

Transformation Chains, Associative Areas, and a Principle of Form for Anton Webern's Twelve-tone Music

BRIAN MOSELEY

Much of Webern's twelve-tone music relies on conventional formal types to structure extended composition and long-range compositional strategy. This article describes how these forms were absorbed into his personal twelve-tone style through an exploration of three entwined techniques. His techniques of serial row chaining and associative organization create a deep musical hierarchy that is frequently navigated by a formal principle of large-scale complementation. The analyses appearing here are drawn from across Webern's twelve-tone period and are elucidated through spatial representations that describe compositional potential and musical realization. In addition to providing a means for analytical interpretation, the analyses reveal how Webern's fusion of form and twelve-tone technique resemble characteristics of the tonal system while amplifying basic axioms of serial composition.

Keywords: Webern, twelve-tone music, transformation theory, musical form, transformation chains, complementation, associative organization, musical spaces, Cantata, Op. 31, String Quartet, Op. 28, Piano Variations, Op. 27, Quartet, Op. 22.

History seems to have judged the crystalline focus and brevity of much of Webern's music positively. Nevertheless, he was often anxious about the length of his music, and, at important junctures in his compositional life, he sought ways to produce lengthier works.¹ Famously, his prewar instrumental compositions shrank to such a degree that after completing the three *Kleine Stücke* for Cello and Piano, Op. 11, in 1914, he wrote only songs for the next decade, hoping that the addition of text would support more extended music. His initial attempts at twelve-tone composition were similarly tethered to text and produced small works. At Schoenberg's public unveiling of the method in 1923, Webern, who had already been experimenting with twelve-tone composition for more than a year, evidently reported that he "never knew what to do after the 12 tones."²

This context marks as significant his report to Alban Berg in September, 1929—seven years after his early twelve-tone experiments—that he could "compose quite 'long' again! . . . thanks to the twelve-tone technique."³ Entirely reversing his

prior frustration, this expression of relief implied that the earlier impediments to extended composition were overcome as a result of the twelve-tone method. He excitedly expressed this feeling in a letter to Berg one month earlier: "I rejoice over all that the method of 'twelve-tone composition' produces, *really quite by itself* . . . what inter-relationships result from it, and how *formally (in giving shape) everything falls into place so easily*" (emphasis mine). Webern's solution to the problem of large-scale organization was not a result of the twelve-tone method alone, per se, but a consequence, he says, of finding a way for the method to interface with musical form. Webern remained committed to traditional musical forms for the remainder of his life, and, though his music was never "long" in a conventional sense, traditional formal archetypes afforded him a means of organization that was relational, hierarchical, and, perhaps most importantly, could be fused to twelve-tone composition in much the same way that characteristics of tonality were fused to those of classical form.

In this article I explore aspects of Webern's twelve-tone technique that "produce" the formal shape of his music, as he put it in the quotation above.⁴ Classical formal archetypes have been a common framework for analyses of his music (an analytical orientation that the composer himself inaugurated).⁵ And, while the present study exists within this tradition, it

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- 1 Stravinsky evocatively captured the postwar ethos surrounding Webern's music by describing his compositions as "dazzling diamonds" (1955, vii)—that is, both small and perfect.
- 2 This quotation is discussed by Shreffler (1994, 298) and comes from the conductor, composer, and publisher Felix Greissle. Shreffler also discusses Webern's anxiety about the length of his works, particularly as it shaped his path toward a personal twelve-tone technique.
- 3 This quotation and the one following are from letters published in a forthcoming edition of correspondence between Webern and Berg (*Briefwechsel Anton Webern - Alban Berg*, vol. 4). They are reprinted here

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- 4 The impetus behind the present study is particularly aligned with Andrew Mead's approach to Webern's twelve-tone music in its interest in Webern's "extraordinary sensitivity to the possibilities of the twelve-tone system for embodying the formal strategies of earlier music" (1993, 173).
- 5 For example, see Webern's analysis of the String Quartet, Op. 28, contained in Moldenhauer and Moldenhauer (1979, 751–56).

proceeds from a novel perspective that views the interaction of twelve-tone composition and conventional form as the byproduct of three entwined techniques: serial row chaining, associative organization, and a formal concept that I will term the *principle of complementation*. I contend that together these techniques produce a deep, temporally ordered serial framework that Webern used to engage with conventional form and to structure long-range compositional strategy.

My principal conclusion states that the constraints holding together this deeper framework reflect lower-level axioms of twelve-tone composition. Webern began chaining series forms in his twelve-tone compositions around the time of the letters to Berg quoted earlier, and his use of the technique became ever more elaborate in his later works.⁶ Simply put, chains elide row forms through shared segments, thus ordering rows much as rows order pitch classes.⁷ Chains produce large serial structures made of conjoined series forms and are temporal counterparts to paradigmatic, associative means of organization.⁸ The present study depicts the interaction of chains and association organization with transformational musical spaces whose “map-like” structure is able to capture the formal potential of a particular row class. These spaces allow me to describe the principle of complementation as a common formal strategy that springs from twelve-tone organization. Much as row chains amplify the serial principle at a higher level, the principle of complementation’s primary characteristic is a high-level reflection of an axiomatic principle of twelve-tone composition: element “exhaustion.”

The analyses contained below are necessarily limited but nonetheless span the entirety of Webern’s mature twelve-tone period, from one of his first, the rondo concluding the Saxophone Quartet, Op. 22 (1929), to his very last, the final movement of the Second Cantata, Op. 31 (1943).⁹ In the first part of the article, I explore the techniques I described above in reference to some late works. After this, I present two

analyses that are more extensive, each exploring individual expressions of these ideas. My analysis of the opening movement of the Piano Variations, Op. 27 (1936), seizes upon “formal combination,” a particular type of formal plan that consumed Webern over the final ten years of his life. I contend that the principle of complementation was a way for him to combine the seemingly contradictory requirements of variation form and ternary form. In my discussion of the rondo finale of the Saxophone Quartet, Op. 22, I show how the principle of complementation manifests as a “chirality” borne from the interaction of row chains with segmental invariance and axial organization.¹⁰ Webern composed this lengthy, discursive movement as he wrote the above letters to Berg. Consequently, the analytical study affords us an opportunity to explore how these techniques took shape at a particularly consequential moment in his compositional life.

CHAINS, AREAS, AND LARGE-SCALE COMPLEMENTATION

Webern’s setting of Hildegard Jone’s “Gelockert aus dem Schoße,” from the second Cantata, Op. 31, provides a remarkable example of the integration of row chains into his composition of melody. **Example 1(a)** shows the tenor melody of “Gelockert,” with a row array and analytical interpretation at (b) and (c).¹¹ This theme—something like a *cantus firmus* for the movement—is comprised of three rows connected by two *transformation chains*, the retrograde-inversion chain $RICH_3$ and the transposition chain TCH_1 .¹² Those chains conjoin the melody’s three row forms through the elided segments shown with rounded boxes on the array at (b). A chain’s *length* equals the cardinality of the elided segment and is signified with a subscript. Thus, $RICH_3$ is a three-note elision joining *RI* related series forms, and TCH_1 is a one-note elision joining transpositionally related series forms. *RICH* and *TCH* are the two most common of four general types of chains scattered throughout Webern’s music, including the inversion chain, *ICH*, and the retrograde chain, *RECH*.¹³

- 6 His early, non-serial works often make use of motivic chains. The early serial works primarily use chains trivially available to every type of twelve-tone row, while the later compositions use rows engineered to engage more exotic chain types—as, for example, the three-note chain used in the final movement of Op. 31 (analyzed below) and the seven-note chain that operates throughout the Variations for Orchestra, Op. 30. Moseley (2018) discusses these later works from this perspective.
- 7 Lewin (1987) described Webern’s row chains in terms of musical transformations. Motivic chains are common in Webern’s earlier, non-serial music as well and are likely related to his interest in common-tone preserving transposition and inversion. See also, Lambert (2000), Straus (2008), and Straus (2011).
- 8 Webern’s music is a wellspring of associative organization, and has been described in those terms by many, including Nolan (1989), Mead (1993), Hanninen (1995), Koivisto (1997), Alegant (2001), Hook and Douthett (2008), and Hanninen (2012).
- 9 In the spirit of Mead (1993), the compositions here are discussed in reverse chronological order, though they increase in complexity. This has the effect of dramatizing how thoroughly Webern grasped the implications and potential of twelve-tone composition from early on while suggesting some ways his engagement with tradition changed over time.

- 10 Chirality, a term borrowed from the sciences, refers to objects whose identical structure belies an underlying opposition (like tonic and dominant triads or key areas, for example).
- 11 The tenor leads a four-voice canon. The remaining voices are not shown but emerge from relationships inherent in the tenor’s structural properties, creating the kind of “horizontal/vertical” correspondence Webern frequently mentions in his writings. Moseley (2017) offers an analysis of this movement that views the structure in **Example 1(c)** as a mirror of Webern’s understanding of the natural world. Reinhardt (1995, 133–41) uses the piece to make a compelling argument about the collaborative working relationship between Webern and the poet Hildegard Jone. See also Bailey (1991).
- 12 In this study, musical transformations such as these chains, but also including transposition (T_x) and inversion (I_x) and retrograde (R), are symbolized with italicized script to distinguish them from musical objects, such as series forms, which are shown with bold script.
- 13 David Lewin first used the term “*RICH*” in *Generalized Musical Intervals and Transformations* (1987, 180ff.), though an earlier conception of the idea is articulated by Lewin (1977) in the context of a discussion of

EXAMPLE 1. Tenor theme from Webern, “Gelockert aus dem Schoße,” Op. 31, sixth movement. (a) Theme with first stanza text and formal annotations

EXAMPLE 1. (b) Theme's row array, showing three rows adjoined by two chains and the resulting projection of A1 onto A2

EXAMPLE 1. (c) Annotations show intervallic alternations among the poetic lines, the interval alternation's interaction with the inversion $I_{D/D}$, and the large formal frame it creates surrounding the theme's central phrase, A2

Although each of the four chains resemble the familiar serial operations (T , I , R , and RI), they are unique in many

significant ways, including their dependence upon the structure of the row, their temporality, and their way of creating larger, row-like structures.

Webern's row forms. In the present study, Lewin's "RICH" is $RICH_2$, so that it can be distinguished from other RI chains, like the $RICH_3$ in Example 1. Lewin (1987) describes TCH as a compound operation, $RICH * RICH$; in the present study, TCH is a unitary operation. Moseley (2018) describes some formal properties of the group of chains.

- Chains are "contextual transformations" (Lambert 2000). Their ability to transform a row and the particularities of the transformation's action are dictated by the intervallic properties of the row itself. $RICH_3$, for example, can

transform Op. 31's **P** and **I** forms, but not its **R** and **RI** forms. Unlike the serial operations, chains are mode-reversing; they transform inversionally related objects in equal but opposite fashion.¹⁴

- *Chains are innately temporal.* As the array at (b) shows, by eliding shared segments of consecutive rows, chains order those rows into “super-serial structures;” just as the rows at (b) order pitch classes, the chains order the rows.¹⁵
- *Chains create large serial structures that maintain the pitch and intervallic structure of the row.* Chained rows contain no adjacent pitch repetitions, and chains ensure that the larger chained structure contains only those intervals found in the row itself.

To be clear, I do not claim in this study that we should aim to hear chains in operation;¹⁶ rather, I contend that a chain's contextual dependence on the row, its ordering of rows, and its method of producing larger reflections of the row constrain composition in ways that stealthily shape the musical surface.

Turning back to “Gelockert,” its large chained-together melody interacts with the syllabic structure of the poem to create a web of formally significant segmental associations. [Example 1\(c\)](#) uses curly braces and beamed note heads to illustrate an interval “rhyme” involving an alternation of interval class 4 and interval class 1—shown with open half notes and open diamond-shaped notes, respectively. The interval rhyme (ic4, ic1, ic4, ic1, ic4) matches the ABABA rhyme scheme of the poem (... Schoße, ... Frühlingsraum, ... Bloße, ... Mensch und Baum, ... Große), and it reflects the poem's assonance and alliteration as well: because of *RICH*₃'s elision in the second phrase, the <F, D♭> and <B, D♯> of “Gelockert ... Schoße” are heard in retrograde order to set “gekommen ... Bloße.”

The interval rhyme is supported by a striking transformational structure that is shown above [Example 1\(c\)](#). Emanating from the tenor's initial D₄, the inversion I_{DD} —of which the tenor's first D₄ is the axis—joins together the ic4 and ic1 dyads involved in the interval rhyme and creates a transformational articulation of the poem's five phrases into two couplets surrounding a central phrase. The transformational arrows underscore the melody's centripetal nature, and that quality is further embodied in segmental associations that I have highlighted on the array at (b). By acting along with the syllabic structure of the poem, *RICH*₃ allows for a recapitulation of the theme's first nine pitch classes at the melody's very center, yet jumbled and reordered significantly: in the first phrase ([Example 1\(c\)](#)) the transformational structure of the dyads emanates from D₄, but at their recapitulation in the third phrase those dyads enclose D and place the axis at the very

center of the theme.¹⁷ This recapitulation at A2 draws the whole of the theme together around its center through a structure imbued with the transformational implications of the tenor's very first pitch. On the whole, it produces a musical image of the sort of amplification suggested in Jone's poem: “Loosed from the womb [Gelockert aus dem Schoße],” a newborn “comes ... from greater into the great [gekommen ... aus Größerem ins Große].”

In Webern's lengthier instrumental works, chains are often more deeply connected to formal potentiality through a systematic interaction with associative organization. [Example 2](#) offers a short demonstration in the form of an analytical overview of the first movement of the String Quartet, Op. 28.¹⁸ The theme is shown as an array in [Example 2\(a\)](#), and like the melody from “Gelockert,” it can be described as a single large serial structure generated by transformation chains. This theme cycles through a collection of chromatic tetrachords and semitones whose registral, rhythmic, and timbral characteristics suggest two *associative sets*—set A containing the twelve chromatic tetrachords, and set B containing the twelve semitones. Webern's theme articulates a clearly defined *area* (or *subset*) of A and B that is aligned with the array to its left. A₀ contains the T_4 related tetrachords {2, 3, 4, 5}, {6, 7, 8, 9}, and {t, e, 0, 1}, while B₀ contains the “even-rooted” semitones {0, 1}, {2, 3}, {4, 5}, {6, 7}, {8, 9}, and {t, e}.¹⁹

In Webern's twelve-tone music, pre-compositional interrelationships among associative areas and their interaction with transformation chains often seem to have suggested a formal course for a piece. Studying movement within and between such areas gives the analyst a means to relate pre-compositional potentiality to compositional reality and to relate deeper formal organization to surface detail.²⁰ For example, the contextual criteria characterizing Op. 28's theme create the overlapping A and B areas shown with the spatial transformation network in [Example 2\(b\)](#), whose second row contains the row progression seen at (a).²¹ Every

14 In fact, chains inherit most characteristics of the “Riemannian” group of operations. [Moseley \(2018\)](#) offers more extensive discussion of this property. See also [Hook \(2002\)](#) and [Hook and Douthett \(2008\)](#).

15 This temporality can be expressed as a simple instance of multiple order function, described by [Batstone \(1972\)](#), because the pitch classes in the chained segment have multiple order number interpretations.

16 In fact, elsewhere ([Moseley \[2017\]](#)), I argue the opposite.

17 In fact, the soprano, who echoes the tenor in canon but is an *RI* transformation of the tenor, leaps to a climactic D₅ at the precise rhythmic center of the song.

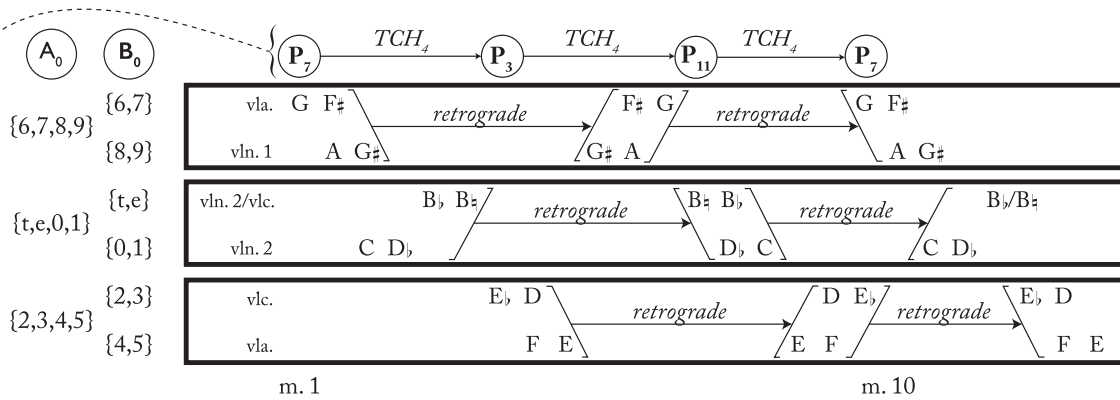
18 [Hook and Douthett \(2008\)](#) and [Clampitt \(2009\)](#) offer similar analyses of this movement, and [Moseley \(2018\)](#) discusses the movement in much greater detail.

19 I use the terms *associative set* and *subset* here and in what follows in the sense described by [Hanninen \(2012\)](#). Associative sets contain “segments bound [by] contextual criteria into an integrated system that functions at a higher level of organization” (98). Segments form a subset when they are “part of the same larger set” and “associate more strongly with one another than they do with other segments in the larger set” (100). I denote a subset of a set with a numbered subscript; A₀, A₁, A₂, and A₃ are the four, three-element subsets of A.

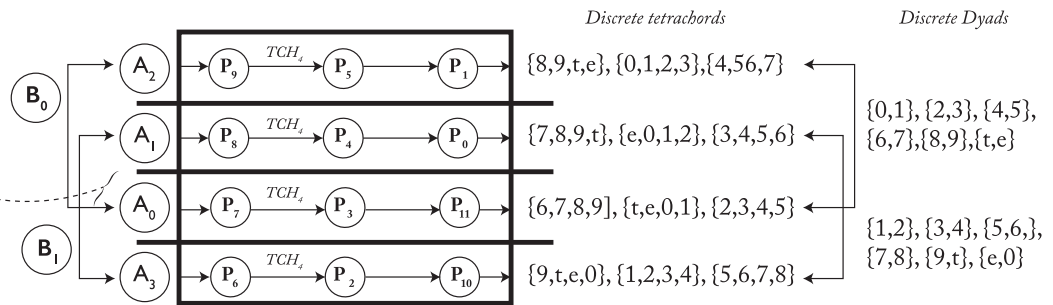
20 This echoes one facet of the partitioning approach to twelve-tone composition discussed by [Alegant \(2001\)](#). Associative areas, in this study, also resemble [Lewin's \(1967, 1968\)](#) and [Mead's \(1985\)](#) analytical approaches to analyzing Schoenberg's combinatorial works.

21 Webern's row is *RI*-symmetrical and therefore possesses only twenty-four distinct forms. I have included only **P**-forms here to simplify the presentation.

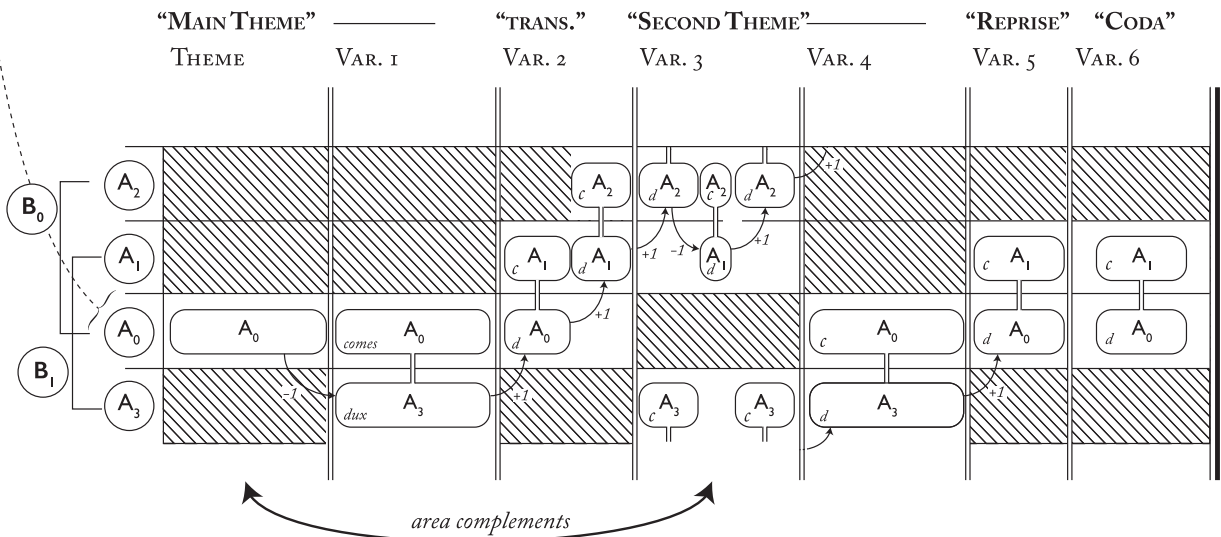
(a) row array for the main theme of Webern's String Quartet, Op. 28, I, with two associative sets (A_0 and B_0) its left.



(b) a spatial transformation network for Op. 28, I.



(c) an event transformation network, showcasing complementary relationships in Op. 28, I.



EXAMPLE 2. Organized associative sets, their connection with transformation chains, and the role each play in the projection of a large-scale complement relation in Webern, String Quartet, Op. 28, first movement

series form belongs to one of two dyadic areas (B_0 or B_1) and one of four chromatic tetrachordal ones (A_0 , A_1 , A_2 , or A_3).²² This space's temporality and connectedness is created by the transformation chain (TCH_4) that ordered the rows in the theme. These transformational pathways (which when running into an edge emerge on the opposite side) are highly static with respect to the network's underlying associative organization; that is, iterative applications of TCH_4 retain the spatial status quo.

Webern uses the dual associative organization of this space to produce distinct components of the movement's formal scheme. In [Example 2\(c\)](#) I show the form as a set of six variations nested within a large ABA form, all of which is articulated by a two-voice canon commencing at the first variation.²³ Using the structure of [Example 2\(b\)](#) as a map, this diagram charts motion within A and B.²⁴ Notice that the two canonic voices beginning at the first variation occupy complementary dyadic areas throughout the movement: when the *dux* is playing in the B_0 area, the *comes* is in B_1 .²⁵ Simultaneously, Webern has shaped the large ternary by following a path through the four tetrachordal areas. The theme begins the movement by articulating A_0 . Over the course of the first variation and transition the music ventures away—"rising" through the space to A_1 and A_2 .²⁶ Upon arrival of the "second theme" (also the third variation), the two canonic

voices move quickly through three areas— A_1 , A_2 , and A_3 —that contrast (tonally) with the theme's A_0 . The movement's "reprise" then returns the canon's *dux* to A_0 , where it began the movement.

Studying the Quartet's movement through A and B highlights a formal principle that recurs in many of Webern's compositions. I call this the *principle of complementation*. It describes Webern's tendency to use complement relationships to articulate formal relationships and processes. In the String Quartet, the principle of complementation describes an interesting shared attribute of the canon's structure and the large ternary's. Both the canon and the ternary use complementary and unique associative areas as a means to articulate their internal parts. The three chromatic tetrachords of the theme, forming A_0 , are *complemented* in the second theme by the nine chromatic tetrachords the theme excludes, members of A_1 , A_2 , and A_3 . At the same time, the canon voices throughout the movement exist in a complementary relationship in reference to their dyadic structure: B_0 is always echoed in canon by its complement, B_1 , and vice versa.

The principle of complementation describes a common "navigational" strategy in relationship to a composition's underlying, chained-together associative organization.²⁷ Much as transformation chains replicate the serial principle on a larger scale, this principle amplifies a characteristic feature of twelve-tone composition: the exhaustion of a set of elements. To be clear, by complementation I do not mean aggregate completion; or, at least, I do not mean to refer to aggregate completion exclusively, though such strategies may be used by Webern in his music. This principle is meant to be understood much more broadly, in order to encompass a variety of compositional strategies. In "Gelockert aus dem Schoße," for example, the principle of complementation helps describe a transformation that spans and frames the movement, as I show below [Example 1\(c\)](#). The underlying semitone line $\langle D\flat, C, B \rangle$ that orients the three ic4s in the first phrase recurs in the last (as $\langle C\sharp, C, B \rangle$), where those pitch classes are used to form three new ic4s. Together, the first and last phrases *exhaust* the set of ic4s containing those pitch classes, underscoring the larger metamorphosis that occurs in the song and poem. In the two extended analyses below, I show how the principle is used as a large-scale compositional strategy interacting with musical association. Though the principle allows us to generalize these formal strategies, the analyses show that Webern makes use of its potential in unique and interesting ways.

22 Thus the dyadic areas are related to the tetrachordal ones by literal inclusion. One can determine the number of transpositionally and/or inversionally equivalent associative sets by dividing 24 by a set's degree of symmetry (DS). Here, the dyadic set's DS is 12 and the chromatic tetrachordal set's DS is 6. The four tetrachordal areas that result ($24 \div 6 = 4$) include the two ($24 \div 12 = 2$) dyadic ones. See [Alegant \(2001, 5\)](#).

23 My formal labels derive from Webern's analysis in [Moldenhauer and Moldenhauer \(1979, 751–56\)](#). Formal combination was of significant interest to Webern, particularly in the last five of his completed works. See [Boynton \(1995\)](#) and [\(2009\)](#), and the analysis of Op. 27/1 in the present study.

24 While [Example 2\(b\)](#) reflects [Lewin's \(1993\)](#) description of "formal networks" that "exist outside human time in an abstract universe of quasi-spatial potentialities" (41), [Example 2\(c\)](#) more closely matches his notion of a chronological "figural network." For related discussion of these distinct depictions of musical time and space, see [Rings \(2006\)](#) and [Roeder \(2009\)](#), where formal/figural networks are renamed as "spatial" and "event" networks. Unlike Lewin's figural networks, [Example 2\(c\)](#)'s topography emerges from the structural characteristics of [Example 2\(b\)](#).

25 Webern's analysis notes that the end of each variation is an "upbeat" to the subsequent variation ([Moldenhauer and Moldenhauer 1979, 751ff.](#)). The network in [Example 4](#) shows how one might interpret this statement to mean that the *comes* always anticipates the tonal location of the *dux* in the following variation.

26 In this space, and in all of the spaces in this study, references to directions "up" or "down" are entirely metaphorical; or as [Westergaard \(1996\)](#) elegantly writes, "The traveler who floats in this space gets no compass. Here, as in that Swedenborgian heaven that Schoenberg quotes from *Seraphita*, 'no absolute down, or right or left, forward or backward' guides your flight" (16).

27 My sense of an underlying "map" navigated in the course of a composition allies the present approach with many recent studies tonal and atonal music. See, for example, [Cohn \(2012\)](#) and [\(Straus 2011\)](#). In their relationship to compositional design, many of the map-like representations in this article resemble the musical grammars discussed by Robert [Morris \(1995\)](#). [Moseley \(2013\)](#) discusses this metaphor as well.

COMPLEMENTATION IN VARIATION AND RECAPITULATION

Complementation between formal sections that have customarily depended on thematic or tonal contrast is the most obvious candidate for the principle's use, but Webern also used the principle in ways less tied to tonal practice, as we will see in the Andante first movement of the Piano Variations, Op. 27. [Example 3](#) presents an overview of the movement. The movement's purported formal amalgamation—a variations nested within a ternary form—has engendered disagreement among analysts that stems from a potentially apocryphal analysis by Webern himself.²⁸ My own interpretation reads the musical evidence in favor of an amalgamated form wherein the eighteen-measure theme of the ternary's exposition produces two large variations (themselves eighteen measures long) that simultaneously act as contrasting middle and recapitulation. Each of these large sections contains a theme and variation within themselves (see [Example 3](#)). My use of the term variation here draws upon two characteristics in particular: the effect of a *symmetrical persona*, tied to transformation chains' action on row combinations, that becomes increasingly fractured through asymmetry and eventually splits; and variations in *gestural position* within the movement's recurrent palindromes—a process through which gestures on the “outside” of phrases become “inside” ones, and vice versa.²⁹ As I show below, these surface processes reflect a deep structural one guided by large-scale complementation.

Let us first consider some general musical characteristics of the exposition's theme and variation. One function of the exposition theme ([Example 4\[b\]](#), mm. 1–10) is to establish a multifaceted symmetrical persona that extends throughout the composition.³⁰ The two phrases are individual palindromes

oriented around a temporal axis, and the second phrase introduces vertical symmetry around a pitch axis. Palindromes of lesser degrees of strictness also comprise the exposition variation ([Example 4\[b\]](#), mm. 11–18), and, indeed, every phrase of the movement. Their greatest formal consequence lies in their ability to frame motivic gestures around their temporal axes—either “on the outside” or “on the inside” of the phrase's palindrome, as shown on [Example 4](#).³¹ Here, these outside/inside gestures are typified by the tritones they contain. For example, we can hear the first phrase's palindrome (mm. 1–7) as projecting a six-note “outside” gesture, containing the melodic tritones {F, B} and {C♯, G} (mm. 1–2; 6–7), and a six-note “inside” one with melodic tritones {E♭, A} and {D, G♯} (mm. 3–5). The theme's second phrase (mm. 8–10) already begins to vary the first by returning three of those four tritones but swapping the outside/inside position of {C♯, G} and {E♭, A}. In fact, it is this positional swap that contributes to the emergence of the second phrase's vertical pitch symmetry. At the temporal axis in m. 9, the tritone {A♭₃, D₄} occurs “one beat early” and the A♭ is an octave “too low.” The early, altered entry slightly fractures (that is, varies) the phrase's palindrome; had it been faithful to the temporal symmetry, {D₄, G♯₄} would have sounded below C♯₅ on the last beat of m. 9 instead.³² A consequence of this early entrance, however, is an emergent vertical symmetry between the two hands (see the *I*₉ arrows between the staves), which echo one another in an inversionsal canon around E₄/F₄.³³

In the exposition's remainder, the asymmetry first felt in m. 9 increases until the persona breaks the palindromes. As they

28 Details of this controversy are outlined in [Boynton \(2009\)](#). In short, Webern composed what became the final movement of the Piano Variations first. Because that movement is clearly a set of variations, some have questioned whether the title of the piece (Piano Variations) refers to that movement alone or each movement in the set. The former stance has been argued by [Bailey \(1973\)](#), (1988), (1991) and [Wason \(1987\)](#); however, most primary source evidence supports the latter. Willi Reich's published notes, compiled in [Döhl \(1976\)](#), recall an analysis carried out with Webern in which the composer analyzed the first movement as a combination of variations and three-part form. Though Bailey has questioned the veracity of Reich's account, [Boynton \(2009\)](#) presents additional evidence corroborating it, among which are letters from Webern to the pianist Eduard Steuermann, where he writes: “I am working . . . on the variations for piano which I have already told you about. It will be variations in several movements, however” ([Boynton 2009](#), 204–05).

29 Thus, it matches Willi Reich's account in [Döhl \(1976\)](#) and resembles analyses by [Leibowitz \(1948\)](#) and [Nelson \(1969\)](#). Published accounts of this movement are less common than for the remaining movements of Op. 27, though in addition to the analyses cited above, see also [Starr \(1984, 202–7\)](#), [Nolan \(1989, 258–90\)](#). The present analysis also echoes some observations from [Koivisto \(1997\)](#).

30 By persona, I mean to reference [Monahan's \(2013\)](#) notion of “work-persona”—a “unitary and continuous” personality extending throughout a composition (328–29). This idea seems evident in the first published analysis of the work by René Leibowitz ([1949] 1970, 229ff.), who

imagines the idea of *Spiegelbild* (mirror image) as operant in different ways in each of the work's three movements. Symmetry not only acts on pitch, rhythm, dynamics, and form, but influences performance as well, particularly in the hand crossing that Webern asks of the performer, as described by [Mead \(1999\)](#).

31 The special sort of closure that palindrome produces is a byproduct of this framing characteristic. A palindrome, [Hasty \(1984\)](#) notes, “undoes what has been done—when the last element appears in retrograde the structure is completed as if by being emptied of its contents. Since this structure admits no further accretion of elements it is inviolate and is thus articulated as a unit” (179).

32 Catherine Nolan, writing about Webern's temporal symmetries, proposes that they are “static [entities],” “antithetical to the dynamic character of tonal harmonic progression” (1989, 251). My sense of the fixed nature of temporal symmetry matches Nolan's and foregrounds precisely the reason that the {D, G♯} in m. 9 is such a dynamic element—it acts *against* the static nature of the underlying palindrome.

33 The second phrase's *I* symmetry occurs largely (though not entirely) in terms of pitch, not just pitch-class. It manifests rhythmically as well, as the two sixteenth-note gestures are answered by their *I*₉-partner one beat later. This aspect of inversionsal structuring is quite apparent playing the passage at the piano and contrasts markedly with the first phrase, where the hands seem to combine to create a single line. Because of the chains that lie behind the array, the second phrase is a pitch class short of a complete aggregate; and therefore, the B♭₄ at its temporal axis does not have an *I*₉ partner. Interestingly, it finds that *I*-partner with the B♭₄ that starts the next phrase, a melodic and dynamic climax that Webern marked in Peter Stadlen's piano score with a suggestive “mehr!” ([Webern 1979](#)).

<i>Ternary:</i>	EXPOSITION	CONTRASTING MIDDLE	RECAPITULATION
<i>Variations:</i>	THEME	VARIATION 1	VARIATION 2
	THEME (m. 1) VARIATION (m. 11)	THEME (m. 19) VARIATION (m. 30) re-trans.	THEME (m. 36) VARIATION (m. 47)
	symmetry → asymmetry	symmetry → asymmetry	symmetry → asymmetry

EXAMPLE 3. Formal diagram of Webern, *Piano Variations*, Op. 27, first movement

(a)

PHRASE 1

o.n. 01 2	3 45	6 78	9t e/0	12 3	4 5 6 7	9 t e
E ^b F C [#]	E ^b C ^b D	G [#] A ^b B ^b	F [#] G B	E ^b EC	C [#] DG [#] B ^b	A ^b F [#]
[F ^b] [C [#] G]	[E ^b A] [D ^b G [#]]	[D ^b G [#]] [E ^b A]	[C [#] G] [F ^b]	[E ^b A]	[C [#] G][D ^b G [#]]	[E ^b A]
B G ^b F [#]	B ^b A G [#]	D ^b C E ^b	C [#] F ^b E	F [#] FA	G ^b A ^b DC [#]	C ^b E ^b
o.n. 0 12	34 5	67 8	9 t e	01 2	3567	8 9 t
outside	inside	inside	outside	outside	inside	outside

PHRASE 2

o.n. 01 2	3 45	6 78	9t e/0	12 3	4 5 6 7	9 t e
E ^b F C [#]	E ^b C ^b D	G [#] A ^b B ^b	F [#] G B	E ^b EC	C [#] DG [#] B ^b	A ^b F [#]
[F ^b] [C [#] G]	[E ^b A] [D ^b G [#]]	[D ^b G [#]] [E ^b A]	[C [#] G] [F ^b]	[E ^b A]	[C [#] G][D ^b G [#]]	[E ^b A]
B G ^b F [#]	B ^b A G [#]	D ^b C E ^b	C [#] F ^b E	F [#] FA	G ^b A ^b DC [#]	C ^b E ^b
o.n. 0 12	34 5	67 8	9 t e	01 2	3567	8 9 t
outside	inside	inside	outside	outside	inside	outside

(b)

THEME, PHRASE 1

PHRASE 2

VARIATION, PHRASE 3 (CF. PHRASE 1)

PHRASE 4 (CF. PHRASE 2)

registral "flip" as compared with mm. 11-13

entire middle gesture is "one sixteenth early"—obliterating the palindrome and obscuring the vertical symmetry

{A^b3, D3} sounds "one beat early"—fractures the palindrome

EXAMPLE 4. (a) Aligned row array. (b) score for the exposition of Webern, *Piano Variations*, Op. 27, first movement

were in m. 9, the “inside tritones” $\{D, G\sharp\}$ and $\{C\sharp, G\}$ are the variation's most salient actors in this process. Midway through the third phrase in m. 13, the sounding of $\{D, G\sharp\}$ is followed by a registral flip, and, in the exposition's culminating phrase (m. 16, plus anacrusis), just a tinge of the symmetry we heard in the first phrase still remains. Both inside tritones $\{D, G\sharp\}$ and $\{C\sharp, G\}$ enter early, along with the entire inside gesture—completely fracturing the phrase's temporal and vertical symmetry (cf. mm. 16–17 with mm. 8–9). Not only do these tritone-infused gestures vary the palindromic symmetry, they also express a behavioral tendency to move from the “inside” of each palindrome to the “outside.”³⁴

We will have occasion to see how this behavioral tendency plays out in the remainder of the movement soon, but first, this persona and the variational qualities it inspires have origins in two interrelated serial traits that are described in the array aligned with the first ten measures of the score in [Example 4\(a\)](#). Notice first that, although a tritone infuses every exposition gesture, the row itself has only a single segmental tritone, at its center between order numbers 5 and 6. Thus, Webern creates the tritone-laden exposition gestures from the superimposition of coinciding, retrograde-related rows (or *R*-pairs, as I will call them). Those tritones are shown with lines between the series forms on the array and are the same in each of the four phrases: $\{F, B\}$, $\{C\sharp, G\}$, $\{Eb, A\}$, and $\{D, G\sharp\}$. The array also shows how *RICH*₁ is involved in the exposition's shifting symmetries. The chain connects each phrase to the subsequent one, but to maintain the *R*-relationship between coinciding series forms, rows must chain *in alternation*.³⁵ As a consequence, one or the other rows in each pair “leaps ahead” of the other to begin the second and fourth phrases. This creates a variationally significant order-number misalignment, seen most clearly in phrase 2 of the array. When **I**₁₁ begins before the second phrase while **RI**₁₁ begins with the second phrase, the misalignment produces the *I*₉ inversional symmetry described earlier, and is seen below at (b). Thus, $\{Ab, D\}$'s variational early entry in m. 9 can be imagined as responding to the vertical symmetry made available by *RICH*₁. It is attempting to participate in the new, vertical symmetrical order.

These associative attributes provided Webern ample resources to work with in creating the structural backbone of the movement's entwined forms. The spatial network in [Example 5](#) organizes the row class into six associative areas (labeled A_0 – A_5) joined to one another by *TCH* and *RICH*.³⁶

34 My sense of a behavioral tendency involving shifting roles (“inside” and “outside”) is influenced by Mead's (1993, 187ff.) description of a similar behavior (of “between things” to “within things”) as regards the first movement of Op. 22.

35 Transformation chains, unlike transposition and fixed-axis inversion, do not commute with the serial operation *retrograde*. Thus, it is not generally possible for both a pair of *R* related row forms to chain while maintaining their *R* relation. A similar curiosity underlies the *I*₆ related row pairs that structure the second movement of Op. 27, discussed in Hook and Douthett (2008). Unlike transposition and fixed-axis inversion, chains do commute with fixed-axis inversion.

The network represents an organized associative set of outside/inside tritones (summarized to the space's right) that are created from adjacent or simultaneous pitch classes of coinciding *R*-pairs. Every area in the network at (a) contains four *R*-pairs shown as “barbell-shaped nodes” that are unified by a common set of inside tritones—e.g., $\{Eb, A\}$ and $\{D, G\sharp\}$ for A_5 .³⁷

[Example 5\(b\)](#) isolates the members A_5 and A_4 , and shades the exposition's *R*-pairs.³⁸

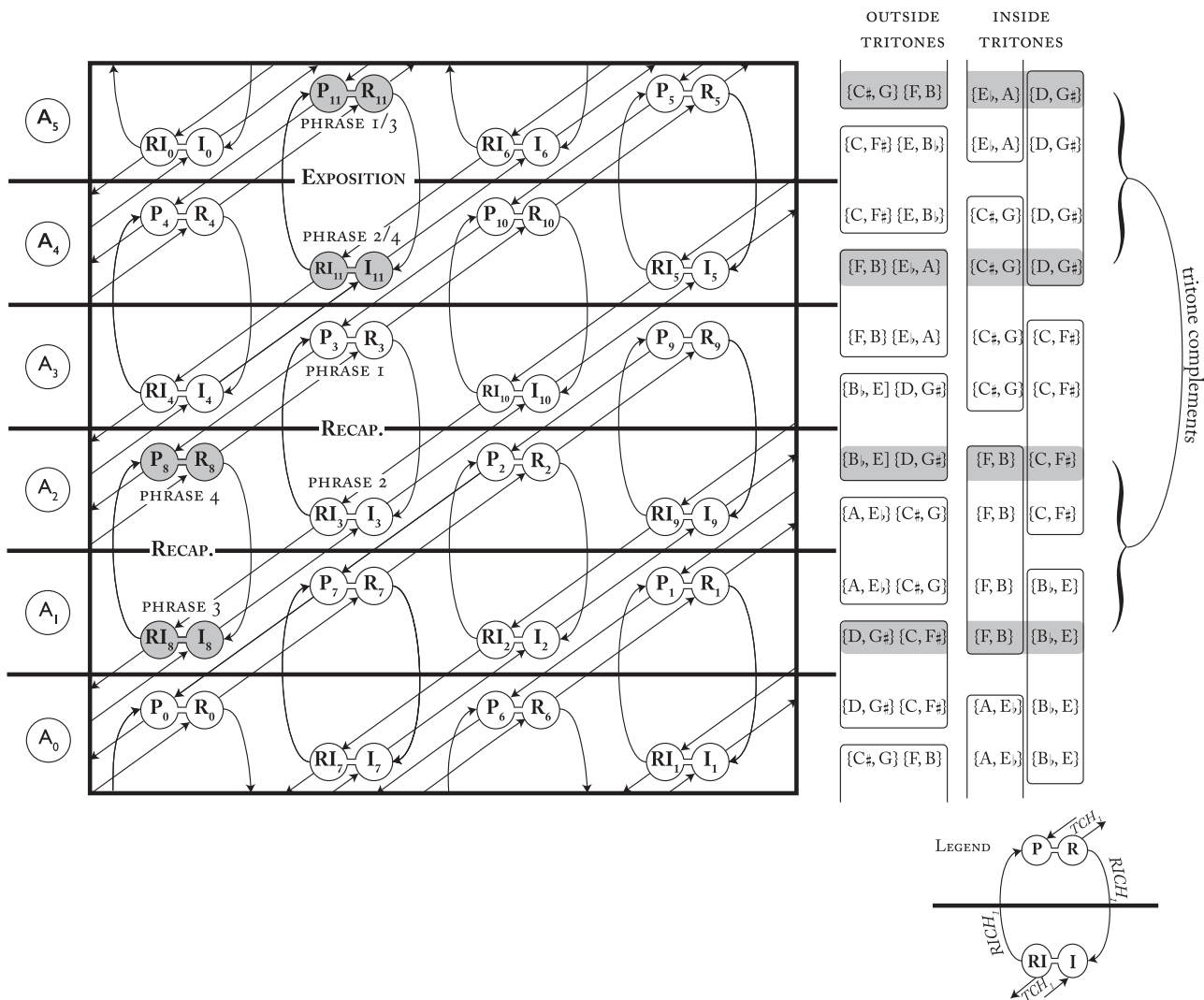
Two particular characteristics of the space influence the ternary and variation aspects of the movement. The first corresponds to our earlier observations about the exposition's sense of variation: adjacent areas (A_5 and A_4 , for example) are *maximally similar* as regards their group of outside/inside tritones, as one can see to the right of [Example 5\(a\)](#) with the rounded boxes straddling those areas (A_5 and A_4 share $\{C, F\sharp\}$ and $\{E, B\flat\}$ as outside tritones, and $\{D, G\sharp\}$ as inside ones). An even closer relationship obtains between the *RICH*₁ related *R*-pairs that are aligned vertically on [Example 5\(a\)](#), as they contain the same unordered set of tritones. Three such groups are highlighted on the space in gray, and correspond to the four phrases from the exposition and recapitulation. The exposition's four phrases use *RICH*₁ to move between A_5 and A_4 , causing $\{Eb, A\}$ and $\{C\sharp, G\}$ to swap position. The same variational swapping occurs in the four phrases of the recapitulation, as chain movements by *RICH*₁ move the music from A_3 to A_2 in the first half (swapping $\{B, F\}$ and $\{C\sharp, G\}$) and A_1 to A_2 in the second (swapping $\{E, B\flat\}$ and $\{D, G\sharp\}$).

More significantly for the movement's larger ternary form, the space has *complementary poles* (situated as A_x is to A_{x+3}) whose influence is felt in the movement's recapitulation. For example, comparing the shaded inventories corresponding to the third and fourth phrases of the exposition and recapitulation shows that each one is the pole of the other: the three inside tritones defining the exposition ($\{Eb, A\}$, $\{D, G\sharp\}$, and $\{C\sharp, G\}$) are complemented by the three inside tritones closing the recapitulation ($\{F, B\}$, $\{C, F\sharp\}$, and $\{B\flat, E\}$). The same relationship holds between outside tritones: those characterizing the exposition ($\{F, B\}$, $\{C\sharp, G\}$, and $\{Eb, A\}$) are complemented by those ($\{E, B\flat\}$, $\{C, F\sharp\}$, and $\{D, G\sharp\}$) that end the

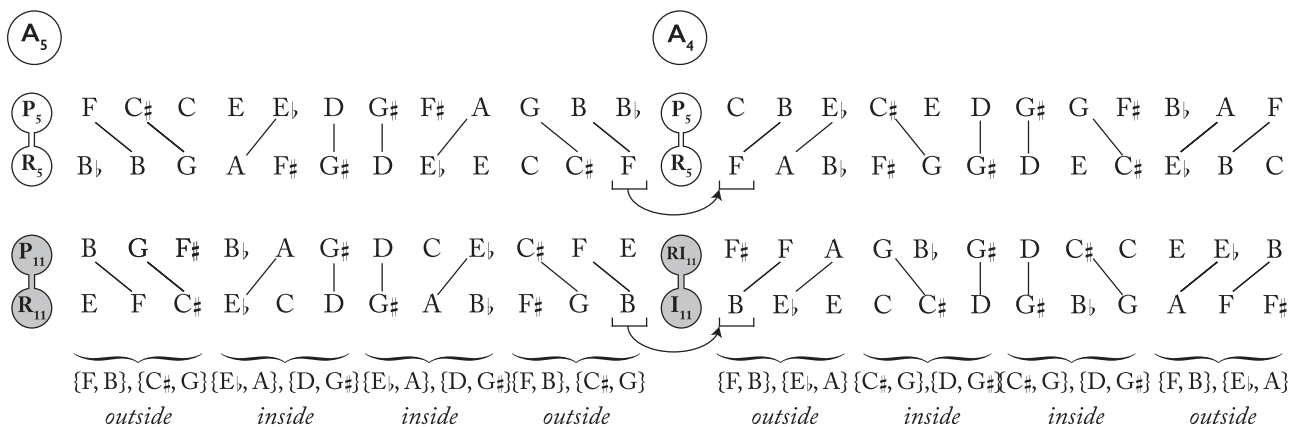
36 The legend summarizes the action of these transformations. This space is three dimensional. When a transformation encounters an edge, it emerges at the same point on the opposite edge. There are six areas because each collection of inside tritones and outside tritones has a degree of symmetry equal to 4, splicing the 24 *R*-pairs into six groups.

37 Moreover, all eight rows in a single area are generated from the same discrete (012345) hexachord. Those hexachords form the basis of Koivisto's (1997) analysis of the movement, and therefore, my analysis arrives at a somewhat similar conclusion regarding its structure. However, for two reasons my analysis is focused less on hexachords as structural units than the gestural components of those hexachords: first, because of the overlap created by chains, complete hexachords are not coterminous with phrase units and thus have only hazy perceptual significance; and second, my sense is that concentrating on hexachords obscures the smaller gestures that are the core variational actors in the movement.

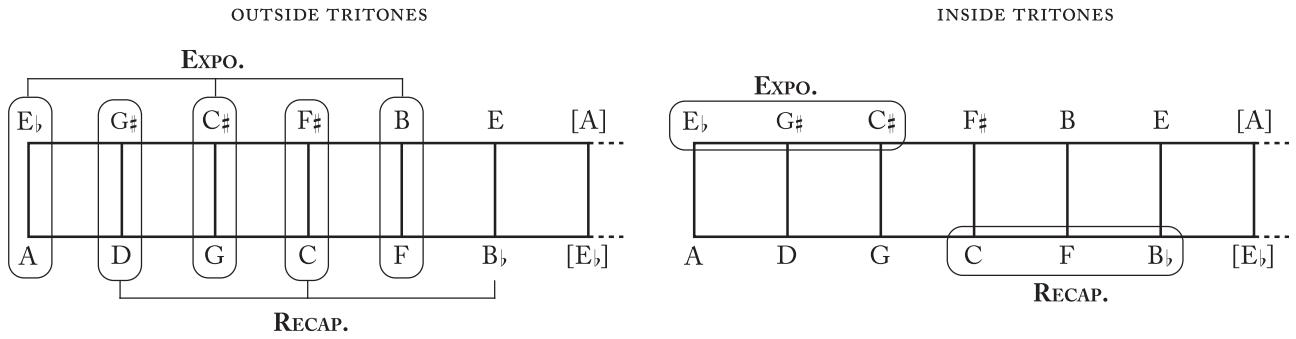
38 Thus, the associative set relates different trichordal set classes on the basis of shared tritones.



EXAMPLE 5. Spatial depictions of tritone relations in Webern, *Piano Variations, Op. 27, first movement*. (a) Transformation space organized according to R-pairs “inside” and “outside” tritones, and animated by chains



EXAMPLE 5. (b) “Inside” and “outside” tritones for chain-related and spatially adjacent row areas



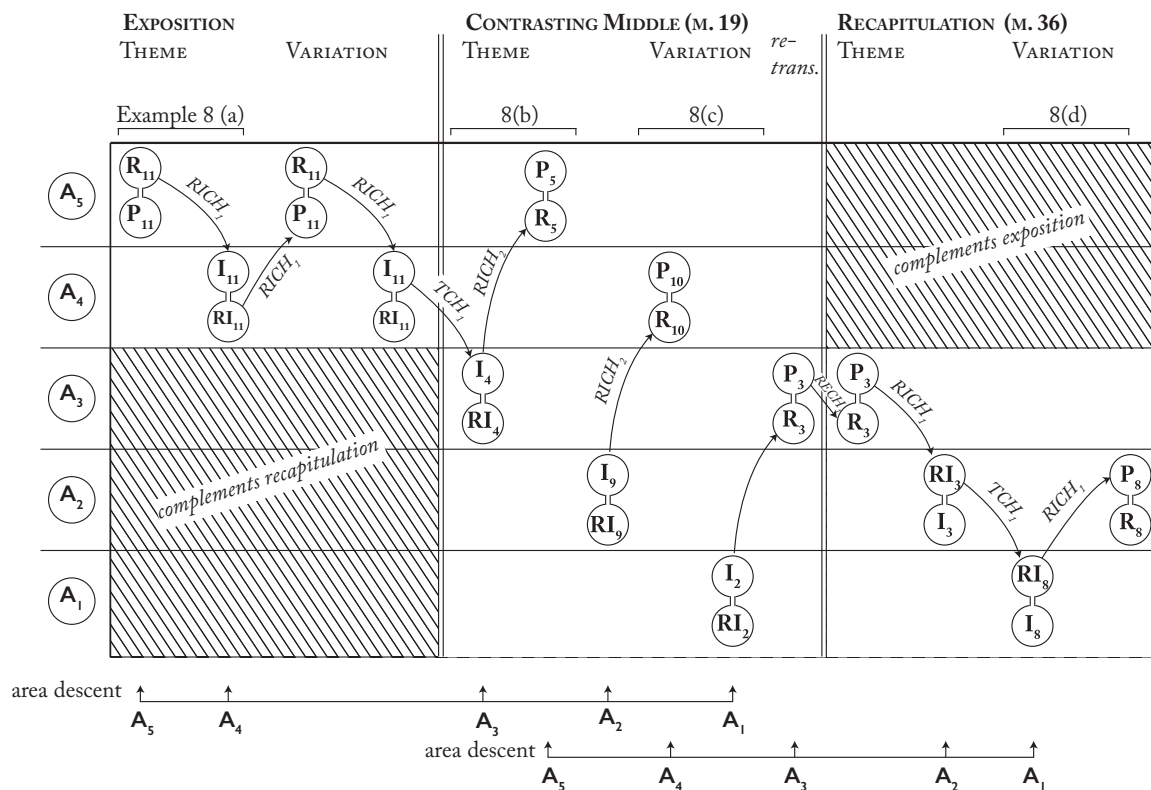
EXAMPLE 6. (a) A tritone space showing the complementary tritone relationships between exposition and recapitulation

EXAMPLE 6. (b) Complementary tritone relationships between the final variation phrases of the exposition and (c) the recapitulation

recapitulation. The poles therefore give meaning to the way in which the recapitulation resolves the exposition—not by “ending in the home key,” but rather by complementing its tritone structure.

Example 6 contains the most salient expression of large-scale complementation, showing how outside gestures in the exposition are forced inside in the recapitulation. The example includes a summary of the complementary relationships with two tritone spaces at (a) and gives excerpts at (b) and (c) of the closing phrases from the exposition and recapitulation. Circled verticalities on those phrases show how two invariant ic1

dyads, {A, B♭} and {E♭, E}, separate inside from outside. At (b), vertical {A, B♭}s in mm. 12 and 14 enclose a four-note inside gesture {G♯, E♭, C, D}. When recapitulated at m. 47, shown at (c), the large-scale complementation moves that inside gesture to the phrase’s outside. There, the tritone {G♯, D}, which was on the very inside at mm. 12–13, acts as the palindrome’s outer incipit. The final phrases of each section complement one another as well. The trichord {F, F♯, A} that initiates the exposition’s final phrase (mm. 15–16, right hand) flips to the inside in m. 52 (see [c]), around an invariant {E♭, E}. Similarly, and most significantly, the trichord {C♯, D, G♯},



EXAMPLE 7. Event network for Webern, *Piano Variations*, Op. 27, first movement that shows a variational descent through adjacent areas and a recapitulatory complement

which sits at the inside of the exposition's final phrase (m. 16, right hand), sounds the final outside gesture of the piece (m. 54, right hand). I view this final trichord $\{C\sharp, D, G\sharp\}$ as an important aural marker of the entwined formal processes. It completes the large-scale complementation, as this example illustrates, but it also involves the very same pitch classes implicated in the movement's first variational moment—the early, altered entrance disturbing the palindrome in the exposition's second phrase (Example 4b, m. 9). In m. 54 this verticality's length and its inclusion of $G\sharp$ make it the least symmetrical phrase in the movement and a fitting end to the variation process.

Example 7 offers an overview of the movement's formal plan, as organized by Example 5's associative areas, to show how the ternary form is tied to this variation process through large-scale complementation. Both the exposition and recapitulation's four phrases traverse unique paths but connect adjacent, maximally similar areas through the variational chain $RICH_1$. Below the network I have shown how two large-scale descents through adjacent areas overlap in the contrasting middle, which serves as a nexus point: both of these large motions begin at A_5 and descend to A_1 .³⁹ In this sense, the

recapitulation fulfills an interlaced, bipartite process serving both the ternary form and the variations. First, the dip to A_1 in the penultimate phase of the recapitulation completes a *variational* descent through those areas that reaches back to the second area of the contrasting middle, where it linked together with a similar descent begun in the exposition. Second, that dip to A_1 , followed by the final motion to A_2 , provides an answer to the exposition's A_5 and A_4 by complementing it, as we saw in Example 6.

As listeners, we can follow this formal combination by attending to the inside and outside tritones as they change position within each of the movement's palindromic phrases. Example 8 shows four important phrases along this path that correspond to moments annotated on Example 7. In the theme's first phrase (see Example 8[a]), the $\{C\sharp, G\}$ and $\{D, G\sharp\}$ initially occupy opposing positions, but come together as part of A_4 in the second phrase, where they fracture its

and not in the more specific sense used by Mead (1985) and Alegant and Mead (2012) to describe passages at the end of Schoenberg's works wherein a variety of compositional strategies coalesce. Formal nexus points in Webern's music are quite often found in the work's very center, undoubtedly a result of his interest in large-scale symmetry. Moseley (2017) and Moseley (2018) discuss a number of these moments, found in movements from the two late cantatas, Op. 29 and Op. 31.

³⁹ See also Koivisto (1997, 45: Example 15). I use "nexus" here to describe the way in which the movement's center interlinks with the outer sections,

EXAMPLE 8. *A variational path through Webern, Piano Variations, Op. 27, first movement, tracking “inside” and “outside” tritones. (a) Exposition, mm. 1–10*

EXAMPLE 8. (b) *Contrasting middle, mm. 19–26*

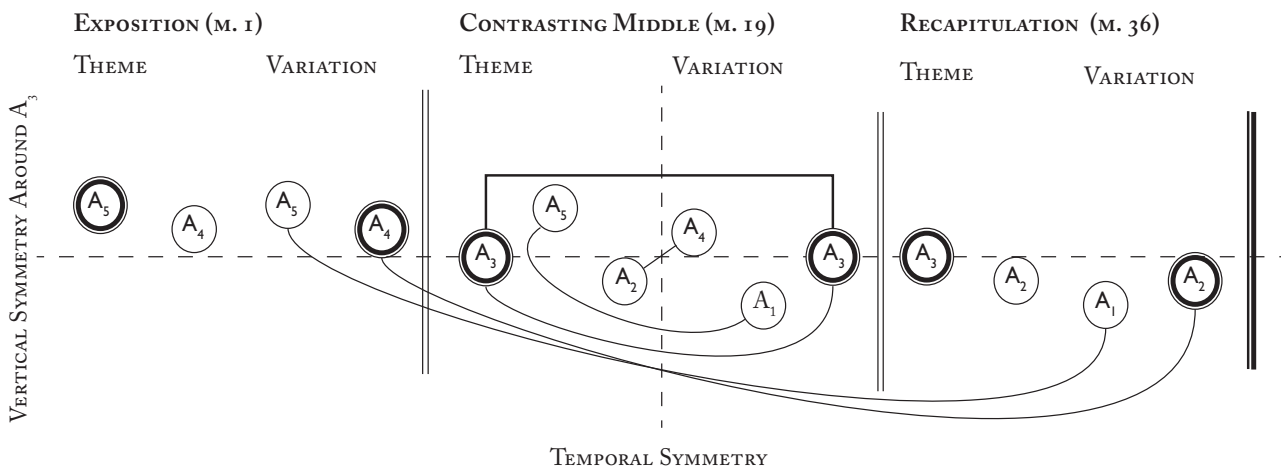
EXAMPLE 8. (c) *Contrasting middle, climax, mm. 30–34*

palindrome for the first time. As the contrasting middle begins (see [b]), Webern uses register and duration to foreground those tritones again, at the center of the palindromes underlying the first two phrases. Measures later (at [c]) the contrasting middle's variation leads to the movement's climax, where, as part of A_1 , the $\{C\#, G\}$ and $\{D, G\# \}$ escape “to the outside” for the first time in the movement, while the $\{F, B\}$ tritone that began the movement (see [a]) becomes enclosed for the first

time “on the inside.” That climactic passage foreshadows the final phrases of the recapitulation (see [d]). There, the movement closes with $\{D, G\# \}$ and $\{C\#, G\}$ “on the outside”—and the $\{C\#, D, G\# \}$ trichord on the very outside—thereby recalling a large web stretching back to the exposition and completing the movement's variation process.

To conclude, [Example 9](#) offers a reduction of the movement's area progression that summarizes its formal

EXAMPLE 8. (d) *Recapitulation*, mm. 47–54



EXAMPLE 9. *A background image of the Piano Variations symmetrical persona*

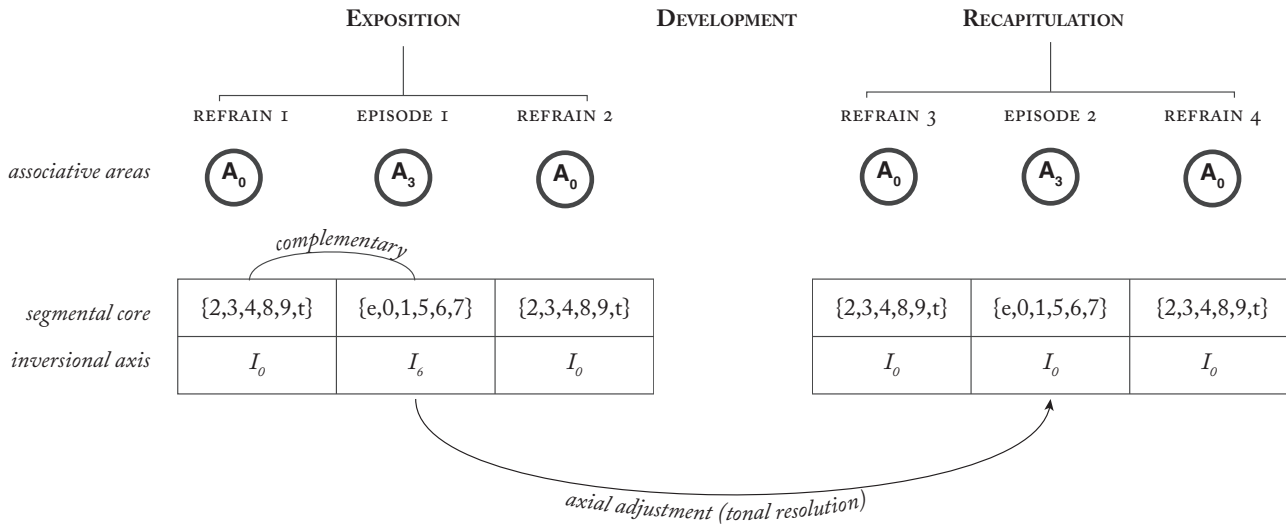
amalgamation. In addition, it reveals how Webern’s formal plan is a structural image of the movement’s dual symmetrical personae. Echoing the temporal and vertical symmetry in the exposition, the image shows how the contrasting middle acts as a symmetrical fulcrum around which the exposition and recapitulation temporally and vertically pivot.

CHIRALITY AND AMBIGUITY IN WEBERN’S SAXOPHONE QUARTET, OP. 22, NO. 2

Webern was completing the large rondo that closes his *Quartet for Violin, Clarinet, Saxophone and Piano, Op. 22*, as he wrote the letter to Berg quoted at the beginning of this article. The movement is long by Webern’s standards—192 measures of dense, motivically variegated music. Both its length and discursive character match the liberation Webern expresses in that letter (“I rejoice over all that the method of ‘twelve-tone composition’ produces . . . what inter-relationships result from

it, and how formally . . . everything falls into place so easily”).⁴⁰ The present analysis describes the movement’s character in the context of a fascinating associative and transformational structure that shapes multiple structural complementations. While the surface is as unrestrained and dense as any other of Webern’s twelve-tone works, the rapprochement with typical principles and procedures of tonal composition are decidedly conservative. Whereas the later works weave novel paths through traditional forms, in this movement of Op. 22 we find a pre-compositional structure with conceptual ties to tonality that are mined to create a formal plan whose exceptional characteristics are also very much indebted to tonal formal procedure.

⁴⁰ Webern’s feelings of comfort have not generally been echoed in analytical accounts, which often contrast this movement with the elegance and lucidity of the first. For example, see Fennelly (1966), Smith (1966), Perle (1971), and Bailey (1991).



EXAMPLE 10. Formal plan for Webern, *Quartet for Violin, Clarinet, Tenor Saxophone, and Piano, Op. 22, second movement*

Before addressing these links, it will be useful to summarize the movement's formal plan. Example 10 contains an overview. This rondo has sonata-like characteristics, both in its large-scale recapitulation of the exposition and its extended development. Though formal boundaries are often blurry, there certainly are salient rhythmic, motivic, and stylistic differences between sections: the terse, clipped gestures of the refrain contrast rather conventionally with broader, lyrical episodes; a ruminative, expansive development leads to the movement's climax just before the recapitulation. In this respect, the movement's formal heterogeneity is supported by abstract structural attributes. Example 10 shows that episodes and refrains are contrasted by a *complementary segmental core*, which I define below. Webern also manipulates pitch and pitch-class axes in dialogue with procedures typical of tonal form: while the I_6 axial organization of the exposition's episode creates a "tonal contrast" with the I_0 organization of the exposition's refrains, the recapitulation mimics "tonal resolution" by adjusting the axis to I_0 .

All four refrains are demarcated by an associative area that I call A_0 . Example 11 presents A_0 and describes several traits. All eight members of the area can be connected to each other by *TCH*, *ICH*, *RECH*, or *RICH*, a group shown in the double-circle space at (a). Because the series contains a tritone between its first and last pitch classes, each of the four chains is an involution. The inner and outer rings of A_0 's circular representation at (a) are flattened at (b), where they occupy its "top" and "bottom" halves.⁴¹ The irregularly formed partitions I create at (c) show the properties of these two halves. The middle of every series form contains an eight-note chromatic

segment comprising two, tritone-related chromatic tetrachords called *X*.⁴² The tetrachordal remainder, called *Y*, belongs to set class (0167).⁴³ *P/R* series forms on the "top half" of (b) share *X* and *Y* segments, as do *I/RI* forms on the "bottom half." While not identical, the two halves are maximally similar: the segments comprising the top half of A_0 are a pitch-class semitone removed from those on the bottom. To underscore this similarity, Example 11(d) illustrates their intersection as comprising a *segmental core* for A_0 . The final trait of A_0 is shown with the larger arrow to the left of (c). Given any *X* or *Y* segment from the top half of A_0 and a corresponding *X* or *Y* segment from the bottom half, the two will be I_0 or I_6 transforms. That those two *I* values match those that characterized the inversional structure of the refrains and episodes is of some musical significance.

A_0 's characteristics are evident in the two extended refrains that begin the exposition and recapitulation. Both have two parts that themselves relate through a complementation that coincides with a change from *axial ambiguity* to *axial explicitness*. Example 12 illustrates abstractly with an event network that uses the flattened space as a map.⁴⁴ Excepting its very last series form, Example 12 shows that two or more rows coincide throughout the passage, each chained to a subsequent row by

41 This flattened representation simplifies the geometry and transformational actions of A_0 . When an arrow runs into an edge, it emerges in the same place on the opposite edge. *RICH*₁ has been removed to simplify.

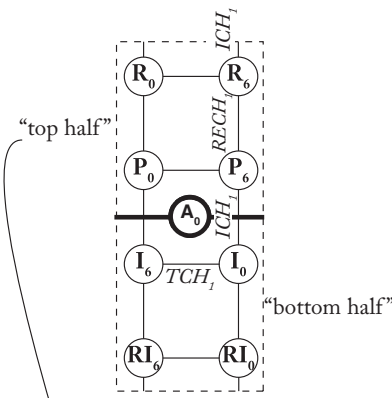
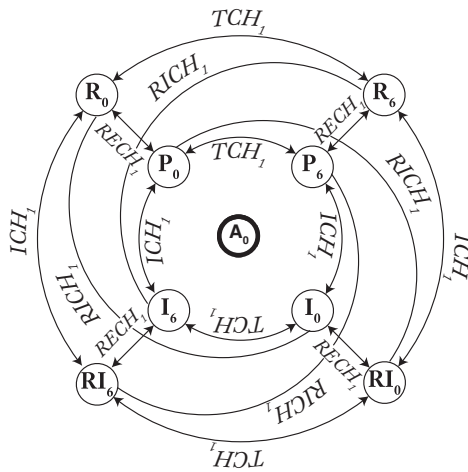
42 Certain of these properties are noted by Mead (1993, 187ff.) and Bailey (1991, 20).

43 These segments are named according to their "lowest" pitch class in normal form. Because *X* and *Y* are transpositionally and/or inversionally symmetrical set classes, there are only twelve *X*'s and six *Y*'s; two ways to transform any *X* into any another *X*; and four ways to transform any *Y* into any another *Y*. The analysis below explores in part how Webern makes use of the transformational ambiguity.

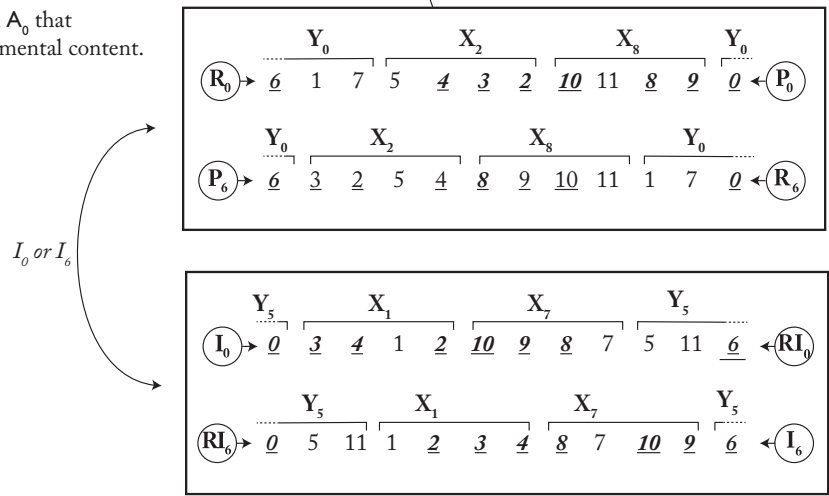
44 The network also describes the recapitulation's first refrain as well, though that passage is a thorough recomposition.

(a) a double-circle space showing how chains define the group A_0 .

(b) abbreviated, flattened version of (a) highlighting its two halves.



(c) an irregular partitioning of rows in A_0 that highlights their maximally similar segmental content.



(d) the segmental core of A_0 , defined as the intersection of its two segment types.

$$X \text{ (segmental core)} = \cap(X_1, X_2, X_7, X_8) = \{2, 3, 4, 8, 9, t\}$$

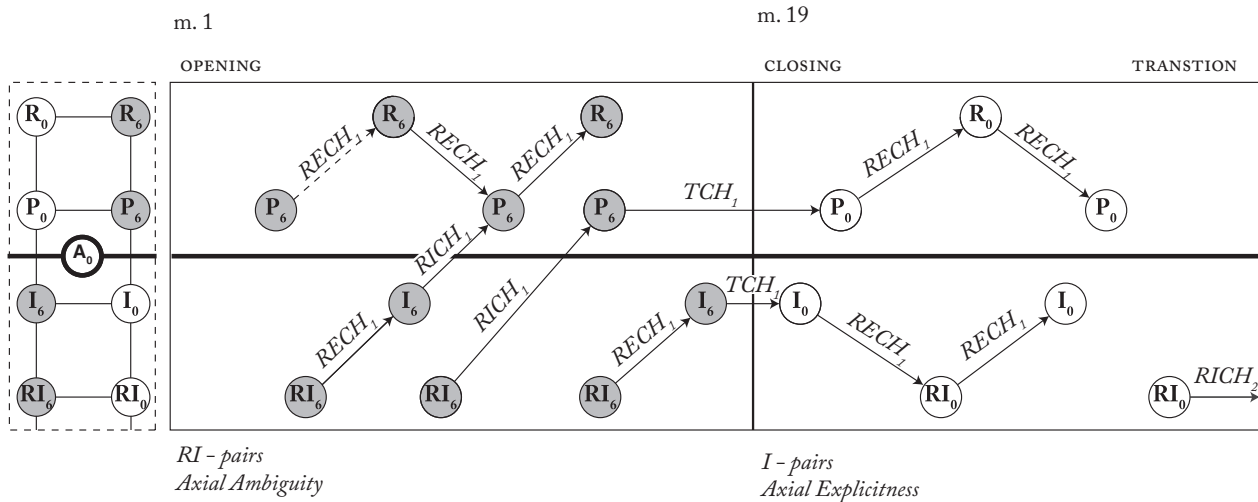
$$Y \text{ (segmental core)} = \cap(Y_1, Y_3) = \{0, 6\}$$

EXAMPLE II. Transformational and associative characteristics of A_0

$RECH_1$ or $RICH_1$. These coinciding row forms always include both “halves” of A_0 , a spatial characteristic that indicates the presence of the traits noted above: the full complement of A_0 ’s X and Y segments are always in circulation and the segmental core of A_0 is present at all times; further, an I_0 or I_6 relationship is at all times at least implicit. As the refrain’s first half passes to the second at m. 19, TCH_1 creates a small-scale complementation when the four rows comprising one half of A_0

are followed by their complements. As we will see, that complementation coincides with the emergence of the “home” I_0 axis.

The first phrase of the refrain is given in Example 13(a). In concert with its extraordinary freedom of motive at the surface of the music, the passage expresses a thoroughgoing axial ambiguity enabled by the particularities of the coinciding row pairs. In mm. 1 and 7, the I_0 axes C and $F\sharp$ sound together as



EXAMPLE 12. An event networking showing small-scale complementation of A_0 and the unveiling of its axis in the context of the first refrain's bipartite form

EXAMPLE 13. Characteristics of the exposition refrain and transition to the first episode in Webern, *Quartet*, Op. 22, second movement. (a) Refrain 1, opening, mm. 1–7

part of two Y segments formed from RI -related rows. These axis pitches (and the Y segments they are part of) are heard as either the I_0 or I_6 transformation of the other, as I show with the beams above the example. The two sub-phrases within are similarly ambiguous. Each contains a melody and accompaniment whose four X segments are juxtaposed such that the I_0 -or I_6 -related $E_{b4}/D\#4$ and A_4 initiate and close each. Two consequential motives emerge from the segmental core of these X segments, and are reduced to the example's right: $\{E_b, E\}$, played as a compound ic1, that is heard at the registral and temporal extremes of the first sub-phrase, and a melodic "major second" combining eleven or thirteen semitone verticalities. The curly brace under mm. 1–4 identifies a hexachord $\{2, 3, 4, 5, 6, 8\}$ whose importance I will assert later in this analysis.

The opening phrase's ambiguity is resolved in the refrain's second half, a closing passage shown in Example 13(b). At m. 20, eight overlapping imitative gestures articulate a series of I_0 pitch axes. First oriented around C_5 axis—a sort of "home" axis in the remaining music—gestures 3–7 reorient around $F\#4$ before a transition to the first episode begins. Even within this axially explicit music, Webern avoids the axis pitch C until the fifth gesture in mm. 26 and 27. There, the axis pitch creates a particularly salient arrival, as its imitative echo—at the time interval of a single eighth—sounds squarely on the downbeat of m. 27.⁴⁵

45 The I_6 emphasis of the opening phrase and its resolution to I_0 calls to mind the initial phrases from the scherzo of Beethoven's Op. 14, No. 2. Beethoven's tonic-key refrains begin with an unaccompanied melody

pitch axes: I_{C5}^{G5} ————— $I_{F\#4}^{F\#4}$

EPISODE I

*** mm. 30–37

RI₀
6 e 5 7 8 9 t
2 1 4 3
0 I₃ 3 6 7 4 5 1 0

I_6
 I_6
 I_6
 I_6
 I_6
 P_3
3 0 e 2 1 5

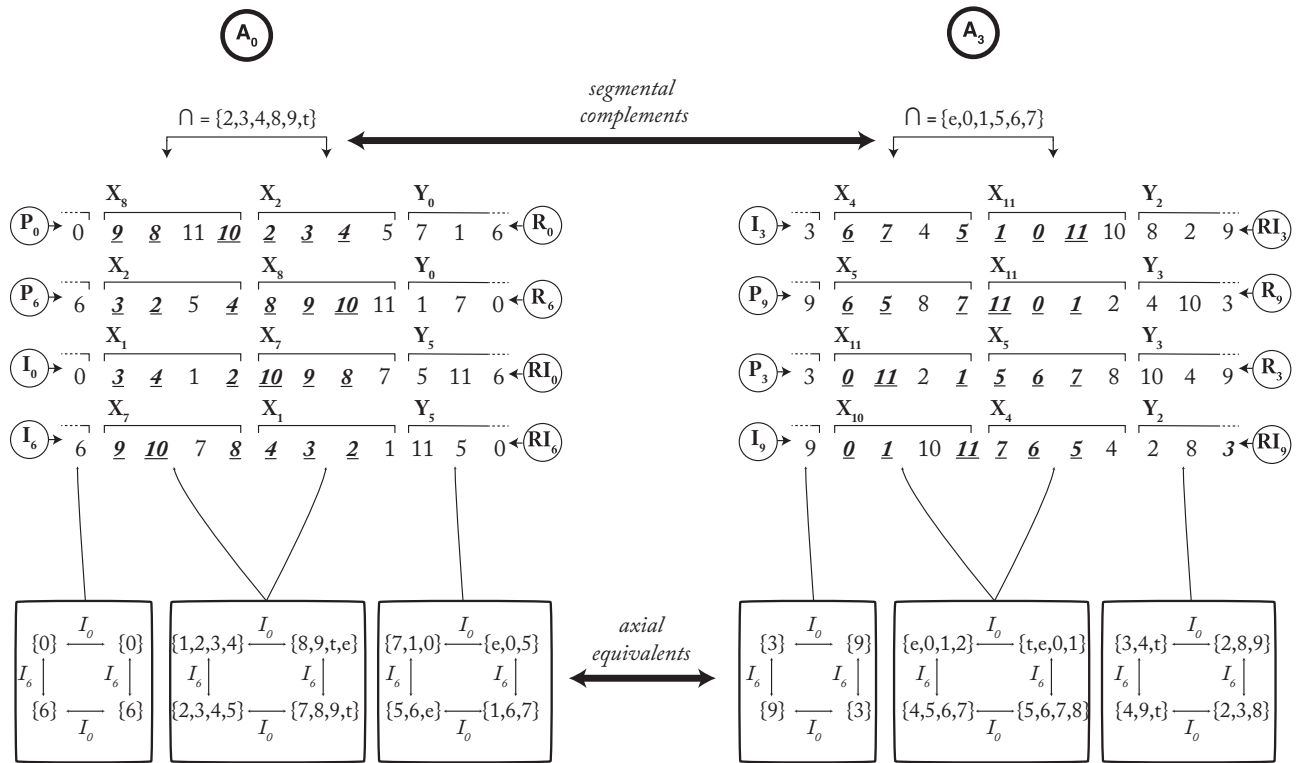
EXAMPLE 13. (b) Refrain 1 closing and transition to episode 1, mm. 20–37

With this musical context, Example 14 expands the scope of the row class by using the attributes of A_0 to form a complementary area analogue, A_3 . In the example A_0 and A_3 are segmented into the irregular partitions of X and Y segments we saw earlier. These areas have entirely unique collections of X and Y segments. Moreover, their *segmental cores* evince the principle of complementation: A_0 's X segments form a core, $\{2, 3, 4, 8, 9, t\}$, that is the complement of those characteristic of A_3 , $\{e, 0, 1, 5, 6, 7\}$. At the same time, however, inversionsal interpretations of those segments shown at the bottom of the example demonstrate that each area's X and Y segments have equivalent axial organization. Given any two I -related rows from A_0 or A_3 their inversionsal relationship will be one of the two axes we saw in the refrain, either I_0 or I_6 , and the segmental core of each area's Y segments present the axes themselves.

emphasizing the *dominant* key note. Webern's emphasize the "dominant" axis. In a lesson with Willi Reich, Webern mentioned Op. 22 in connection with Beethoven's scherzo, evidently reporting that "the Scherzo of Beethoven's Piano Sonata Op. 14 No. 2 . . . was formally an exact analogy" (Webern [1960, 1973], 57). Other similarities are noted below.

The relationship between these two associative areas is a "chiral" one roughly resembling a common characteristic of tonality. In mathematics and the natural sciences, chiral objects are non-superimposable mirror images, a familiar example of which are human hands. Tonic and dominant triads and keys are chiral objects as tonal elements. They are structurally identical—that is, comprised of the same interval content—but functionally opposite, or non-superimposable, a characteristic that lends itself to the "tonal resolution" typical of recapitulation. Our formal diagram of this movement in Example 10 clearly evinces the chirality of A_0 and A_3 in Webern's formal plan. There, it is the property that allowed the exposition's contrasting episodic material, formed from A_3 's segmental core, to return in the recapitulation but with its axial organization adjusted to match A_0 .⁴⁶ Thus, Webern's formal plan, in its imitation of tonal procedure, is enabled by structural traits themselves deeply tied to tonality.

⁴⁶ Chirality calls to mind the concept of network isography. Strongly isographic Klumpenhouwer networks may have non-isographic "L-nets," networks of pitch classes related only by transposition. This notion is explored in O'Donnell (1998).



EXAMPLE 14. Chiral properties of A_0 and A_3

Two passages highlighting the large-scale connection between the exposition and recapitulation will demonstrate the point. At the close of the refrain passage studied earlier (Example 13[b]), Webern thins the row structure to a single series form (RI_0) just measures before the transition to the first episode. The eighth and final imitative gesture in m. 30 is created from RI_0 , and its ambiguity allows Webern to change the axis from I_0 to I_6 , as preparation for the impending episode (the row array below the score shows these details). At the refrain's conclusion over mm. 31–32, we hear a statement of X_1 whose registral characteristics recall the {Eb, E} motive from the movement's first phrase (cf. Example 13[a], mm. 2–4). Here, however, X_1 is reoriented to conclude with a repeated Eb₄ in m. 32, where its four-fold repetition underscores the new I_6 axis. The episode begins in A_3 , unfolding imitative lines comprised of new X segments (X_4 , X_5 , X_{10} , and X_{11}) and beginning with the I_6 axis. Notice how Webern connects the refrain and episode by repurposing {Eb, E} in mm. 33–35. At the analogous moment in the recapitulation, a recomposition of the refrain's end features motivic play between two X segments in the piano and clarinet. Example 15 provides a reduction of the passage. On the lower staff, the piano plays a registraly ordered version of the A_0 segment X_2 , {D, Eb, E, F} that is partially answered by its I_0 partner X_7 in the clarinet. But the clarinet's {G, G[#], A, Bb} is missing its Bb₆—the I_0 answer to the piano's low D₃. Example 15 shows how the missing Bb₆ is supplied by the violin at the registral and dynamic climax of the refrain in m. 150, after which Webern effects a

short transition to the recapitulation's episode that resembles the one from the exposition. Comparing those passages, we can see and hear how the new episode gesturally resembles the exposition episode by using X_4 , X_5 , X_{10} , and X_{11} . A_3 's chiral relationship to A_0 allows Webern to adjust the axis to I_0 , "resolving" it into the refrain's—a change underscored by the episode's initiation from the C5.

Stepping back once more, Example 16 describes A_0 and A_3 within a complete space among four additional associative areas.⁴⁷ The space makes the chirality of A_0 and A_3 apparent by showing their segmentally complementary characteristics on the right while using the central column to highlight their axial equivalency. It also describes a different sort of chirality among the spatial network's rows. For example, compare the "upper half" of A_0 with the "lower half" of A_1 (due east on Example 16). The two groups are segmentally equivalent but axially distinct, reversing the segmentally distinct and axially equivalent relationship between A_0 and A_3 . We will see Webern use this property in the development. Finally, it describes distinct "functions" for one- and two-note transformation chains. While the one-note chains maintain a single area, $RICH_2$ (represented by the longer arrows running between areas) is

47 This space has a complex geometry that this representation flattens. Each of the areas are Möbius strips, and there are numerous twists in the connections between them. In this flattened representation, when an arrow runs into a dotted edge it emerges on the opposite edge, but when running into a solid edge, it emerges on the opposite edge and is "twisted."

REFRAIN, CLOSING

clar. f ff pp pp ff

pno. p pp pp

viol. ff

EPISODE 2

clar. ff

pno. p fp pp

vin. fp pp

sax. pp

*** mm. 152–58

A_3	(RI_0)	$RICH_2$	(P_3)
	9	t 2 1	4 (3 0) 11 2 1 5 6 7 8
	3	2 t e	8 (9 0) 1 10 11 7 6 5 4
(R_0)	$RICH_2$	(I_9)	

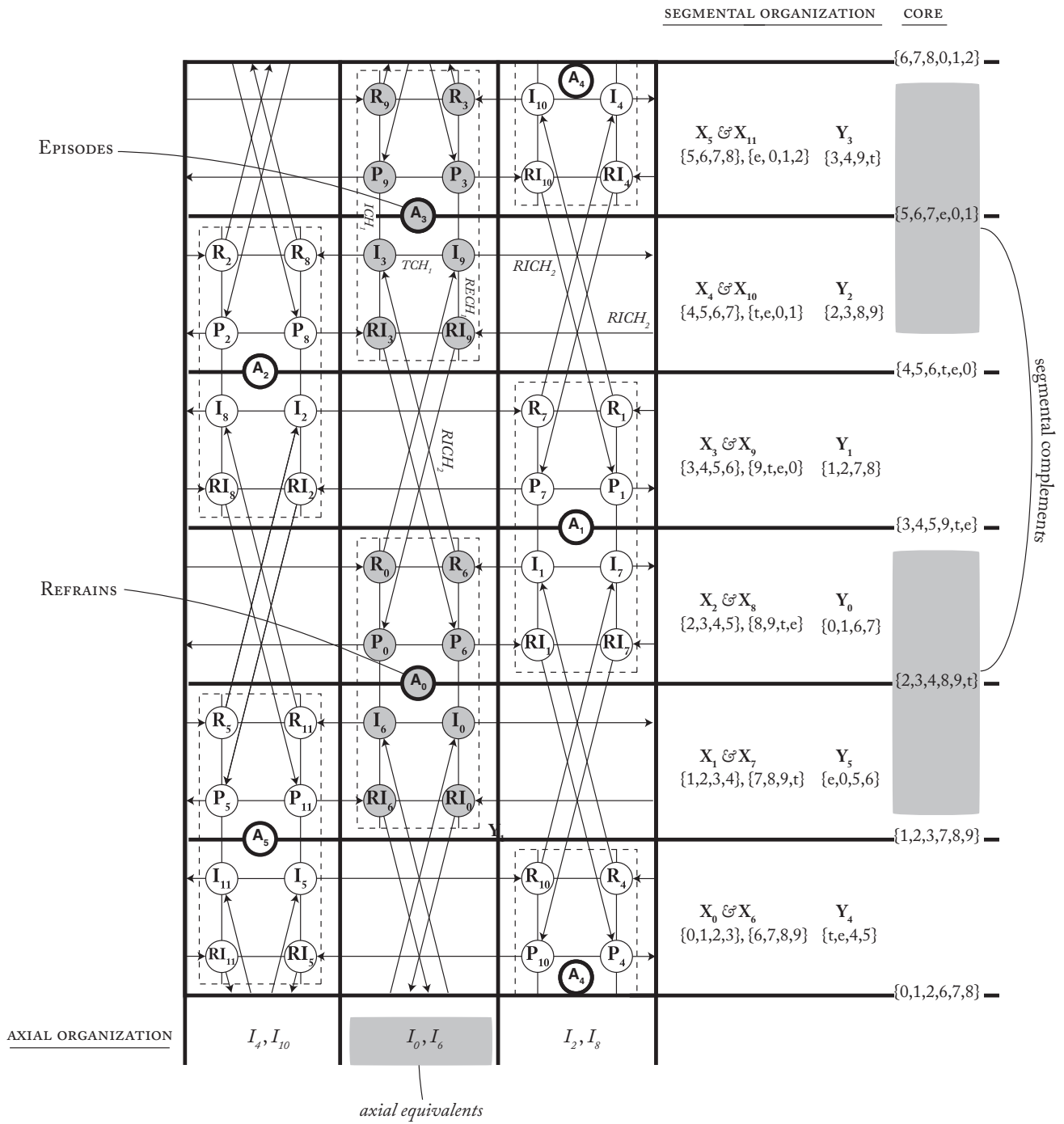
EXAMPLE 15. Characteristics of the recapitulation's refrain and transition to the first episode in Webern, *Quartet, Op. 22, second movement*

dispersive in two different ways. When acting on **R/RI** forms, as we saw at the end of the refrain in Example 15, $RICH_2$ carries a row to its segmentally opposite but axially equivalent area. But when acting on **P/I** forms, $RICH_2$ carries them to their segmental equivalent but axial opposite.

Finally, Example 17 provides a formal diagram of the rondo organized by the spatial characteristics of Example 16, with more detail given for the development. A complete event network of the movement is offered as Example 19. On the whole, it shows the influence of large-scale complementation: while every refrain is uniquely associated with and confined within the associative area A_0 , the episodes always begin and end in A_3 , but are never confined to it, and in fact “fill out” the space’s remainder. Spatially, the development is the movement’s most unique passage. While in the episodes and the refrains Webern “fills” an area completely by using coinciding

series forms from both its top and bottom row of the space, the development projects no single area unambiguously until the musical climax at its very end.

My final analytic comments are directed toward that passage and the way these spatial characteristics allow the music to create anticipation for the subsequent refrain. The development’s spatial and transformational underpinnings are given in more detail below Example 17. Its twelve transformational moves use $RICH_2$ to “surround” A_0 by leaping around it. Upon leaving A_0 at the end of the refrain Webern systematically avoids it by creating a twice-traversed circuit that skips around A_0 before returning to it at the passage’s end. This technique of spatial avoidance manifests musically by the appearance of segments common to but not unequivocally indicative of A_0 . For example, the segmental $\{E\flat, E\}$, whose motivic importance we noted in the refrain, is a member of

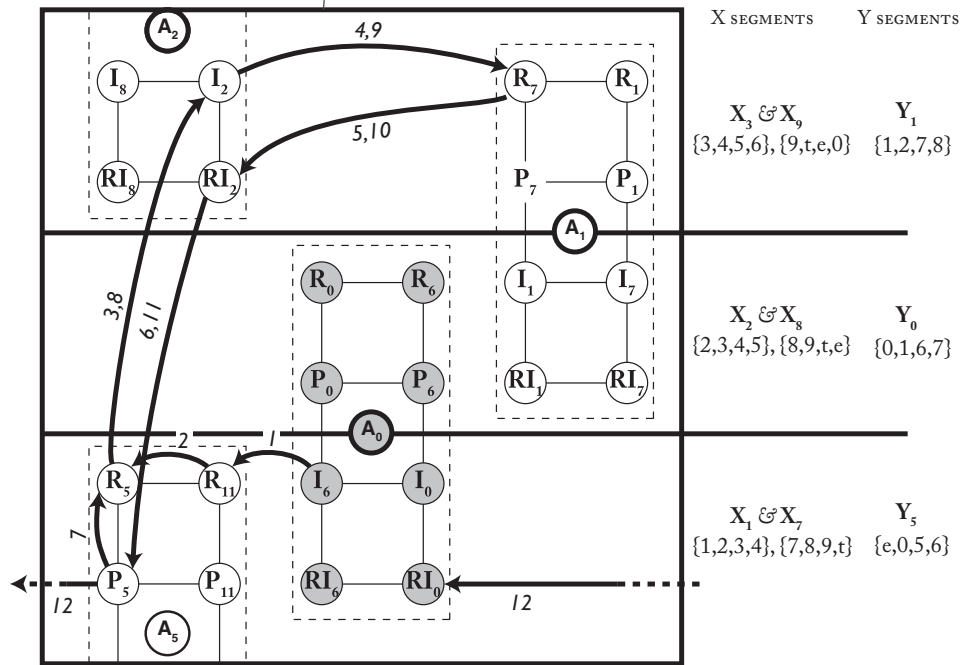
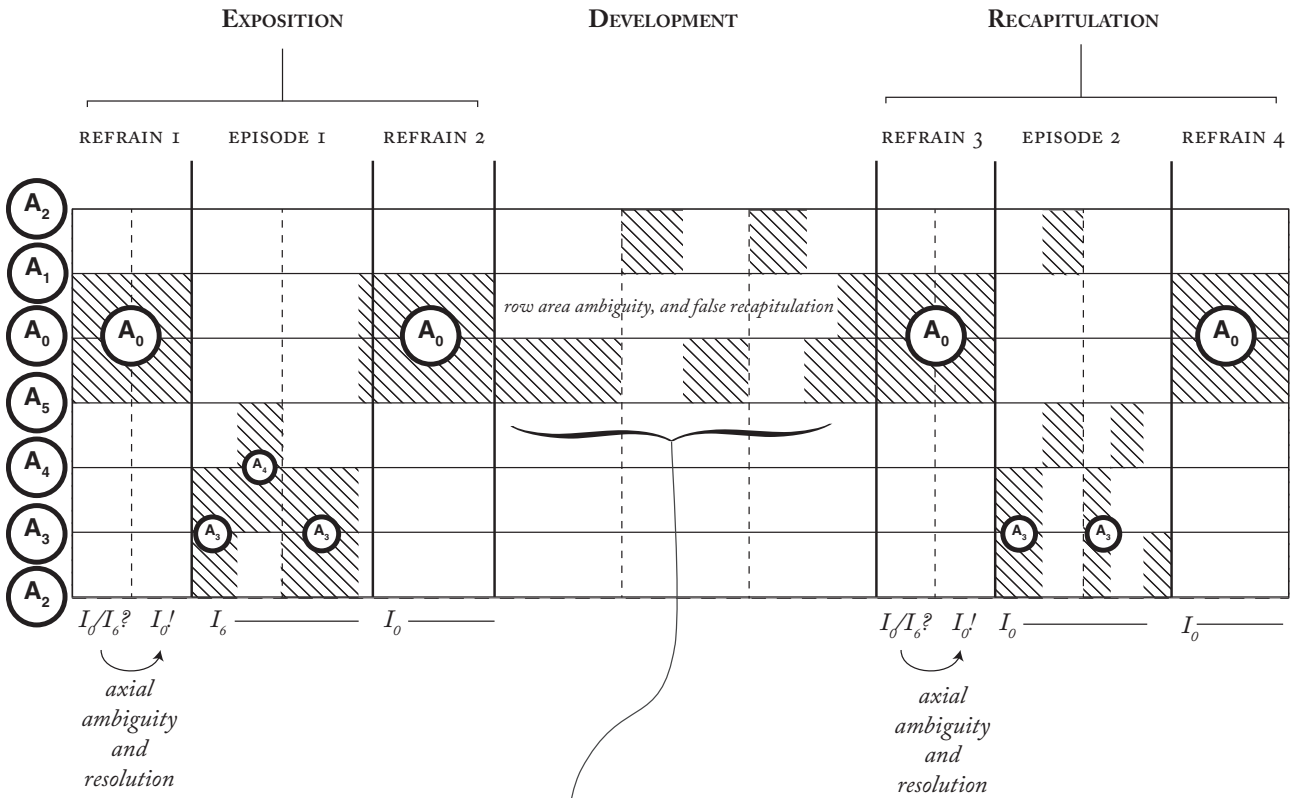


EXAMPLE 16. *A spatial network for Webern, Quartet, Op. 22, second movement*

each X segment in every cross-section of space and creates a pedal throughout the passage. This motive, and the “major second” motive I analyzed earlier, led to a false recapitulation followed by a resolution to A₀ at movement’s climax that ushers in the recapitulation.⁴⁸

48 As others have noted, a false recapitulation in Op. 22, II, is suggested by

Webern’s analysis of the movement with Reich. The idea has been contested by Bailey (1991, 248ff.) who is generally skeptical of Reich’s remembrances of these analyses with Webern and has a deeper-seated pessimism toward the idea that the twelve-tone system may have systemic, and not simply superficial, corollaries with the tonal system.



EXAMPLE 17. An event network and formal diagram for Webern, *Quartet*, Op. 22, second movement, showing greater detail for the development

PART 1 (MOVES 1-2)

PART 2 (MOVES 3-7)

PART 3 (MOVES 8-11), FALSE RECAPITULATION AND CLIMAX (MOVE 12)

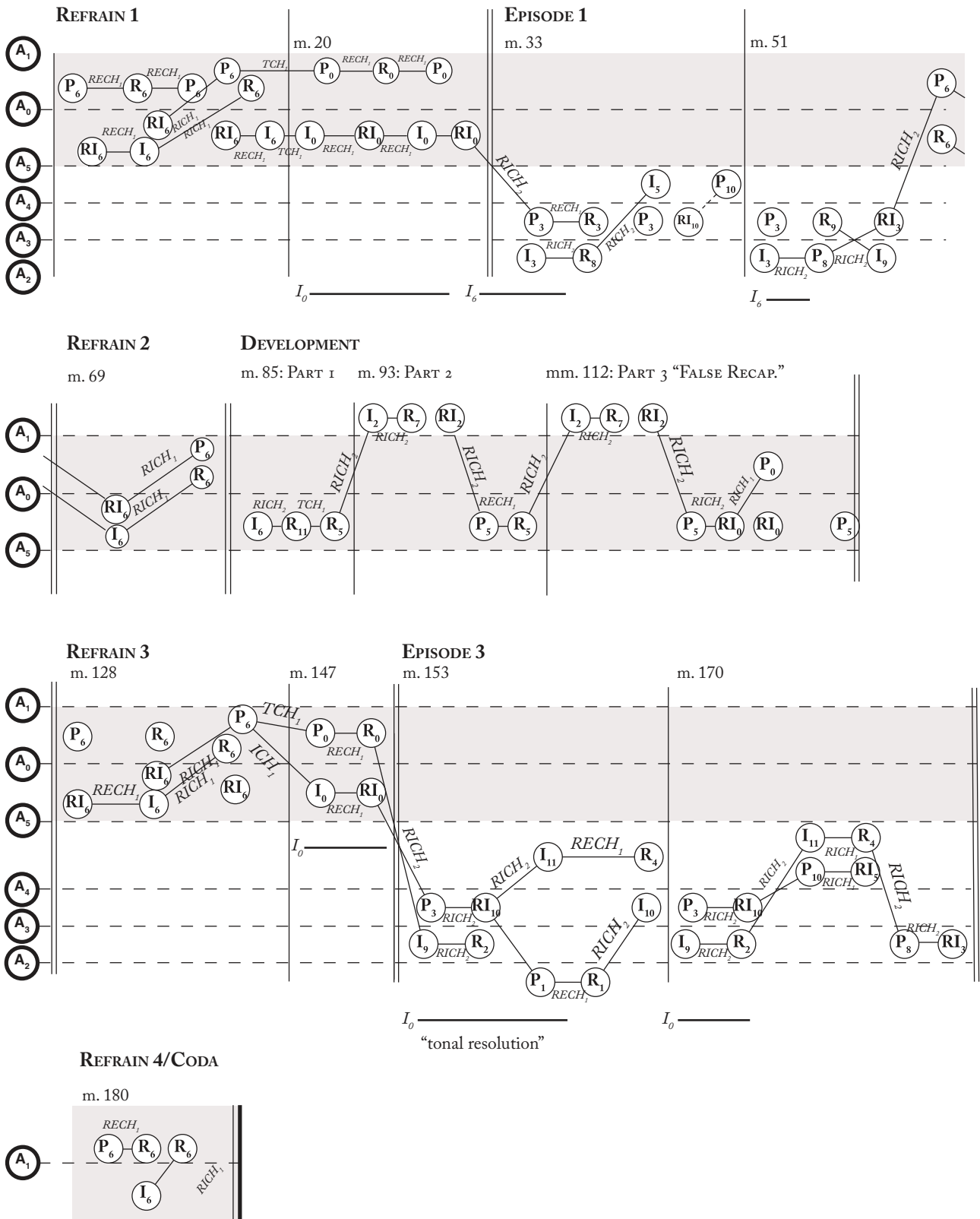
RECAPITULATION (CF. EXAMPLE 13(A))

EXAMPLE 18. *The development's three parts, climax, and false recapitulation*

My musical representation in Example 18 shows that the development has three characteristic parts.⁴⁹ Each is composed of a small number of recurring gestures associated with the segments X and Y. Most saliently, the motivic {Eb, E} that is

shown on the bottom staff sounds throughout but changes register at significant moments—for example, at the beginning of the second and third parts. The middle staff illustrates how two X segments form recurring “major second” motives that recall those we heard in the first phrase of the movement. Significantly, the music shows how the X segments (X₇ and

49 Hanninen (1995) offers a discussion of this passage.



EXAMPLE 19. Comprehensive event network for Webern, *Quartet, Op. 22, second movement*

X_9) surround the upper half of A_0 (cf. Example 17) and leave X_8 conspicuously absent. These gestures recur repeatedly over the course of the first two parts and urge on a “false recapitulation” at m. 112. We hear at that moment a melody formed from the hexachord $\{D, E\flat, E, F, F\sharp, G\sharp\}$ that began the movement's first refrain, but in a new ordering. The hexachord occurs again in mm. 118 and 119, but unlike the refrain, this passage lacks axial moorings. As the dyad $\{E\flat, E\}$ and the “major second” motive, appearing as X_7 , grow more insistent over mm. 112–21, they lead to the climax of the movement at m. 122. That moment corresponds with the movement's registral highpoint and the return of the axis pitch, C_7 , in the first violin, followed by the appearance (in m. 123) of the previously absent segment X_8 . Most significantly, the subsequent measures couple the climactic C_7 at m. 122 with its I_0 partner C_2 at m. 129. That connection completes the home axis just as the “real” recapitulation commences at m. 129.

CONCLUSION

Despite his desire to produce more and longer music, Webern left us with a small body of mostly short works. And yet the music has an extraordinary intensity; it contains so much despite its small package, and it asks the analyst to confront a great many fascinating questions. Much of the music's intrigue, I believe, stems from its combination of a conservative use of traditional forms with a radical reimagining of the underlying systematics. What this study has shown (and in this it resonates with Andrew Mead's [1993] study of Webern's music) is that Webern was extremely creative in this regard: he created rows of great imagination and was sensitive to their possibilities for producing form and orienting long-range compositional strategy.

In the letter to Berg that sparked this article's course, Webern's excitement was directed at how the “formal shape” of a work could arise from “interrelationships” produced by the twelve-tone system. This study has shown how those interrelationships are often produced through the interaction of three structural principles that themselves reflect the system. Chains acquire their meaning from the row, and the principle of complementation is a deeper expression of the row's most characteristic feature—the exhaustion of a set of elements. It is certainly the case that these interrelationships resemble, at times, some characteristics of tonality. I argue that is true for the network of chiral relations underlying the second movement of the Saxophone Quartet. But a commitment to finding a precise mirror of tonality in each twelve-tone work of Webern will almost certainly lead one to miss long-range strategies enabled by the twelve-tone system alone. The discursive musical surface and dynamic ambiguities of the Saxophone Quartet are produced by potentialities that are not at all tonal. And while the principle of complementation quite nicely describes the chirality of the Saxophone Quartet, in the Andante movement of the Piano Variations it creates a

dynamic, amalgamated structural backbone that has no easy tonal analogue. That these two movements—and the String Quartet movement discussed in the article's first part—make use of the same principle to such different ends illustrates both the flexibility of twelve-tone composition and Webern's creativity in putting its possibilities to musical use.

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