OC	8-1 {6789te01}	
Vla.	1311 (1) 1131	R-OO	8-1 {12345678}	
Vc.	non-serial	—	4-1 {9te0}	
STANZA 5: NRL + NRL			12-1 (aggregate completed)	
Tenor	1311 (2) 1311	T-OC	8-1 {te012345}	
Vn.I	1311 (2) 1311	T-OC	8-1 {56789te0}	
Vc.	1311 (e) 1311	T-OC	7-1 {te01234}	
STANZA 6: NRL + NRL			12-1 (aggregate completed)	
Tenor	1311 (2) 1131	R-OO	9-1 {9te012345}	
Vn.I	1311 (i) 1131	R-OO	9-1 {89te01234}	
Vn.II	1311	(P ₉)	5-1 {9te01}	
Vla.	1311 (i) 1311	T-OC	10-1 {23456789te}	
Vc.	1311 (1) 1131	R-OO	10-1 {9te0123456}	

Of the twenty super-serial formations shown in table 6.6, twelve are reflection-symmetric (10 R-OO; 2 R-CC) and eight are translation-symmetric (5 T-OC; 3 T-CO).³¹ In addition to the statements of the thematic “Do not go” and “Rage,” the majority of the super-serial formations in the song are distortions of the basic two-unit R-OO “Rage” model (examples 6.3, 6.4, and 6.7). Including the ritornelli (Vc.), expressions of the T-OC type—the distortion of a single serial unit (example 6.6)—is relatively frequent. The R-CC and T-CO types (which are relatively rare in the Song), as well as T-OC types, are

³¹ The number of super-serial formations produced by the NRL blocks equals the number of syllables found in each pair of non-recurring lines.

found in the Dirge Canons. As will become clear, R-OO types are not represented in the Dirge Canons, while the function of the R-CC type becomes particularly significant.

THE DIRGE CANONS: PRELUDE AND POSTLUDE

The Dirge Canons create the enclosure for the Song “Do Not Go Gentle,” the centerpiece of Stravinsky’s triptych *In Memoriam*, yet they can also stand independently as a complete work for double quartet.³² In fact, the canons establish a strong symmetrical design that is disrupted at the musical surface by the presentation of the Song. As will become clear, the Dirge Canons derive several important structural attributes from the Song that manifest themselves in unique ways. Moreover, these attributes direct the special transformational pathways that bind the ten canons into a complete work of art.

Table 6.7 illustrates the formal plan of the Dirge Canons. The ten blocks of the Dirge Canons are equally divided between the Prelude and the Postlude.³³ Analogous to the formal arrangement of the ritornello and stanza blocks of the Song, the Dirge Canon blocks (DC blocks) are antiphonally deployed throughout the prelude and postlude. The DC blocks express two types of designs, non-recurring (NR), and ritornello (DC-Rit). The non-recurring blocks function to introduce and develop thematic materials, while the ritornello blocks re-establish important thematic materials, which in turn effects stability and provides a moment of reflection or contemplation. In the prelude, the three non-recurring blocks of the prelude are scored for the trombones and the two ritornello-blocks are scored for string quartet; in the postlude, the three ritornello-blocks are scored for the trombones and the two non-recurring blocks are scored for string quartet.

³² Gauldin and Benson, “Structure and Numerology in Stravinsky’s *In Memoriam*”: 174. Gauldin and Benson share this opinion.

³³ The coincidence of the number of canons (five and five, totaling ten canons) with the number of elements in the series and the number of syllables found in each line of text is remarkable.

Table 6.7. *In Memoriam*, Dirge Canons: Form

PRELUDE	<i>rehearsal letters:</i>	(before A)	A	B	C	D
	BLOCK NUMBER:	(1)	(2)	(3)	(4)	(5)
	BLOCK TYPE:	NR 1	DC-Rit 1	NR 2	DC-Rit 1	NR 3
	INSTRUMENTS:	Trombones	Strings	Trombones	Strings	Trombones
POSTLUDE	<i>rehearsal letters:</i>	(before A)	A	B	(B)	C
	BLOCK NUMBER:	(6)	(7)	(8)	(9)	(10)
	BLOCK TYPE:	DC-Rit 2	NR 4	DC-Rit 2	NR 5	DC-Rit 2
	INSTRUMENTS:	Trombones	Strings	Trombones	Strings	Trombones

Example 6.21 is a pitch reduction of the complete set of Dirge Canons.³⁴ The label for each of the DC blocks indicates the block number (1 – 10) and its function. As illustrated in table 6.1, the five non-recurring blocks—blocks 1, 3, 5, 7, and 9—are labeled NR 1 through NR 5, respectively. The five ritornello blocks—blocks 2, 4, 6, 8, and 10—are labeled either as DC-Rit 1, representing the ritornello blocks scored for strings in the Prelude, or DC-Rit 2, representing the ritornello blocks scored for trombones in the Postlude.

The Non-Recurring Blocks

Each non-recurring (NR) block derives its unique identity through row-form selection and deployment (example 6.21). Nonetheless, the NR blocks share similar structural attributes. Each NR block contains eight serial units that are unequally distributed among the serial and super-serial formations expressed by the four instruments so that one instrument expresses a single serial unit, two instruments express a super-serial formation comprising two serial units, and one instrument expresses a super-serial formation comprising three serial units.³⁵ All of the basic row-types are expressed in the non-recurring blocks—that is, P, RP, I, and RI forms. Moreover, four of the five non-recurring blocks include at least one expression of the thematic unit P_0 , its permutation I_8 , or their retrograde forms (RP_0 or RI_8). The exception to this is block 5 (NR 3)—the block that concludes the prelude—in which such serial units are absent (example 6.21).

³⁴ The style of presentation for the analytical graphs is discussed above.

³⁵ This summary of the serial unit constituents of the NR blocks includes occurrences of duplicated row forms. The NR blocks express twice as many serial units than do DC ritornello blocks.

Example 6.21. *In Memoriam*, Dirge Canons: Pitch reduction

(Prelude)

Block 1 (NR 1), Trombones

(Ten. Tbn. 1) P6 <t9678> <- 5-1 {6789t}>

(Ten. Tbn. 2) P0 ("Theme") <43012> (elided) I10 <23654> P9 <109te> <- 10-1 {9te0123456}> T-OC

(Bass Tbn. 1) RP8 <t98e0> <- 8-1 {89te0123}> T-CO

(Bass Tbn. 2) P0 ("Theme") <43012> (elided) I10 <23654> R17 <1230e> <- 7-1 {0123456}> T-OC

12-1

Block 2 (Rit-1), Strings

A

(Vn. 1) I10 <23654> <- 5-1 {23456}>

(Vn. 2) P0 <43012> <- 5-1 {01234}>

(Vla.) RP0 <21034> <- 5-1 {01234}>

(Vc.) R18 <23410> <- 5-1 {01234}>

<- 4-27 {8e24} (Tbns. 3-11 {48e}) <- 3-6 {024}>

7-1 {0123456}

(Example 6.21 continues)

(Example 6.21 continued)

Block 3 (NR 2), Trombones

B

(Ten. Tbn. 1) I10 <23654> I1 <56987> <- 8-1 {23456789} T-OC

(Ten. Tbn. 2) RP7 <987te> RI7 <1230e> <- 9-1 {789te0123} T-CO

(Bass Tbn. 1) RI8 <23410> I10 <23654> RP0 <21034> <- 7-1 {0123456} T-CO

(Bass Tbn. 2) P5 <98567> <- 5-1 {56789} T-CO

12-1

Block 4 (Rit-1), Strings

C

(Vn. 1) I10 <23654> <- 5-1 {23456}

(Vn. 2) P0 <43012> <- 5-1 {01234}

(Vla.) RP0 <21034> <- 5-1 {01234}

(Vc.) RI8 <23410> <- 5-1 {01234}

<- 4-26 {e247} (Tbns. 3-11 {47e}) <- 3-6 {024}

7-1 {0123456}

Block 5 (NR 3), Trombones

D

(Ten. Tbn. 1) RI4 <te098> P2 <65234> <- 10-6 {2345689te0} R-CC

(Ten. Tbn. 2) RP10 <0et12> RI9 <34521> (elided) P9 <109te> <- 9-1 {9te012345} R-CC

(Bass Tbn. 1) RI11 <56743> <- 5-1 {34567} R-CC

(Bass Tbn. 2) RI10 <45632> <- pe palindrome --> I10 <23654> (elided) 3-4 {e34} --> <- 5-1 {23456} R-CC

12-1

(Example 6.21 continues)

(Example 6.21 continued)

(Postlude)

Block 6 (Rit-2), Trombones

(Ten. Tbn. 1) I10 <23654>

(Ten. Tbn. 2) P0 <43012>

(Bass Tbn. 1) RP0 <21034>

(Bass Tbn. 2) RI8 <23410>

7-1 {0123456}

← 5-1 {23456}

← 5-1 {01234}

← 5-1 {01234}

← 5-1 {01234}

← 3-6 {024}

Block 7 (NR 4), Strings

A

(Vn. 1) I8 <01432> I11 <34765>

(Vn. 2) RP5 <76589> RI5 <e0119>

(Vla.) I RI6 <012et> I8 <01432> P10 <0et12>

(Vc.) P3 <76345>

← 8-1 {01234567} T-OC

← 9-1 {56789te01} T-CO

← 7-1 {te012345} T-CO

← 5-1 {34567}

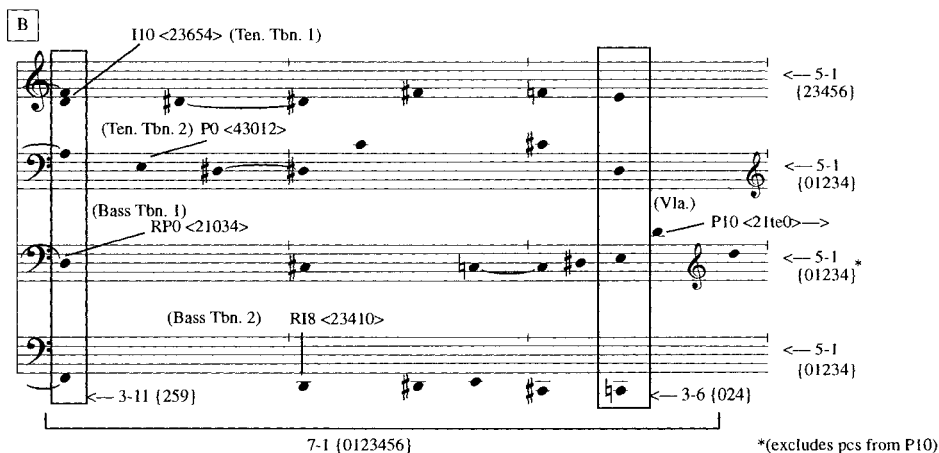
12-1

(Example 6.21 continues)

(Example 6.21 continued)

Block 8 (Rit-2), Trombones

B



I10 <23654> (Ten. Tbn. 1)

(Ten. Tbn. 2) P0 <43012>

(Bass Tbn. 1) RP0 <21034>

(Bass Tbn. 2) RI8 <23410>

(Vla.) P10 <21te0>

<- 5-1 {23456}

<- 5-1 {01234}

<- 5-1 {01234}*

<- 5-1 {01234}

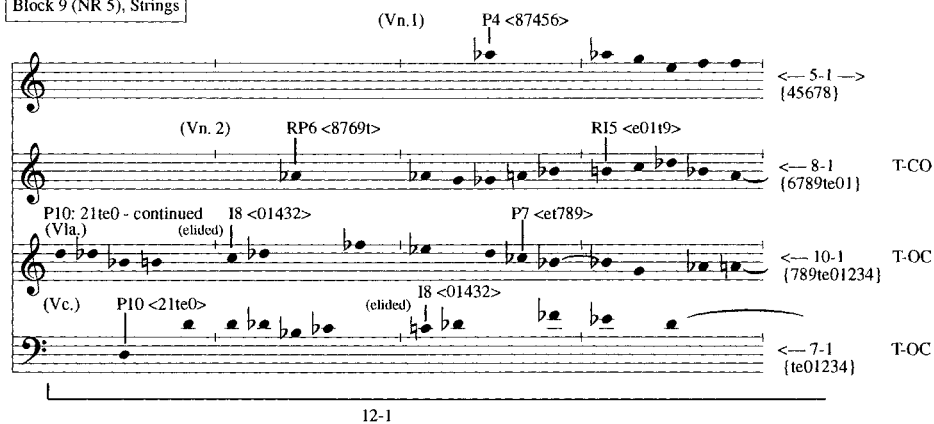
<- 3-11 {259}

<- 3-6 {024}

7-1 {0123456}

*(excludes pcs from P10)

Block 9 (NR 5), Strings



(Vn. 1) P4 <87456>

(Vn. 2) RP6 <8769t> RI5 <e011t9>

P10: 21te0 - continued (Vla.) (elided) I8 <01432> P7 <et789>

(Vc.) P10 <21te0> (elided) I8 <01432>

<- 5-1 {45678}

<- 8-1 {6789te01} T-CO

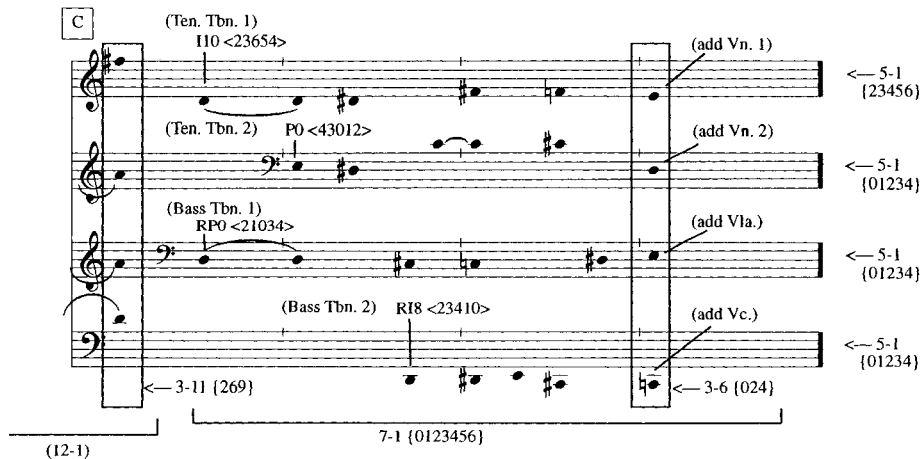
<- 10-1 {789te01234} T-OC

<- 7-1 {te01234} T-OC

12-1

Block 10 (Rit-2), Trombones

C



(Ten. Tbn. 1) I10 <23654>

(Ten. Tbn. 2) P0 <43012>

(Bass Tbn. 1) RP0 <21034>

(Bass Tbn. 2) RI8 <23410>

(add Vn. 1)

(add Vn. 2)

(add Vla.)

(add Vc.)

<- 5-1 {23456}

<- 5-1 {01234}

<- 5-1 {01234}

<- 5-1 {01234}

<- 3-11 {269}

<- 3-6 {024}

7-1 {0123456}

(12-1)

Like their NRL-block counterparts in the Song, the NR blocks complete the aggregate while the principle of aggregate *non*-completion influences the selection of the component units of the super-serial formations, each of which yields chromatic pcsets.³⁶ Table 6.8 summarizes the serial and super-serial formations expressed by the constituent instrumental lines. As shown in the table (and example 6.21), the super-serial formations found in the NR blocks are primarily translation-symmetric types (T-OC and T-CO). The notable exception to this, however, is NR 3 (Block 5), the block that concludes the Prelude in which the three super-serial formations are reflection-symmetric R-CC. Unlike the thematic and NRL blocks of the Song in which reflection-symmetric R-OO formations constitute the prevalent super-serial type, R-OO formations are completely absent in the Dirge Canons.

Table 6.8. *In Memoriam*, Dirge Canons: Summary of serial/super-serial types in the non-recurring (NR) blocks

BLOCK 1/NR 1 (PRELUDE)				BLOCK 7/NR 4 (POSTLUDE)			
Ten.Tbn.1	1311	(sc 5-1)	P unit	Vn.I	1311 (i) 1311	(sc 8-1)	T-OC
Ten.Tbn.2	1311 (. .) 1311	(sc 10-1)	T-OC	Vn.II	1131 (i) 1131	(sc 9-1)	T-CO
BassTbn.1	1131 (i) 1131	(sc 8-1)	T-CO	Vla.	1131 (. .) 1131	(sc 7-1)	T-CO
BassTbn.2	1311 (e) 1311	(sc 7-1)	T-OC	Vc.	1311	(sc 5-1)	P unit
(Aggregate completed)				(Aggregate completed)			
BLOCK 3/NR 2 (PRELUDE)				BLOCK 9/NR 5 (POSTLUDE)			
Ten.Tbn.1	1311 (i) 1311	(sc 8-1)	T-OC	Vn.I	1311	(sc 5-1)	P unit
Ten.Tbn.2	1131 (i) 1131	(sc 9-1)	T-CO	Vn.II	1131 (i) 1131	(sc 8-1)	T-CO
BassTbn.1	1131 (. .) 1131	(sc 7-1)	T-CO	Vla.	1311 (. .) 1311	(sc 10-1)	T-OC
BassTbn.2	1311	(sc 5-1)	P unit	Vc.	1311 (e) 1311	(sc 7-1)	T-OC
(Aggregate completed)				(Aggregate completed)			
Block 5/NR 3 (PRELUDE)							
Ten.Tbn.1	1131 (i) 1311	(sc 10-6)	R-CC				
Ten.Tbn.2	1131 (. .) 1311	(sc 9-1)	R-CC				
BassTbn.1	1131	(sc 5-1)	R unit				
BassTbn.2	1131 (e) 1311	(sc 5-1)	R-CC				
(Aggregate completed)							

³⁶ The exception to this is the super-serial formation expressed by the first tenor trombone in Block 5 (NR 3), which yields the near-chromatic pcset 10-6 {23456789te0} (Appendix 1).

The significance of the three reflection-symmetric R-CC super-serial formations found in NR 3 (Block 5), one of which contains a palindrome (Vc.), is two-fold. First, this represents a significant departure in the continuity of design established by the NR 1 and NR 2 (Blocks 1 and 3). Second, the reflection-symmetric super-serial design adumbrates the reflection-symmetric designs of the “Do not go” and “Rage” blocks that follow in the Song. Thus, NR 3 holds both a closing function to the Prelude and a transition-preparation function with respect to the Song.

The Dirge-Canon Ritornello Blocks (DC-Rit 1 and 2)

Excepting orchestration and registration, the thematic Dirge-Canon ritornelli (DC-Rit blocks) are nearly identical. Each of the four instruments (string quartet, Prelude; trombone quartet, Postlude) articulates one of the basic row-form types in the same vertical order: (beginning with the top staff), I-form (I_{10}), P-form (P_0), RP-form (RP_0), and RI-form (RI_8). Together, the four units produce 7-1 {012346}, the abstract complement of sc 5-1, the sc representing the serial unit: P_0 , RP_0 , and RI_8 are symmetrically invariant—they express pcset {01234}—and are partially invariant with I_{10} {23456} through pcset 3-1 {234}.

Transformations among the Cycle of NR Blocks

Although each NR block expresses unique attributes at the musical surface, a simple transformation by T_{10} establishes a direct relationship between NR 1 and NR 4 (blocks 1 and 7), and NR 2 and NR 5 (blocks 3 and 9). That is, each linear formation of NR 1 is transposed by T_{10} , resulting in the linear formations of NR 4; each linear formation of NR 2 is transposed by T_{10} , resulting in the linear formations of NR 5. Note that the super-serial formations formerly presented in the second and third lines of NR 1—Ten. Tbn.2 and Bass Tbn.2—switch to the third and second lines of NR 5—Vla. and Vn.1 (example 6.21). The third non-recurring block, NR 3 (block 5, rehearsal D, prelude), is unique among the other non-recurring blocks of the Dirge Canons since there is no simple transformational relationship between the serial and super-serial formations found in NR 3 and the analogous formations that constitute the other non-recurring blocks.

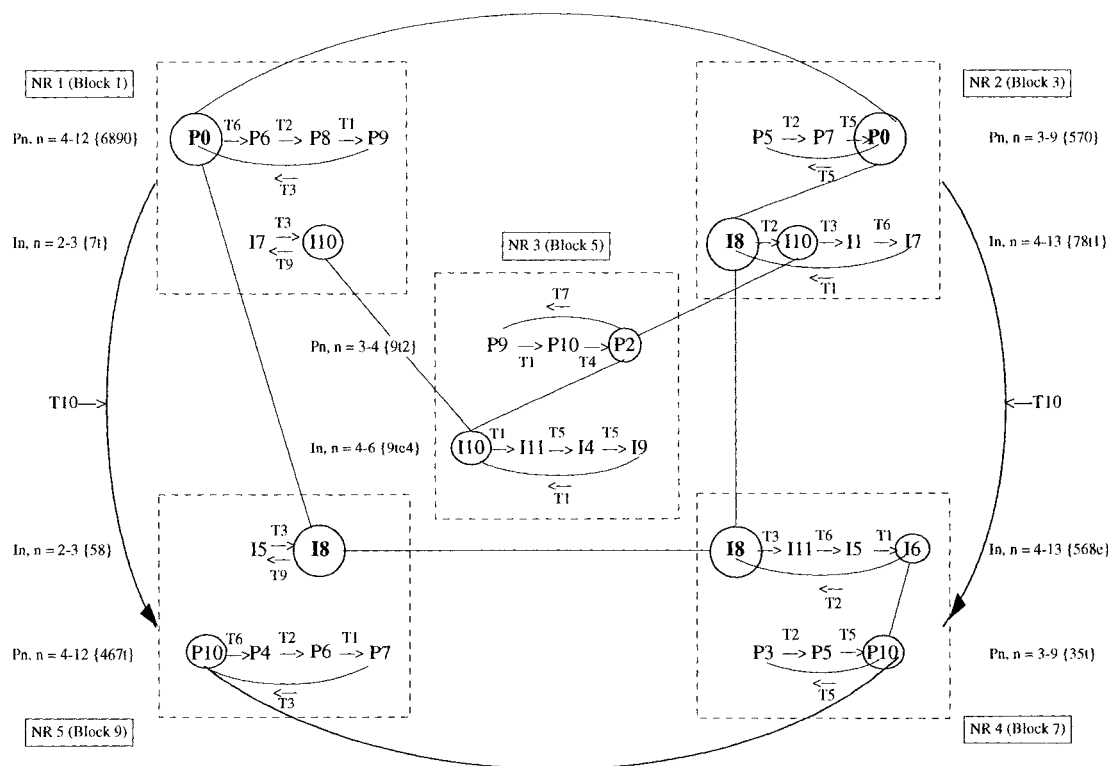
Figure 6.2. *In Memoriam*, Dirge Canons: Transformations among the cycle of NR blocks

Figure 6.2 is a complex transformational network that establishes relationships among the groups of P and I forms abstracted from the component serial units of the linear formations that constitute each NR block, and draws all five NR blocks into a single cycle through the interconnection of thematic pc objects. In figure 6.2, the component serial units of each NR block are reduced into a pair of P-form and I-form successions comprising non-redundant prograde serial units represented by their label. For example, serial units P₀, I₁₀, P₈, P₆, P₉, and I₇ of NR 1 appear as P₀ - P₆ - P₈ - P₉ and I₇ - I₁₀. Arrows and T_n operators indicate the transformations (T_n) among successive serial units for each P and I group, including the complementing T_n operator. The paired component P and I groups of each NR block are enclosed within a broken-lined box, which are arranged into a square with NR 1 and 2 positioned at the upper left and right corners (respectively), NR 5 and 4 positioned at the lower left and right corners (respectively), and NR 3 positioned at the center.

Interconnectivity among important three thematic pc objects—P₀, I₁₀, and P₁₀—is

indicated by the solid lines drawn between the encircled serial-unit labels in figure 6.2. The prime ordering, P_0 , or its invariant partner I_8 , is expressed in each NR block—both are expressed in NR 2. All three NR blocks of the Prelude (NR 1, 2, and 3) express I_{10} —NR 3 also expresses P_2 , the invariant partner of I_{10} . The two NR blocks of the Postlude (NR 4 and 5) express P_{10} and/or its invariant partner I_6 . The significance of P_0 , I_{10} , and P_{10} (and their invariant partners) lies in the ability of their paired interaction to generate sc 7-1—the abstract complement of 5-1 (the sc representing the series) and the sc representing the pcset as well as the pcset {0123456} produced by Dirge-Canon ritornelli (below, and example 6.21): To illustrate:

$$\begin{aligned} \{P_0/I_8\} \cup \{I_{10}/P_2\} &= \{01234\} \cup \{23456\} = 7-1 \{0123456\}; \\ \{P_0/I_8\} \cup \{P_{10}/I_6\} &= \{01234\} \cup \{te012\} = 7-1 \{te01234\}. \end{aligned}$$

Dirge-Canon Linear Formations and Octatonic-Diatonic Influence

Although the pc environment of the Dirge-Canon blocks is primarily chromatic, the sonorities that delineate the NR blocks and the DC-Rit blocks suggest that the octatonic and diatonic genera influence vertical interactions among linear formations. The final (right boundary) sonority of the ritornelli expresses a literal linear-vertical transformation of the diatonic pcseg from P_0 <402> (example 6.21: blocks 2, 4, 6, 8 and 10).³⁷ The component serial and super-serial formations of each NR block participate in an elided octatonic-diatonic sonority that terminates the NR block and begins a ritornello block (example 6.21: see blocks 2, 4, 8, and 10). In the Prelude, these sonorities yield pcsets 4-27 {8e24} and 4-26 {e247}, both of which contain expressions of sc 3-11—{48e} and {47e}, respectively. The elided sonorities in the Postlude yield pcsets 3-11 {259} and 3-11 {269}. The final non-elided sonority of the Prelude (NR 3) produces the chromatic-diatonic pcset 3-4 {e34}.

The influence of the octatonic and diatonic genera on the interactions among simultaneous linear formations is also suggested by the linear transformations among the serial-unit components of the P-form and I-form successions derived from each NR block shown in figure 6.2. As shown in the figure, the T_n operators that transform the

³⁷ All eight instruments participate in the final 3-6 {024} sonority of the last ritornello that concludes the entire work (Postlude, at rehearsal C).

successive serial units express the characteristic intervals of octatonic and diatonic genera. Moreover, the values of n derived from the constituent serial unit of each succession of P or I forms coalesce into pcsets that evince generic, inter-generic, and pan-generic characteristics.³⁸

The pairs of pcsets shown to the *left* of the NR 1 and NR 5 boxes in figure 6.2 are strongly associated with the octatonic genus, while the pcsets formed through their union are strongly associated with chromatic genus. The P and I successions of NR 1 yield 4-12 {6890} and 2-3 {7t}, respectively, and the P and I successions of NR 5 yield 4-12 {467t} and 2-3 {58}, respectively. Each P and I pair coalesces into the near-chromatic pcsets 6-2 {6789t0} (NR 1) and 6-2 {45678t} (NR 5). Finally, the union of the 6-2 pcsets yields the near-chromatic pcset 8-2 {456789t0}.

The pairs of pcsets shown to the *right* of the NR 2 and NR 4 boxes in figure 6.2 are strongly associated with the octatonic and diatonic genera, while the pcsets formed through their union are strongly associated with diatonic genus. The P and I successions of NR 2 yield the diatonic 3-9 {570} and the octatonic 4-13 {78t1}, respectively, and the P and I successions of NR 4 yield the diatonic 3-9 {35t} and the octatonic 4-13 {568e}, respectively. Each P and I pair coalesces into diatonic pcsets 6-z25 {578t01} (NR 2) and 6-z25 {3568te} (NR 4). Finally, the union of the 6-z25 pcsets yields the characteristic diatonic nonachord, pcset 9-9 {5678te013}.

The generic associations of the pairs of pcsets shown to the *left* of the center NR block (NR 3) in figure 6.2 are less clear than are those associated with the other NR blocks. The P and I successions of NR 3 yield pcset 3-4 {9t2}, which evinces intervals characteristic of the diatonic genus (see Song ritornello, above), and the near-chromatic pcset 4-6 {9te4}, respectively. Together, these sets yield a near-diatonic pcset 5-14 {9te24}.

³⁸ See table 2.4.

CONCLUSION: THE SERIES OF *IN MEMORIAM* AS A MICROCOSM OF THE GENERIC MODEL OF SC SPACE

Among the works considered in this dissertation, *In Memoriam* best exemplifies the fluid interaction of the three constituents of the generic model of set-class space—the diatonic, chromatic, and octatonic genera. The present chapter examined the precompositional potential of the five-note series, $P_0 \langle 43012 \rangle$, and discovered that all three genera are expressed as pcsegs: the octatonic tetrad 4-3 $\langle 4301 \rangle$, the chromatic tetrad 4-1 $\langle 3012 \rangle$, and the embedded diatonic trichord 3-6 $\langle 402 \rangle$. Thus, the series itself is a microcosm of the generic model of set-class space: sc 5-1—the sc expressed by the series—represents the chromatic universe and scs 3-6, 4-1, and 4-3 are analogs of the cynosures that define each of the constituent genera. The potential of this microcosm is realized through various compositional processes, resulting in several distinctive generic expressions that contribute to the formal processes, define local and large-scale structures, and influence interactions among the multifarious linear formations that constitute *In Memoriam Dylan Thomas*.

Expressions of the chromatic and octatonic genera are prevalent in the linear dimension as serial pcsegs and boundary tetrads in super-serial formations. As we have seen, the linear design of this work borrows a technique from the first of the *Thee Songs from William Shakespeare* in which the 4-2 unit—too small to stand alone as a serial unit—becomes the primitive of an extended, patterned linear formation. In the present work, serial units frequently coalesce into extended linear formations, especially in the stanza blocks of the Song and in the NR blocks of the Dirge Canons. Since the interior patterning of the super-serial formations is generally erratic, four basic descriptors were developed to identify symmetries among these seemingly disparate formations—R-OO, R-CC, T-OC, and T-CO. Each super-serial descriptor denotes the generic quality of the boundary tetrads—the overlapping octatonic and chromatic tetrads found in the series—and the type of the symmetry that defines the relationship of the intervallic successions expressed by the tetrads (reflection-symmetric or translation-symmetric). Thus, super-serial types represent special transformational relationships between the two boundary units. Moreover, each super-serial type signifies the specific pathways that

trace the transformation of a single serial unit into a complex linear formation or, conversely, the specific pathways that establish the transformational relationship of a complex linear formation to a single serial unit.

The octatonic and diatonic genera influence the vertical interactions among simultaneous linear formations, especially in the ritornelli blocks of the Song. The abstract vertical combination of the four serial units derived from the Song ritornelli shown in figure 6.1 produces intense symmetrical expressions of octatonic scs, especially the characteristic 4-3 tetrad. The use of the T-OC super-serial formation in the compositional realizations of this abstract model, however, mitigates the octatonic domination of the vertical dimension and allows diatonic sonorities to participate in the counterpoint among simultaneous linear formations. As we have seen, these compositional adjustments elevate the embedded diatonic 3-6 <402> pcseg to a higher structural status through the vertical alignment of the elements of the pcseg with sonorities that evince diatonic characteristics. The linear-vertical transformation of pcseg 3-6 <402> controls interactions among the constituent serial units in the ritornello of the Dirge Canons. Diatonic-octatonic disposition is also evident in the linear dimension. As we have seen, the transformations among the constituent units of the P and I successions abstracted from the serial and super-serial formations of the NR blocks shown in figure 6.2 reveal the influences of the diatonic and octatonic genera.

Ultimately, the linear and vertical expressions of the chromatic, octatonic, and diatonic genera—intrinsic to serial design—are subsumed within the chromatic universe. Although sonority is an indicator of generic, inter-generic, and pan-generic interaction, the chromatic genus eventually dominates the compositional environments of the Song and the Dirge Canons. As we have seen, the thematic and developmental linear formations of *In Memoriam* yield chromatic pcsets as do the blocks in which they participate. Furthermore, the NRL blocks of the Song and the NR blocks of the Dirge Canons periodically complete the aggregate. Thus, the microcosm of the generic model of set-class space expressed at the serial level directs the composition of linear and vertical structures that become the vehicles for the expression of Thomas's elegy. This, in turn, points up the rich metaphor that underlies Stravinsky's interpretation of the poem "Do not go gentle." The multifarious linear and vertical formations and their concomitant

generic expressions that coalesce into the triptych *In Memoriam Dylan Thomas* speak of Stravinsky's personal response to the loss of Dylan Thomas, while the enveloping chromatic environment—the universe of twelve pcs—symbolizes the macrocosm from which Stravinsky's creation emerges.

CHAPTER SEVEN

CONCLUSIONS

SUMMARY

The transformational system and the model of generic set-class space put forth in Chapter 2 of this dissertation provide special investigative tools for the analysis of works selected from Igor Stravinsky's early serial music, in which the compositional surfaces are organized through various techniques, including serial as well as other methods of linear construction. The diverse serial and non-serial linear formations found at or near the musical surfaces in these works are inextricably linked to musical gesture, expression, and symbolism. Once filtered through the apparatus of transformational analysis, these discontinuities form relationships that transcend order relations within the linear formations. Moreover, this mode of analysis reveals the role genera plays in defining the dynamic post-tonal environments from which these formations emerge.

The Transformational System and the Model of Generic Set-Class Space

The transformational system combines symmetry transformations and mappings, combinational transformations, and NE (near-equivalency) transformations, and allows for their interactions. The music-theoretic group of symmetry transformations and mappings—including the TTOs and the serial operations of transposition, inversion, retrograde, and retrograde inversion—is analogous to the mathematical group of functions that defines the symmetry transformations of a geometric figure, including rotations, translations and reflections. Stretching, shrinking, and substitution are special kinds of transformations that affect the distortion of a pcseg so that the pcseg only partially maps onto the object upon which it is modeled. The combinational processes of

inclusion and complementation are defined by the algebra of sets. The NE transformation is related to the symmetry group of functions, the distortion transformation of substitution, and the collection of combinational processes. The model of set-class space—the complex of genera that organizes pc-space in relation to collections of diatonic, chromatic, and octatonic scs—provides a framework for the transformational system so that the multifarious pc objects discovered through analysis can be drawn into special associations based on their relationship to the three genera.

Analytical Conclusions

The strategy employed in the analyses of the works considered in this study begins by exploring the precompositional potential of the series in terms of order relations, segmentation, pc resources and generic expressions, and then examines ways in which these potentials are exploited as elements of compositional design. Ultimately, a model of the singular compositional environment emerges for each of these works that renders them as distinct objects of musical art.

Tracing the canonical and non-canonical transformations of the series into non-serial formations in the serial interludes from *Orpheus* and *Ricercar II* from the *Cantata* reveals the extent of thematic transformations as well as the generic models that influence pitch organization. The pan-genericism of the series from *Orpheus* is expressed by the diverse generic affiliations of the multifarious linear formations and by the simultaneities that coordinate the interactions of the disparate serial and non-serial linear formations. Moreover, the pcsets associated with vertical adjacencies evince linear-vertical transformations of pcsets derived from serial units. The linear formations of *Ricercar II* become polarized as diatonic/near-diatonic or chromatic/near-chromatic objects, which reflects the inter-generic chromatic-diatonic attribute of the series. The diatonic genus is strongly expressed through the simultaneities that shape the vertical interactions among linear formations, while chromatic expressions in the vertical dimension are relatively negligible.

The compositional designs of “Musick to heare” and *In Memoriam Dylan Thomas* are highly symmetrical. Segmentation of the linear formations in “Musick to heare” consistently yields isomorphs of the 4-2 unit (with the exception of the 5-23 pcsegs);

similarly, segmentation of the linear formations of *In Memoriam* consistently yields isomorphs of the series. Nonetheless, these symmetries undergo distortion near or at the musical surface. Transformational analysis elucidates the strip-pattern design of the 24-note object-theme in “Musick to heare,” and explicates how the pattern undergoes distortion without significantly disrupting the symmetry underlying the deployment of the 4-2 units. The serial units of *In Memoriam* also participate in extended linear formations that evoke the object-theme/image-theme model proposed for “Musick to heare.” Since super-serial formations do not evince the strict interval-patterning characteristic of the strip pattern, the present study models them as serial distortions. Similar to the labels used to describe each of the four basic row forms, the label for each of the four super-serial types implies a fundamental group of transformational processes that link these formations to the essential serial model. Transformational analysis also draws the disparate diatonic 5-23 formations and the chromatic 4-2 formations of “Musick to heare” into a single model. Analysis of the five-note series of *In Memoriam* reveals that all three genera interpenetrate linear design, which is expressed locally and globally in linear and vertical formations and at different structural levels throughout the Song and the Dirge Canons.

The transformational system and the generic model, in addition to the analytical methods applied herein to the analysis of *Ricercar II*, “Musick to heare,” *In Memoriam*, and the excerpts from *Orpheus*, promise to be effective in formulating theories of pitch structure for other works from Stravinsky’s serial repertoire.¹ While the transformational system holds the potential to reveal a plethora of structural determinants, the analytical approach applied to Stravinsky’s late serial music may engender models of pitch-class space in which alternate generic clusters emerge.²

¹ The basis of the transformational system and the generic model emerged from a project I undertook in 1996-1997 that addressed the complete cycle *Three Songs from William Shakespeare*. I introduced some of the underlying concepts in an unpublished paper entitled “The Interaction of Serial and Non-Serial Formations in Igor Stravinsky’s ‘When Daisies pied’” at the Graduate Colloquia series, University of Western Ontario, November 1997.

² My preliminary analyses of *Canticum Sacrum* (1955) and *Elegy for J. F. K.* (1964) show similar results to the analyses in Chapter 3-6, above, and suggest the transformational system and the generic model will apply to them as well.

THE SYMMETRIES OF THE TRANSFORMATIONAL SYSTEM
AND THE GENERIC MODEL OF SET-CLASS SPACE

While the formulation of alternate generic models arising from the analysis of Stravinsky's late serial works remains an object for further studies, the present study explores a special generic model for "Musick to heare." In doing so, the model of generic set-class space defined by the complex interactions of the diatonic, chromatic, and octatonic genera re-emerge as the most appropriate theory for the analysis of Stravinsky's early serial repertoire.

"Musick to heare": The Mono-Generic Model as a Special Region of Set-Class Space

In his seminal essay "Stravinsky by Way of Webern," Henri Pousseur detects pitch constructs in Stravinsky's *Agon* that "constitute 'Mode III' of Messiaen (regular alteration of one tone and *two* semi-tones, a nine-note mode, which also has four transpositions [i.e., sc 9-12])."³ The interval pattern Pousseur describes is a symmetry transformation—that is, translational symmetry—of the primitive PCIS <2-1-1>, which is also the PCIS of sc 4-2, the sc expressed as the primitive of the extensive linear symmetries underlying the compositional design of "Musick to heare" (See Chapter 5).

Example 7.1 reproduces Messiaen's Mode III of limited transposition (enclosed in the rectangle).⁴ As illustrated in the example, segmentation of the PCIS confirms Pousseur's analysis of this scale. Moreover, segmentation of the pc succession through imbrication reveals several expressions of sc 4-2 as transpositionally equivalent and inversionally equivalent pcsets. This, in turn, suggests a special model of set-class space for the pitch materials of "Musick to heare": that is, a *mono-generic* model in which the simple genus defined by the cynosural sc 9-12—the set-class expressed by Messiaen's Mode III—is the sole constituent.⁵

³ Pousseur, "Stravinsky by Way of Webern (I)": 33.

⁴ Robert Sherlaw Johnson, *Messiaen* (London: J. M. Dent & Sons Ltd., 1975. Reprint, London: J. M. Dent & Sons Ltd., 1989), 16.

⁵ Set-class 3-12{048}—the abstract complement of sc 9-12—is the best candidate for the progenitor of this genus since each tessellation of the PCIS <2-1-1> in Mode III spans the pc-int4, which in turn produces the SIA of 3-12 <4-4-4>.

Example 7.1. A mono-generic model of set-class space for “Musick to heare”

The example displays four musical staves, labeled A, B, C, and D, each representing a different mode of Mode III. Staff A is labeled 'Mode III₀' and shows a sequence of notes with circles around them, connected by lines to labels '2-5 {70}', '2-5 {27}', and '2-5 {6e}'. Staff B is labeled 'Mode III₁' and shows a sequence of notes with a bracket labeled '4-2 {e013}' and a label '4-2 {e012}' pointing to a sub-series b. Staff C is labeled 'Mode III₂' and shows a sequence of notes with a bracket labeled '4-2 {89t0}' and a label '4-2 {t012}' pointing to a sub-series a. Staff D is labeled 'Mode III₃' and shows a sequence of notes with a bracket labeled '4-2 {79te}' and a label '4-2 {89t0}' pointing to a sub-series a. A legend at the bottom right indicates '← Delineating sc 2-5 dyads'. Below the staves, a larger musical staff labeled 'Mode III' shows a sequence of notes with a bracket labeled '4-2 {2346}' and a bracket labeled '4-2 {678t}'. Below this staff, a sequence of notes is labeled 'PCIS:' and is connected by lines to labels '4-2 {0234}', '4-2 {4678}', and '4-2 {8te0}'. A bracket labeled '9-12 {234678te0}' spans the entire sequence of notes.

Since there are three tessellations of PCIS $\langle 2-1-1 \rangle$ in the SIA of Mode III, the number of unique pcset members is four, including T_0 .⁶ Each of the four transpositions of Mode III—herein labeled III_0 , III_1 , III_2 , and III_3 —are shown on lines A, B, C, and D in the example. Line A illustrates the relationship of Mode III_0 to the sc 2-5 dyads that terminate each of the five sections of “Musick to heare,” and points up the symmetrical distribution of the dyads 2-5 $\langle 07 \rangle$ and $\langle 27 \rangle$ in relationship to pcset 4-22 $\langle 0247 \rangle$, a tetrachordal sub-pcseg of the 5-23 $\langle 02457 \rangle$ formations found in the Introduction and the final section of “Musick to heare” (see example 5.3). Adjacent pcs form tetrachordal pcsegs in lines B, C, and D that yield the pcsets from which the 24-note object these

⁶ See Chapter 2 (“Symmetry Transformations and Mappings as Music-Theoretic Processes: Special Properties of Tessellated Symmetrical Sets”).

derives its materials: Lines D and C yield the pcsets 4-2 {79te} and {89t0} from which the three pcsegs of sub-series *a* are constructed, <e79t> - <80t9> - <e79t>; lines C and B yield the pcsets 4-2 {79te} and {89t0} from which the three pcsegs of sub-series *b* are constructed, <e301> - <2t01> - <e301> (see example 5.1). The relationship of the remaining pitch materials to the 24-note object-theme has already been described in Chapter 5.

The mono-generic Mode III (sc 9-12) model adequately describes the relationship of sc 4-2 to its multifarious manifestations as 4-2 pcsets as well as to the 5-23 pcseg <02457> and the sc 2-5 dyads. Thus, all of the pitch materials in “Musick to heare” can be explained in terms of the collectional interactions among the four Mode III scales (i.e., III₀, III₁, III₂, and III₃). In this model, however, the generic terms *diatonic*, *chromatic* and *octatonic* have no relevance. Conversely, sc 9-12 constitutes a special region of set-class space since it is non-generic according to the *tri-generic* 7-35/7-1/8-28 model of set-class space. Nonetheless, the 4-2 unit and the linear formations in which it participates, and the 5-23 pcseg have definite generic affiliations. Thus, the present study offers a special image of the tri-generic model of set-class space in which the intense symmetry expressed by the 4-2 unit in the Mode III model and the linear formations of “Musick to heare” is retained on one level, but subsumed within the higher structural symmetries that draw the diatonic, chromatic, and octatonic genera into well-defined, dynamic relationships.

The Primacy of the Tri-Generic 7-35/7-1/8-28 Model of Set-Class Space

As we will see, the generic polarization of sc 3-6 and sc 4-28—the octatonic tetrachordal superset of sc 3-10—points up the crucial transformational pathway that re-establishes the tri-generic chromatic-diatonic-octatonic model that has proved to be effective in formulating the theories of pitch structure put forward in this dissertation. As we have seen, 3-6 {024} is expressed by the pcsegs found at o.p.1-4 and o.p.7-10 in the series of Ricercar II and by the non-adjacent pcs of the series from *In Memoriam* (o.p.1, 3, 5). In “Musick to heare,” sc 3-6 is presented twice in the first six elements of the 24-note theme (o.p.1-3, 4-6), and pcset 3-6 {024} is an element of the 5-23 pcseg <02457>.

o.p.1-3.⁷ In the series from *Orpheus*, however, sc 3-10 <t14> is expressed at o.p.1-3, the order positions in which sc 3-6 is found in the series of *Ricercar II* as well as in the 24-note theme and the 5-23 pcseg of “Musick to heare.” Although the sub-thematic sc 3-6 and sc 3-10 objects are generically disparate, their interaction through the transformational system engenders the dynamic post-tonal environment that underlies the compositional designs of these works.

Figure 7.1 is an addition matrix that illustrates the transposition of the prime form of sc 4-28 {0369}—a super-sc of 3-10 and the abstract complement of the octatonic cynosure 8-28—by the diatonic trichord 3-6 {024}, the abstract complement of sc 9-6 and a primary nonachord of the diatonic genus.⁸ As shown in the figure, the operations of T_0 , T_2 , and T_4 on {0369} yield the three unique members of sc 4-28, pcsets {0369}, {258e}, and {47t1}.⁹ In turn, the union of the three 4-28 pcsets produces the aggregate, sc 12-1.

Figure 7.1. Transposition of 4-28 {0369} by 3-6 {024}

	0	3	6	9
0	0	3	6	9
2	2	5	8	e
4	4	7	t	1

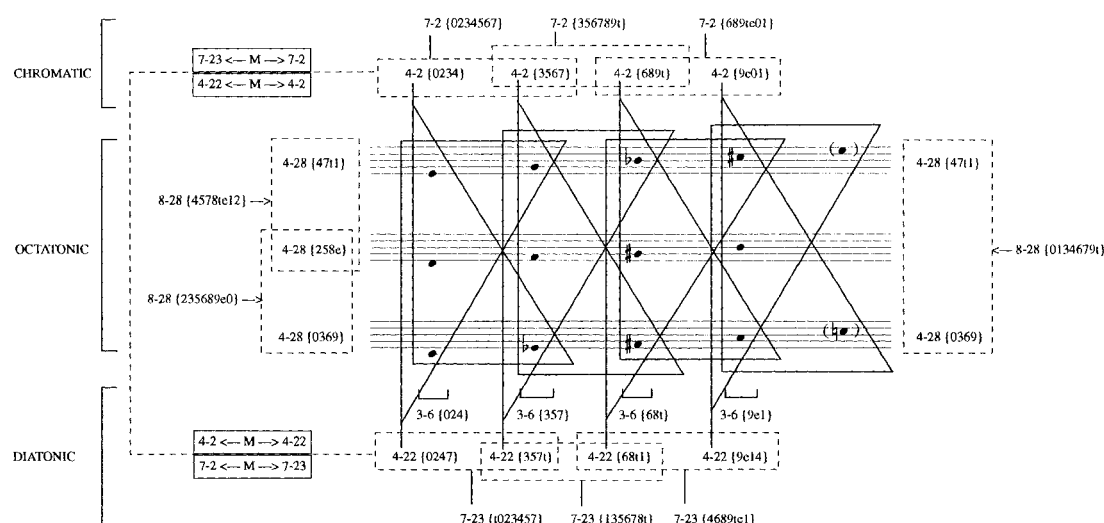
⁷ In fact, segmentation of the 24-note theme of “Musick to heare” by trichord will reveal several additional instances of 3-6 pcsegs.

⁸ The sc 4-28 can be generated from pc-int3, which is expressed in the PCIS of sc 3-10: sc 3-10, PCIS <3-3->; sc 4-28, PCIS <3-3-3>.

⁹ I am grateful for the insights of my friend, colleague, and mentor, jazz pianist and theorist Charlie Austin. In his monumental book, *An Approach to Jazz Piano*, Austin points up the “pluralities” of the superimposed full-diminished seventh chords in terms of their functional relationships to multiple key centers and the unique intervallic qualities that they engender through voicing and voice-leading. In an attempt to memorize these sonorities in terms of Austin’s “pluralities,” I erroneously modeled them in terms of linear superimpositions at *whole-tone* transpositions as opposed to Austin’s vertical stacks in *semi-tone* transpositions. This, in turn, engendered the alternate image of the model of generic set-class space.

Example 7.2 illustrates the transformations derived through the operations in figure 7.1 as objects in pitch space: 4-28 {0369} is shown in the lowest staff, and 4-28 {258e} and {47t1} are shown in the middle and top staves, respectively (assume each staff is in treble clef); the four simultaneities formed through the vertical alignment of the three 4-28 pcsets yield pcsets 3-6 {024}, {357}, {68t}, and {9e1} (indicated by the brackets positioned below the lowest staff). The first pair of vertical triangular enclosures illustrates the participation of the sub-thematic pcset 3-6 {024} in pcsets 4-22 {0247} and 4-2 {0234}, which in turn establishes the NE partnership between scs 4-2 and 4-22. As previously noted, 4-22 {0247} is the subset of the 5-23 <02457> formation from “Musick to heare” and is expressed in Mode III₀; 4-2 {0234} is the first tetrachord of Mode III₀ as well as an expression of the 4-2 unit of “Musick to heare” (see example 7.1). In addition, 4-2 {0234} is subset of 5-1 {01234}, the pcset derived from the series of *In Memoriam*.

Example 7.2. An alternate image of the model of sc space from which scs 4-2 and 4-22 emerge as a result of tri-generic interaction



As example 7.2 shows, the triangles enclosing each tetrachord of the 4-2/4-22 NE pairs are in a reflection-symmetric relationship, while the succession of 4-2/4-22 NE pairs and their concomitant triangular enclosures affect a series of translation-symmetric

figures. This visualization of the transformational partnership between scs 4-2/4-22 and the succession of images that represent their transformations at T_0 , T_3 , T_6 , and T_9 evokes the metaphor of the *wallpaper pattern*—that is, a complex pattern resulting from the repetition of a figure such as the 4-2 enclosure in two directions (that is, in the two dimensions of a plane).¹⁰

The pcsets produced by each of the 4-2 and 4-22 enclosures are shown above and below the system, respectively. The successive, linearly-adjacent pairs of 4-2 and 4-22 pcsets form into 7-2 and 7-23 pcsets, respectively, which is indicated by the broken-lined rectangles and sc-pcset labels. In addition, three pairs of 4-28 pcsets drawn from the three 4-28 pcsets shown in the example combine to form one of the three unique expressions of the octatonic cynosure sc 8-28 (illustrated by the broken-lined boxes beside the staves). The collections of 7-2 and 7-23 pcsets are linked through the large broken line shown at the left of the system in the example. Transformational operators, shown in the boxes attached to this line, indicate that scs 4-2 and 4-22, and scs 7-2 and 7-23 are M-partners. Since sc 7-2 is NE to the chromatic cynosure sc 7-1, and sc 7-23 is NE to the diatonic cynosure sc 7-35, this transformational link re-establishes the symmetry of the set-class space model described in Chapter 2, in which the polarized diatonic and chromatic genera are drawn into a special relationship through the M transformation, and the octatonic genus is the result of diatonic-chromatic interaction.

Example 7.2 expresses the intense symmetrical patterning that is found both in Messiaen's Mode III and in the linear formations of "Musick to heare," in which sc 4-2 manifests itself as the primitive. In this special image of the model of generic set-class space, the expressions of the chromatic sc 4-2 and its diatonic NE/M partner sc 4-22, result from the transformations of the octatonic tetrachord 4-28 by the diatonic sc 3-6. This, in turn, marginalizes the Mode III model and re-affirms the relationship of "Musick to heare" to the other works by Igor Stravinsky considered in this dissertation through the model of generic set-class space.

Ultimately, example 7.2 illustrates the mechanism of the entire transformational system put forth in this dissertation—including symmetry transformations and mappings,

¹⁰ See Chapter 2 ("Symmetry, Groups, Functions, Mappings, and Patterns in Mathematics").

combinational processes, and NE transformations—and provides an image of the symmetries underlying the fluid model of set-class space that is defined through the interactions of the diatonic, chromatic, and octatonic genera. The mechanism of the transformational system and the model of generic set-class space applied to the works discussed in the analytical chapters of the present study elucidates the dynamic relationships among the idiosyncratic serial constructions, the non-canonical transformations, and the discontinuities effected through the propinquity of serial and non-serial formations set within the complex generic environments that are characteristics of Igor Stravinsky's early serial works, and aligns them to the continuum of compositional procedures that transforms compositional designs from precompositional potentials into fully realized works of musical art.

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