Cycles in Webern's Late Music

Brian Moseley

Abstract In his late compositions Webern exhibited a predilection for many types of cyclic organization, involving intervals, motives, contours, and twelve-tone rows; in particular, cyclic row organization provided Webern a means of serial structure beyond the row. Much as the twelve-tone principle produces an ordering of pitch classes that lies behind small formal units, cycles order the presentation of twelve-tone rows and give structure to large formal spans. The present study explores four cyclic organizational principles in works from the String Quartet, op. 28 (1938), to the Second Cantata, op. 31 (1943): (1) the structural composition of complete cycles, including their length, the segmental invariances they produce, and their interaction with Hildegard Jone's texts; (2) the primitives, potentialities, and surface articulations of aligned cycles, both synchronous and asynchronous; (3) the close relationship of row cycles and retrograde inversional symmetry; and (4) cycles that produce cyclic row areas. The article closes with an extended analysis that ties Webern's late cyclic practice to his broader organicist views of nature, finding a match in cyclic composition for the often ungraspable but omnipotent laws that Webern imagined in the world around him.

Keywords cycles, transformation theory, neo-Riemannian theory, Anton Webern, twelve-tone theory

EXAMPLE 1 shows the first violin's music at the beginning of the second movement of Anton Webern's late String Quartet, op. 28 (1939). The violin projects a number of cyclic characteristics—by itself, in its relationship to the other members of the quartet, and as evident in its structural underpinnings. Both of the violin's phrases complete a cycle that moves through a series of three chromatic tetrachords—*x* [e012], then *y* [789t], then *z* [3456], then *x*, and so on.[1] Entwined in this 3-cycle, shown at (b), are two iterations of a cycle created from the alternation of two contour patterns: **A**, **B**, (*R*)**A** creates the first phrase, and (*RI*)**A**, (*I*)**B**, (*I*)**A** creates the second. In that second phrase, announced by the switch from pizzicato to arco in m. 8, each of the first

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1 Though focused on the first movement, both David Clampitt (2009, 207–15) and Julian Hook and Jack Douthett (2008, 110–19) describe the cyclic nature of the tetrachords that emerge from Webern's particular presentation of row forms in this opus.

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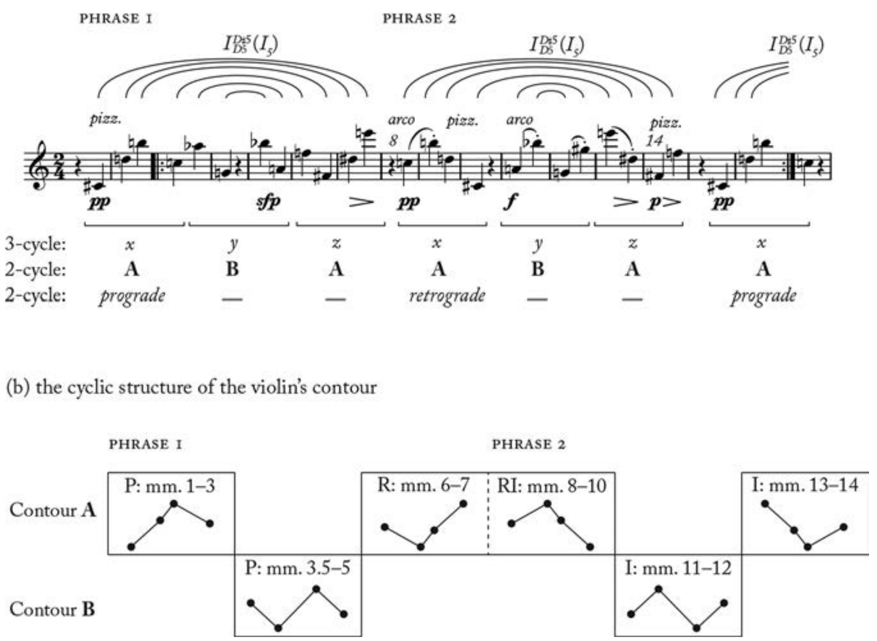
(a)



Example 1. Webern's String Quartet, op. 28/2, "Scherzo," first violin, mm. 1–17.

phrase's tetrachords is retrograded. This deeper cyclic toggle between prograde and retrograde (a 2-cycle) is reinforced by the pitch symmetry of each phrase: all twelve pitches are fixed in register (C♯4, D5, etc.), symmetrically arranged around D5/D♯5, and arrayed in a temporally symmetrical fashion matching the crest and fall of each phrase's dynamics.

Cycles are simply paths that return to their starting point. Music theorists have often been interested in cycles generated by intervals or some other musical action.[2] In this study I am interested in the more general presence of cycles in Webern's music. For example, additional motivic and contour cycles are evident in the double canon led by the violin studied above. The six-line array in Example 2 illustrates both canons, each sliced into tetrachordal *x*, *y*, and *z* segments. (Following the upstems in canon 1 will produce the violin music from Example 1, and following the downstems produces its canon partner, the viola.) Moving through each canon melodically shows two types of

2 Analysts of posttonal music have shown cycles at work in many ways in compositions and compositional systems. These include studies of music by Thomas Adès (Roeder 2009; Stoecker 2014, 2015, 2016), Alban Berg (Headlam 1996; Perle 1977), Béla Bartók (Gollin 2007, 2008), Charles Ives (Lambert 1990, 1997), George Perle (Headlam 1995, 1996; Perle 1996), Igor Stravinsky (Antokoletz 1986), and Webern (Straus 2011). Studies of neo-Riemannian theory, including Richard Cohn's (1996, 1997, 2012) foundational works, have explored cycles as drivers of chromatic syntax, and many of their findings have a fascinating resonance with the present study.

Example 2. Compositional array for Webern's String Quartet, op. 28/2, "Scherzo," mm. 1–17.

⟨*z*, *y*, *x*⟩ cycle: canon 1's first violin and viola produce ⟨*z*, *y*, *x*⟩ four times before repeating, while canon 2 follows the same cyclic progression but articulates each tetrachord twice, as ⟨*zz*, *yy*, *xx*⟩. Both canons also cycle through the same two contours, though in different ways: three lines of the array alternate contours **A** and **B**, and three use a single contour, **A** or **B**. Echoing the pitch symmetry of the first violin, each canon produces cyclic and symmetrical pitch strings, as in the repeated ⟨C♯, D, B, C, C, B, D, C♯⟩ in canon 1's first line and the adjoined ⟨C♯, D, B, C, B, D, C♯⟩ in canon 2's first line. Finally, the chordal verticalities created by the combined canons (shown with set-class labels below Example 2) produce a bipartite symmetrical structure mirroring the two phrases of the first violin.

At a deeper level of structure, a cycle of row forms stealthily shapes the music's cyclic surface and articulates the boundaries of the movement's larger form. In Figure 1, (a) and (b) show the cyclic row structure underlying the first violin. This 3-cycle is created by a four-note transposition chain (TCH_4) that elides adjacent rows until the original row is reattained, motivating the

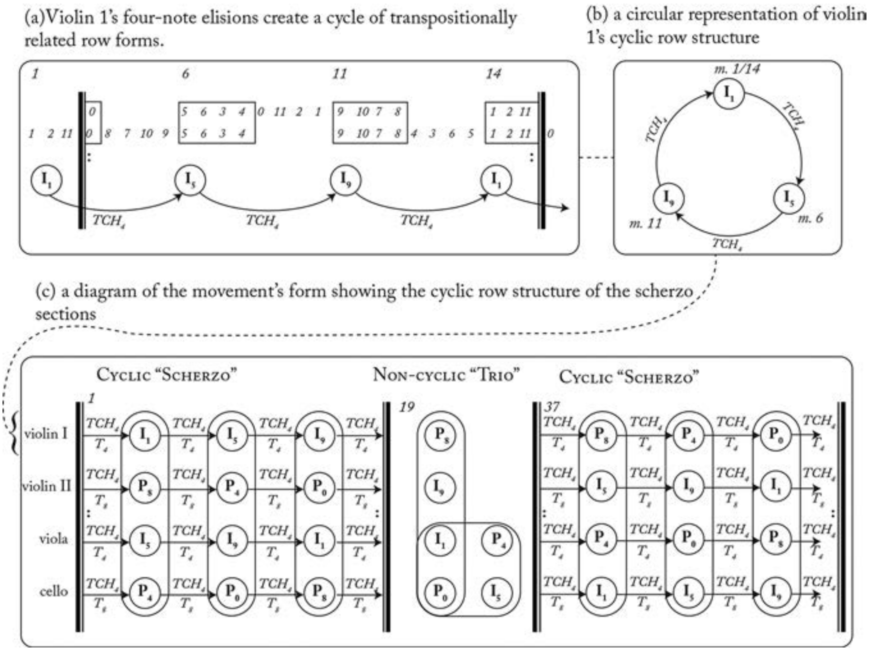


Figure 1. Row and formal cycles in Webern's String Quartet, op. 28/2.

repeats shown at (c).[3] In an analysis of the quartet, Webern described these canons as "perpetual"—no doubt an attribute emanating from the clever repeat enabled by the chained rows, but also surely from the many variously sized and inherently perpetual cycles contained therein.[4] Allied with the steady tick of quarter notes and the homogeneity of the quartet's timbre, the cycles and symmetries furnish the passage with the feeling of orbits circling a planet, forever in motion but fixed in place.

Cyclic traits like these are common in a sizable body of Webern's late music, beginning with this String Quartet in particular.[5] In this final group of compositions, we find many kinds of cycles and a variety of ways in which they were integrated into his twelve-tone technique. This essay argues that cycles had two significant roles in Webern's late music. First, large row cycles

3 While not cyclic itself, the intervening "Trio" owes its foundational particularities to the cyclic music. Transpositionally related rows in each rounded box are related in one of three ways: (1) by TCH_4; (2) by I_5, the inversion describing Example 1's violin melody; or (3) by I_9, the inversion relating Example 2's verticalities.

4 Webern's analysis was not published in his lifetime but appeared eventually in a translation by Zoltan Roman that was published in Moldenhauer and Moldenhauer 1979, 751–56.

5 All three movements of the String Quartet present large cycles of rows. Earlier twelve-tone works by Webern certainly contain row cycles—particularly portions of the final movement of the *Piano Variations*, op. 27, and of the Concerto for Nine Instruments, op. 24. In the later works, however, Webern seized on the potential for cycles to structure large stretches of music to a degree not found in those earlier pieces.

6 The superserial structures studied here represent a later stage in what might be thought of as a trend toward abstraclike those shown in Figure 1 provided Webern with a serial organizational strategy at a level deeper than the twelve-tone row—a "superserial" structure—that allowed him to organize and tie together musical spans of various sizes.[6] Second, in their connections to the broader musical fabric of a work, row cycles mirror Webern's organicist convictions. Cycles control entire compositions in a way that mirrors the omnipotent and often ungraspable laws that Webern imagined in nature. They are ever-present, inexhaustible, and often entirely hidden from view, shaping the music from behind the scenes.

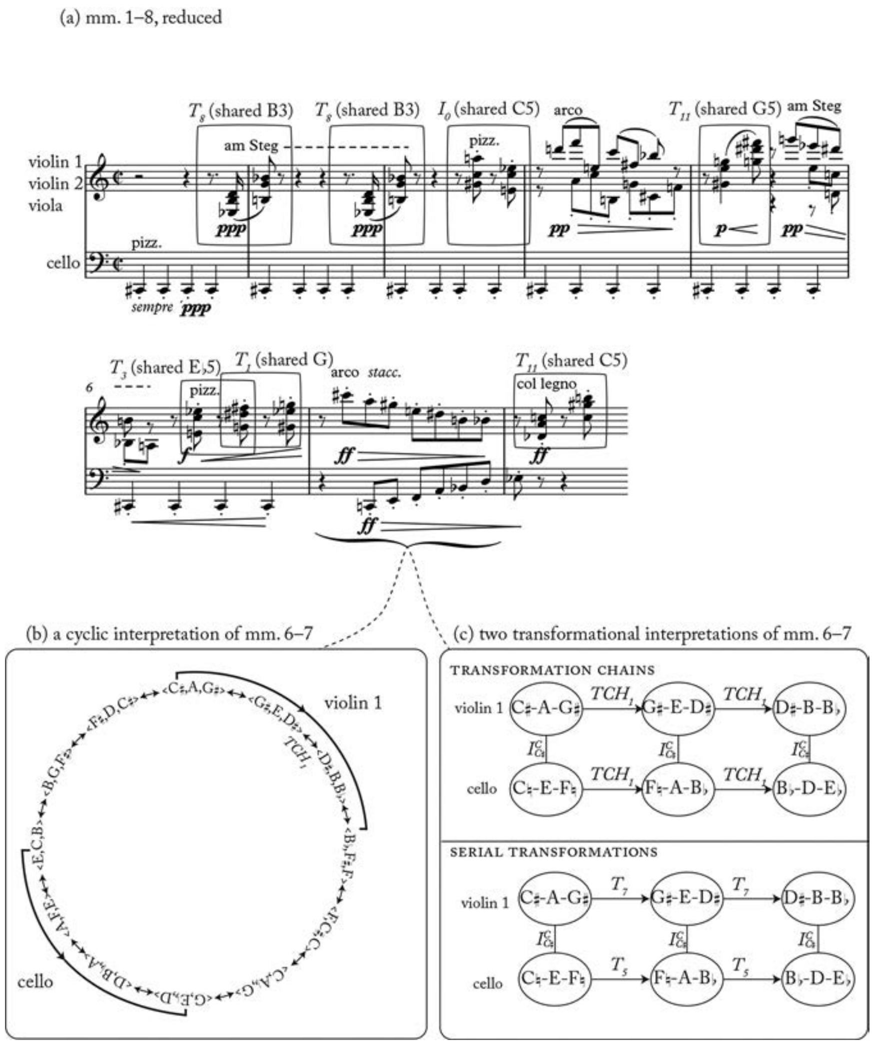
Below I have opted to foreground the diversity of cyclic techniques in the last four of Webern's published works. Following a short preliminary section describing the role of row chains in the formation of cycles, this article presents three analytic shorts that explore (1) complete cycles and cyclic alignment in two movements from Webern's late cantatas, op. 29/1 (1939) and op. 31/2 (1943); (2) partial and asynchronous cycles, and their relationship to *RI* symmetry in the *Variations for Orchestra*, op. 30 (1940); and (3) cyclic areas and the generation of musical form in the first movement of the String Quartet, op. 28 (1938). A concluding analysis of "Kleiner Flügel Ahornsamen," the central movement of his First Cantata, op. 29, offers a fuller exploration of cyclic organization in the context of a piece whose organicist text finds a marvelous match in Webern's musical setting.

Preliminaries: Transformation chains and cycles

Large row cycles in Webern's late music are nearly always generated from repeated iterations of a single type of "row chain," as in the String Quartet. David Lewin (1987, 180–83) was the first to explore chains in great detail, and he focused particular attention on *RICH*, a chain that adjoins RI-related series through a pair of shared elements. But chains can connect series that are related in other ways as well (Moseley forthcoming; Straus 2008). More generally, given two related series *x* and *y*, a transformation chain (*CH*) adjoins *x* to *y* through a shared segment, usually a note or more at the very end of *x* and the very beginning of *y*. Each name of the four resulting chains corresponds to the serial operation that it resembles: *TCH*, a transformation chain; *ICH*, an inversion chain; *RECH*, a retrograde chain; and *RICH*, a retrograde-inversion chain.[7]

tion that shapes his music more generally. Anne Shreffler (1994, 319), for example, has described how Webern's ever-present concerns for his music's length in part led to his "formulation of the row as an abstract model," a notion that mirrored the thematic content of the folk and religious texts he was setting at the time. A similar concern with abstraction as an enabler of extended composition is taken up in Moseley forthcoming.

7 Lewin's later work offers his fullest account of *RICH*, but in an earlier discussion he notes the general practice (Lewin 1977, 35). Chains are also a simple instance of the multiple order function described by Batstone (1972) and others. As simple as chains seem, they often have a profound impact on the deeper levels of Webern's music because of the way they regulate melodic connections. Andrew Mead (1993) reveals such a relationship in his analysis of Webern's op. 27/2, and Mead's perspective informs both Moseley 2013 and Moseley forthcoming.



Example 3. Webern's String Quartet, op. 5/3.

Webern's practice of chaining objects exists not only in the late works but throughout his compositional output, including the early atonal music, where chains are often allied with his predilection for common-tone preserving transposition and inversion (Straus 2011). Retrospectively, their prevalence in the early music can be seen as a harbinger of his later practice, as the late music uses the same techniques put to cyclic ends. As a demonstration, Example 3 provides the familiar opening of Webern's early String Quartet, op. 5/3. Above the cello's persistent C♯, the three upper strings form terse (014) chords that are interposed with brief canonic gestures. Boxed annotations illustrate that these (014)s are related by a transposition or inversion preserving a single common tone. When the tension gives way at m. 7 as the cello finally relinquishes its C♯, it and the first violin unroll in mirror image three serially ordered (015) trichords. Echoing the common-tone transformations prevalent through the first six measures, these are transpositionally related (015)s chained together by a single common tone: the final pitch of each (015) becomes the first pitch of the following (015). The graph at (b) interprets the passage protocyclically by describing the cello and violin on a collision course around the same circular space.

Figure 2 outlines some characteristics of the four commonly used transformation chains with an eye toward their intrinsically serial character, their context dependence, their structural differences with the "classical serial group," and their relationship to cycles.[8]

- Chains are temporal transformations that create larger serial structures. Chains elide elements at the end of one series with the beginning of another. Thus unlike the classical serial group of operations generated by T, I, and R, chronological relationships of "before" and "after" are inherent to these transformations' actions on musical objects.[9] A chain's length signifies the extent of this connection. Signified with an appended subscript, it is equivalent to the number of elided elements joining the first series to the second. For example, the one-note transposition chain adjoining the (015)s in op. 5 is TCH_1, as shown at the top of (c) in Example 3; each of the four-note transposition chains adjoining series forms in op. 28 (Figure 1(a)) was TCH_4. For a composer like Webern, who was interested both in the avoidance of pitch repetition and the consistency of intervallic content, chains are particularly useful. They adjoin series in time (that is "serially") and around a serial segment. As a consequence, chains produce serial structures larger than the original row that contain no adjacent pitch repetitions and only intervals that belong to the row itself.
- Chains are contextual transformations (Lambert 2000). Because the particular action of a chain is determined by the series, chains and series together evince a desirable trait, that object and process exist in a symbiotic relationship.[10] This contextual heritage has two significant

8 My terminology has origins in Lewin 1987, but my desire to describe the group of transformation chains more comprehensively requires some changes in notation. Moreover, my description of *TCH* views it as a unitary operation, while Lewin describes *TCH* as the compound operation *RICH* × *RICH*.

9 Transformational music analysis is often concerned with chronology, but musical transformations are not generally defined by chronology. (Lewin's [1993] analysis of the Stockhausen's Klavierstück III is a classic discussion of these issues, taken up further by Roeder [2009] and Rings [2011].) Transformation chains are an important exception, because they require the linkage of objects situated in a particular chronological relationship.

10 In this sense, analytic accounts guided by transformation chains—even those that study nontriadic music—are allied with neo-Riemannian theory. Defending a central tenet of that project, Cohn (2012, 39–40) notes that "one of the desirable qualities of a theory is the ability to demonstrate a relationship between the internal properties of an object and its function within a system."

	(a) interval requirements	(b) action	(c) commutativity	(d) cyclic periodicity
TCH_i	Initial and final segments of i - 1 ordered pitch-class intervals are the same.	$P_s \rightarrow P_{s+x}$ $R_s \rightarrow RI_{s-x}$ $I_s \rightarrow I_{s-x}$ $RI_s \rightarrow R_{s+x}$	commutes with *fixed-axis inversion*, not with *retrograde*	$\frac{12}{(GCD(12, x))}$
ICH_i	Initial and final segments of i - 1 ordered pitch-class intervals are inversionally equivalent.	$P_s \rightarrow I_{s+x}$ $R_s \rightarrow RI_{s+x}$ $I_s \rightarrow P_{s-x}$ $RI_s \rightarrow R_{s-x}$	commutes with *fixed-axis inversion* and with *retrograde*	2
$RICH_i$	Final segment of i - 1 ordered pitch-class intervals is non-retrogradable.	$P_s \rightarrow RI_{s+y}$ $R_s \rightarrow I_{s+z}$ $I_s \rightarrow R_{s-y}$ $RI_s \rightarrow P_{s-z}$	commutes with *fixed-axis inversion*, not with *retrograde*	2
$RECH_i$	Final segment of i - 1 ordered pitch-class intervals is inversionally symmetrical and i is an even number.	like R_0, unless $i > 1$; then, $RECH = T_6R$	commutes with *fixed-axis inversion* and with *retrograde*	$2 * \frac{12}{(GCD(12, x))}$

x = directed interval between the series' first pitch class and its first chained pitch class
y = directed interval between series' first and last pitch classes
z = directed interval between series' first pitch class and its i-th pitch class
GCD = greatest common denominator

Figure 2. Defining features of four types of transformation chain.

expressions. First, many chains can transform a series only if the series possesses a particular intervallic structure at its beginning and/or end. Those characteristics are summarized in column (a) of Figure 2. Using the language from that figure, TCH_4 could transform the series for op. 28 (Figure 1) only because the series has equivalent initial and final segments of (4 – 1 =) 3 ordered pitch-class intervals.[11]

11 Column (a) implies that there are five "trivial" chains that can transform any series. These include the "one-note" chains (TCH_1, ICH_1, $RECH_1$, and $RICH_1$) as well as $RICH_2$, the retrograde-inversion chain studied by Lewin. $RICH_2$ is the single, multielement chain trivially available to every series because it requires a final segment of (2 – 1 =) 1 ordered pitch-class intervals to be symmetrical, and a single ordered pitch-class interval is trivially symmetrical.

The second consequence of their contextual heritage has to do with how a chain transforms a series. Just as interval structure predicts whether a chain can transform a row form, it also determines the chain's transformational effect. Column (b) of Figure 2 generalizes that action by describing all four chains with a set of variables linked to an arbitrarily determined prime form, $\mathbf{P}_s$: *TCH* and *ICH* are defined by a transposition value *x* that is the directed interval between the series' first pitch and its first chained pitch; *RICH* has a transposition value that is the product of *x* and the interval *y* or the interval *z*; and *RECH* is typically equivalent to retrograde.

- Chains are distinct from classical serial operations. By themselves, the innate temporality and context dependency of transformation chains render them distinct from the classical serial group (T, I, R), which relates musical objects independent of temporality and intervallic structure. But they are matched by an even deeper structural difference between these types of transformations that we have already seen in the two analyses above. In Figure 1, (c) shows the transformational paths of the four strings as described with transformation chains as equivalent, while the serial transformations (shown below each arrow) render a unique analysis when describing the first violin/viola and the second violin/cello. Similarly, in Example 3, (c) presents two transformational accounts of the violin/cello passage from op. 5/3: chains and serial transformation describe the passage in different ways.

These differences are evidence of a structural distinction between a mathematical group containing chains and one representing classical serial transformations. Each of the four chains satisfies the "Riemannian dualism condition" described by Julian Hook; that is, they transform inversely related objects in "equal and opposite" ways (Hook 2002, 74). (Hence the T_7 labels for Example 3(c)'s violin are matched with its inverse [T_5] in the cello.) By consequence, chains inherit the properties of Riemannian transformations and behave more like ⟨P, L, R⟩ than ⟨T, I, R⟩. Most important among those properties are the commutative ones, highlighted in column (c) of Figure 2. Chains commute with fixed-axis inversion, while serial transformations generally do not.[12] We have seen this at play in both Figure 1 and

Interestingly, the intervallic requirements of these transformations are associated with commonly observed characteristics of Webern's row construction: *TCH* and *ICH* require segmental invariance at both the beginning and ending of a row; *RICH* and *RECH* require a symmetrical interval series or symmetrical interval segment.

12 Hook and Douthett (2008) also describe how *TCH* (which they express as a "uniform triadic transformation") commutes with fixed-axis inversion. They use that property to express the isographic relationship between the two canon voices of op. 27/2. That observation is foreshadowed by Mead (1993), who also highlights the commutative nature of chains and fixed-axis inversion in his study of op. 29, discussed below. Interestingly, *TCH* and *RICH* do not commute with retrograde, though transposition and retrograde-inversion do. This property does not manifest in the present study, though it is explored by Webern in the first movement of his *Piano Variations*, op. 27. I offer an analysis of that movement along those lines in Moseley forthcoming.

Example 3. Both passages described a group of instruments mirroring one another around an axis.

This commutative characteristic of chains is evident in nearly every analytic example below, for Webern's compositional interest in mirror symmetry became pervasive at the same time as did his predilection for the constant chaining of row forms. Every opus after the *Piano Variations*, op. 27—which contains the famous fixed-axis canon in the second movement—explores canonic mirror symmetry in conjunction with row chains.[13] Example 3's interest, then, is that it shows that the seed for this much later obsession was planted quite a bit earlier in his life.

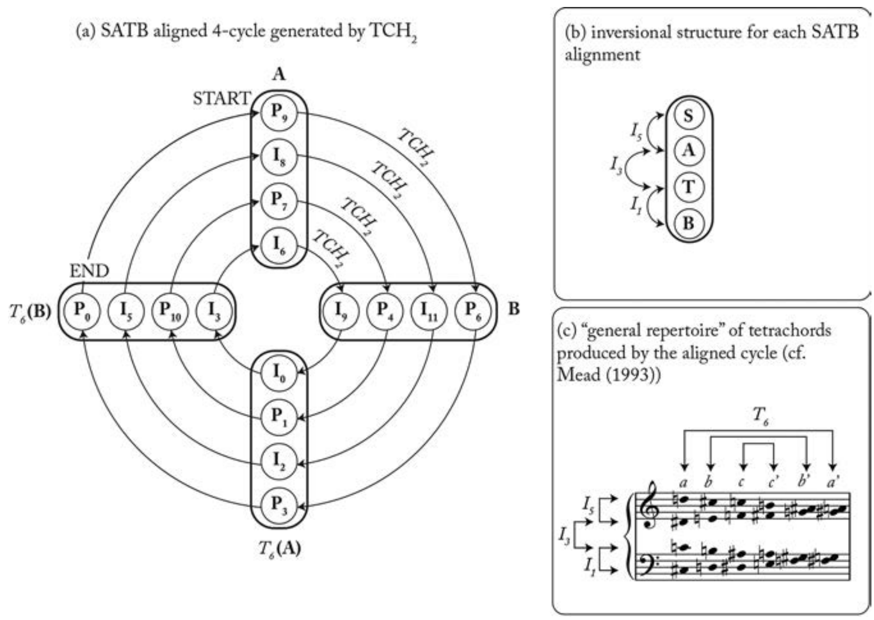
- Chains create cycles defined by the interval structure of the series. Column (d) shows that *ICH* and *RECH* produce 2-cycles (like their serial counterparts), but *TCH* and *RICH* have a cyclic periodicity determined by their transposition value—and hence the intervallic structure of the series.[14] Though the expressions in column (d) are cumbersome, these general characteristics are easily visualized with circular or flattened cycle graphs containing nodes and arrows. I have shown two such graphs already in Figure 1, (b) and (c), and Example 3(b). The 3-cycle produced by TCH_4 in Figure 1(b) creates a self-contained section whose length is a by-product of the directed interval (4) between the first and eighth pitch class of the row. The larger 12-cycle of TCH_1 in Example 3 is a result of the pitch interval (7) spanning each (015). In both, the cyclic periodicity equals the number of nodes on the network, while the transposition level of each chain can be intuited from those nodes' adjacent relationships.

Complete cycles and cyclic alignment in two cantata movements

Multiple coinciding cycles, like those shown in Figure 1, are quite common in Webern's late works, where they often shape entire sections or compositions. In this context, the horizontal character of each individual cycle and the characteristics of the coinciding cycles' vertical alignments are valuable objects of study. The interaction of the two is of central importance. Separately, they represent the "horizontal" and "vertical" dimensions of music to which Webern refers constantly in his writings; together, they embody the "synthesis" that often accompanies those descriptions (Busch 1985, 1986a, 1986b).

13 Milton Babbitt (1987, 33–37) described just this relationship between vertical inversional symmetry and row chains (though he does not use that term). Further implications of Babbitt's discussion are taken up below, in my discussion of two cantata movements (op. 29/1 and op. 31/2).

14 The definitions in Figure 2 borrow from Gollin (2007, 146). *TCH*'s action resembles a simple interval cycle generated by interval *x*, while cycles created by *RICH* could be described as double interval cycles. Straus (2011) discusses *RICH* in these terms as well.



Example 4. Webern's First Cantata, op. 29/1, "choral passage."

Example 4 and Figure 3 provide an analytic summary of a much-studied passage at the center of his Cantata op. 29/1 (1939).[15] Webern creates this music from the complex of cycles illustrated by the aligned cycle graphs in Example 4(a): four transpositionally and/or inversionally related voices (SATB) traverse unique 4-cycles.[16] The cycle graph illustrates a general principle: an *n*-cycle of inversionally related rows will produce *n* unique alignments and half as many alignment types.[17] Thus the 4-cycle produces four alignments, shown on the outside of the cycle graph, and two types, labeled **A** and **B**. Each of the four row alignments contains four distinct row forms, but each is bound by the inversional structure illustrated in Example 4(b). This pervasive equivalence is the result of *TCH*'s ability to commute with fixed-axis inversion, and it has an extraordinary impact on the limited collection of four-voice chords that the choir sings, as illustrated at (c). We hear only six tetrachords (labeled *a*, *a′*, *b*, *b′*, *c*, and *c′*) and three T_6-related tetrachord types (*a*, *b*, and *c*). This "general repertoire" of chords is guaranteed by the consistent vertical inver-

15 Rochberg (1962), Saturen (1967), Kramer (1971), Phipps (1984), and Bailey (1991) are all interested in the chords of this passage and those chords' relationships to the surrounding orchestral music. My analysis is concerned only with the choral music, and it resembles that of Mead (1993), who shows how the consistent chordal structure is a by-product of its fixed inversional structure.

16 The row for op. 29 is *RI*-symmetrical, such that $\mathbf{P}_x = \mathbf{RI}_x + 5$ and $\mathbf{I}_x = \mathbf{R}_x + 7$. In such contexts, *TCH* = *RICH*. My analysis uses only P- and I-forms in this example to simplify the presentation.

17 Aligned cycles of transpositionally related rows produce only one alignment type. See the analysis of op. 28/1 in Example 11 below.

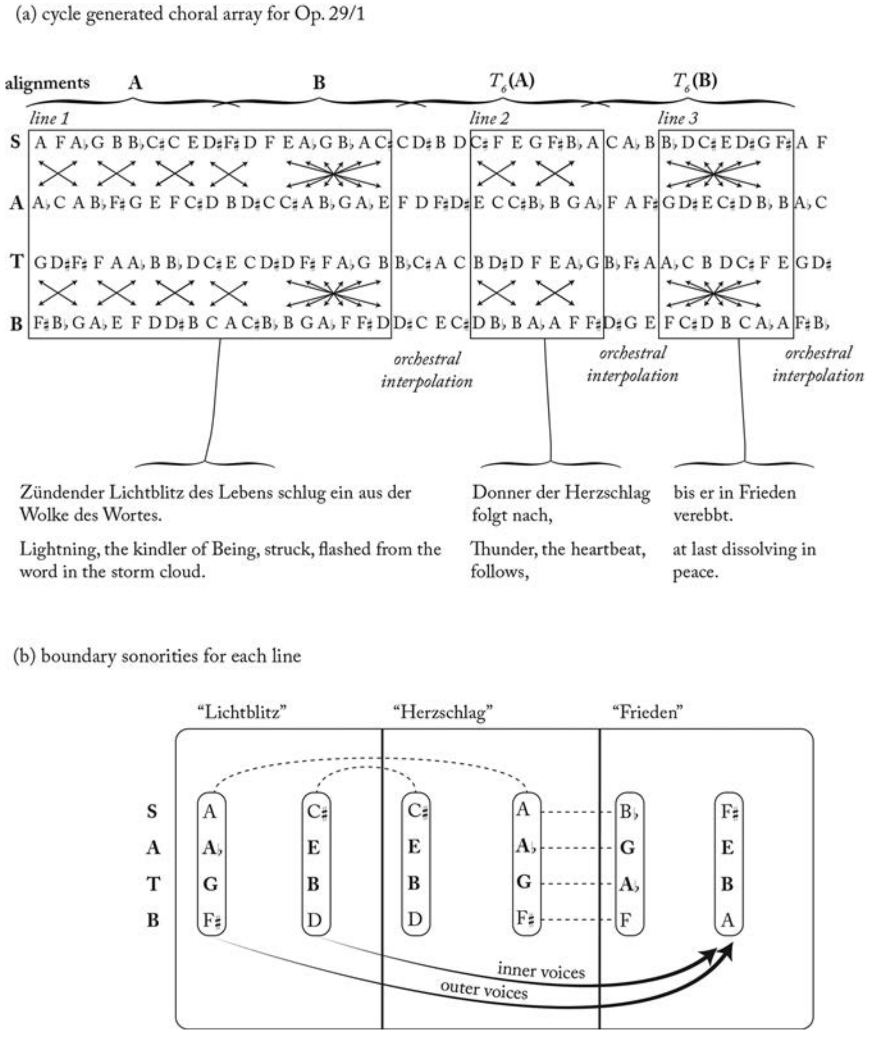


Figure 3. Row array and cyclic alignments for Webern's First Cantata, op. 29/1, "Blitz und Donner."

sional relationships given at (b), as shown by Milton Babbitt (1987) and Andrew Mead (1993). That the consistent inversional structure is itself guaranteed by the horizontal, cyclic chain structure is evidence of a compelling symbiosis between those two musical dimensions.

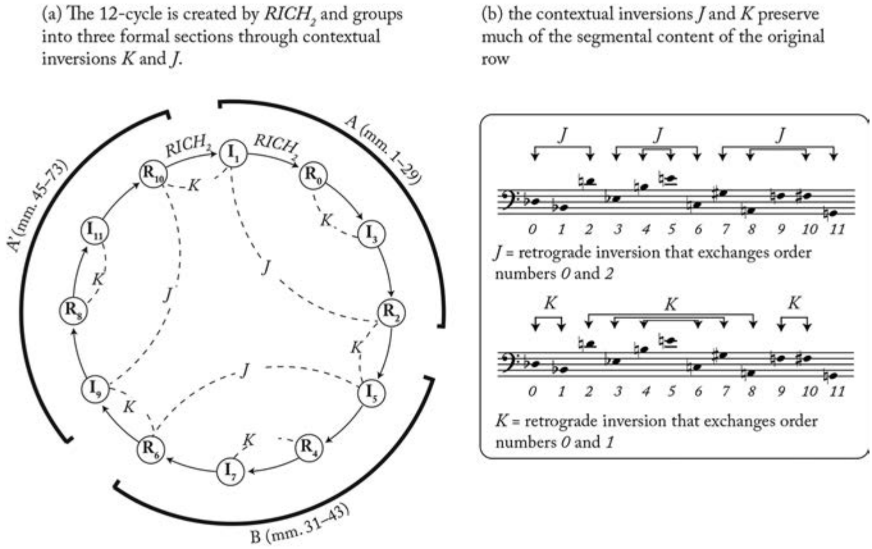
The consistency of these chords is assured independently of the particular rows in use, but their ordering is determined by the row's construction. In this latter respect, Webern's setting exhibits great musical sensitivity. In Figure 3 (a) provides a complete choral array of the movement's central passage. Large boxes show the passage's three stanzas, which are separated by orchestral interpolations, and braces above the passage show the cycle alignments in play. Through this array, we can see that although alignments **A** and **B** are unique, they produce related textures: voice exchanges produced by **A** begin the first stanza, and a large retrograde-symmetrical voice exchange created by **B** is heard at its end. Both textures return at the first orchestral interpolation, transposed by T_6, and thus over the final two stanzas of the poem we hear the same relationships with a different set of chords.

Webern's overlay of the thirty-one syllables of Hildegard Jone's poem onto the cyclic array's forty-two chords creates an evocative musical image of themes suggested in the poem. Jone's text, shown below the array, joins a natural phenomenon to a spiritual one: in the poem's first line a flash of lightning (*Lichtblitz*) captures the immediacy of life's inception, which echoes afterward as a heartbeat (*Herzschlag*) before dissolving in the last line into peace (*Frieden*).[18] In themselves, the musical "echoes" created by the alignments' voice exchanges and retrograde symmetry are befitting musical analogies for the "echo" of a lightning strike, but Webern's placement of the text onto the cycle extends the metaphor further. In Figure 3, (a) shows that the final two choral blocks slightly "misremember" the contents of the first, a loss of fidelity that reflects the decay present in the poem. Only part of the voice-exchange texture of the **A** alignment returns in the second stanza, and just a bit of the retrograde-symmetrical texture from the **B** alignment recurs in the final one. Further, as I show with dotted lines at (b), the choir's boundary sonorities gradually misremember more and more of their predecessors: the second line reverses the sonorities of the first, misremembering their order; and the final line misremembers more completely, by transforming the first stanza's inner and outer voices onto the final chord.[19]

Within themselves, row cycles often contain musically significant groupings that divide the cycle into smaller parts. Such a grouping scheme interacts with the form of the bass aria, "Sehr tiefverhalten," from Webern's final Cantata, op. 31 (1943). Many of the resulting musical characteristics take the form of circular and centripetal relationships that match the poem's description of the beehive (*der Bienenkorb*) and the repetitive, cyclic actions of its inhabitants. The bass alone sings the complete 12-cycle illustrated by Example 5(a). Even before studying the music, we can already see in this cycle an important formal relationship to the poem. The poem's three stanzas have forty syllables each (120 syllables total), and therefore $RICH_2$'s 12-cycle allows Webern to accommodate the poem syllabically by eliding two notes in all twelve statements of the series. There are 12 notes × 12 rows = 144 notes, but

18 Bailey (1991, 442n1) mentions that Jone's use of *Herzschlag* is interesting in the poem's larger context. It can mean both "heartbeat" and "heart failure," and thus connects life to death in a particularly evocative way.

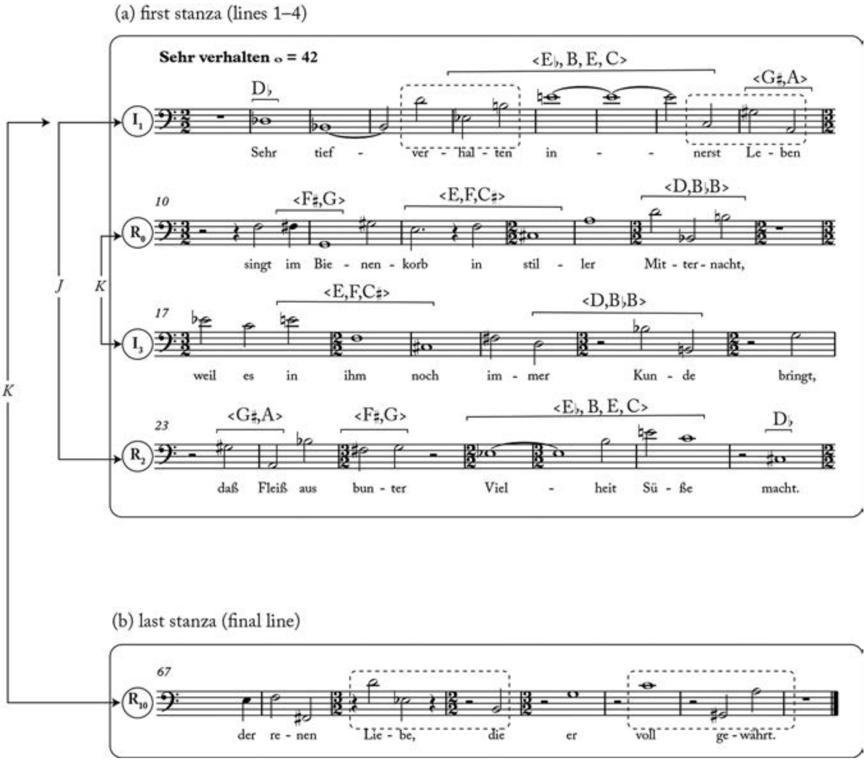
19 In a more extended analysis, I relate the chordal misremembrances of this passage to the instrumental canons that begin and end the movement (Moseley 2013). Those canons undergo a process of rhythmic and metric manipulation (described by Hartwell [1984] and Bailey [1991]) that erode their perceptibility. Thus the long-range chordal, melodic, and rhythmic strategy of the movement closely mirrors the decay that one senses in Jone's poem.



Example 5. Webern's Second Cantata, op. 31/2, "Sehr tiefverhalten."

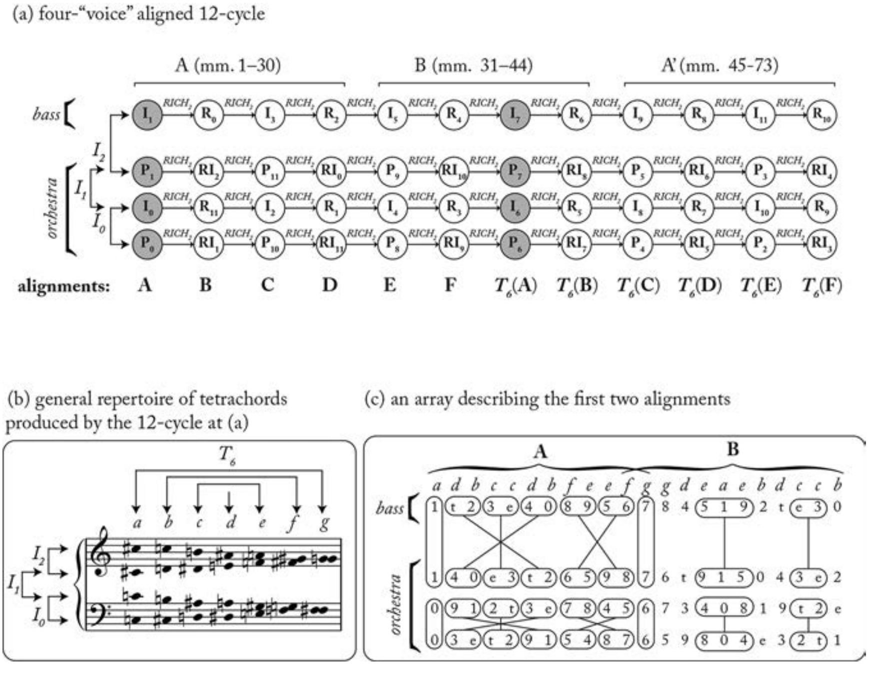
the twelve two-note elisions reduce out twenty-four of them, yielding 120 notes, the syllabic length of the poem.

The movement's formal sections are differentiated by rhythm and texture, and their pitch structure derives from invariances embedded in the cycle. Before I describe one of these passages, I show the cycle in Example 5(a), parsed into three groups of *RICH*ed row forms that correspond to the movement's three-stanza ABA form. *RICH* produces two repeating contextual inversions that hold invariant substantial segments of a given row: *J*, shown to the cycle's right, produces a retrograde inversion that exchanges pitch classes at order numbers 0 and 2 and preserves a four-note segment and two dyads; *K* exchanges pitch classes at order numbers 0 and 1 and preserves two trichords and a dyad. The cycle graph shows that *J* spans the boundaries of the movement's three stanzas (connecting $\mathbf{I}_1$ and $\mathbf{R}_2$ in the A section, for example), while *K* links rows within and between them. In Example 6, (a) illustrates these relationships as we find them in the aria's first stanza. The music on the fourth system sets the stanza's final line. Because of its *J* relation to the first phrase (shown with arrows to the score's left), the section's final line reverses the bracketed segments heard in the first phrase while preserving their serial order and registral location: C♯3, at the end of the section (m. 29), is the most significant link back as it creates a frame with the D♭3 that began the passage (m. 2); the segment ⟨E♭, B, E, C⟩ heard over mm. 26–28 similarly harks back to mm. 4–8. In between, *K* nests a similar set of invariances on the section's inside. In the second and third systems, it associates two prominent trichords whose serial order is again maintained.



Example 6. Webern's Second Cantata, op. 31/2, "Sehr tiefverhalten."

In the larger formal scheme, the cyclic structure of the rows amplifies the invariances in two ways. First, the cyclic structure guarantees that the contrasting B stanza and transposed recapitulation of A will possess the same invariances and inner coherence that we saw in Example 6. But more interestingly, the row cycle's conclusion—in the transposed recapitulation of A—projects the circularity and symmetry of those smaller sections onto the whole of the movement. The passage given in Example 6(b) is the aria's final phrase, a setting of $\mathbf{R}_{10}$ that occurs one *RICH* away from the first row on the cycle graph of Example 5(a). $\mathbf{R}_{10}$ exists in a *K* relationship to that series form, which began the aria, and therefore the same contextual relationship that associated rows within the A section shown in Example 6(a) also exists between the movement's first and last phrase. Example 6(b) illustrates, showing how in the final phrase two trichords (identified with dotted boxes on the score) produce a large-scale invariance linked back to the movement's beginning. In one sense, we might imagine this recapitulation as inducing closure, much as the first stanza's fourth phrase referred back to its first. But in another way, the large-scale relationship allows us to imagine the final phrase anticipating the first, a musical representation of the circularity depicted in Jone's poem.



Example 7. Row array and cyclic alignments for Webern's Second Cantata, op. 31/2, "Sehr tiefverhalten."

Finally, in Example 7, (a) shows the bass cycle's canonic accompaniment, which produces six alignment types. Because all four of the coinciding cycles are unique, the aria's cyclic structure produces a complete presentation of all forty-eight row forms. As we saw in the first cantata movement, $RICH_2$'s ability to commute with inversion preserves *I*-structure, indicated to the cycle's left, and creates a fixed "general repertoire" of four-voice chords, shown at (b). Webern's initial alignment, labeled as **A**, creates a concentrated synergy between the bass solo and the orchestra: chords *a*, *b*, *c*, and *d* echo the segmental content of the bass's first heptachord, and chords *e*, *f*, and *g* do the same for the subsequent pentachord. The aria's cyclic unfolding of the remaining alignment types, shown at (a), gradually disentangles this close connection. Alignment **A** returns at the movement's very center, before it again unravels into the movement's closing lines. In conjunction with the circularity of the three individual stanzas, the unwinding and reassembling of these alignment types again echoes Jone's poem, an apt musical image of "the swarm breaking in the early morning" (der Schwarm in ewige Frühe bricht) before collecting "in the beehive at quiet Midnight" (im Bienenkorb in stiller Mitternacht).

Partial cycles, asynchronous cycles, *RI*-symmetry, and the *Variations for Orchestra*

Both of the cantata movements demonstrate a reciprocity between cyclic substructure and surface that seems to mirror—in ways explored more thoroughly below—Goethe's description of the centrifugal and centripetal forces that shape metamorphosis (Neff 1993, 413–15). Forces of this Goethean sort are perhaps most associated with the *Variations for Orchestra*, op. 30 (1940), a work that Webern described as "in continual Metamorphosis" (Webern et al. 1967, 44).[20] Unlike the pieces studied thus far, most of op. 30's variations are formed from incomplete traversals of larger cycles. These partial cycles are interesting analytically because of the way they interact with the row's *RI* symmetry. A characteristic of many of the late rows, *RI* symmetry in a cyclic context is associated with a systematic amplification of row properties onto larger serial spans. The *Variations* is too large and complex a composition for extended study here, so the account below centers on the movement's initial variation, first describing the interaction of partial cycles and *RI* symmetry abstractly and then showing how the interaction is at play in the metamorphosis that relates small and large gestures in the variation's two melodies.

In Figure 4, (a) illustrates op. 30's *RI* symmetry in two complementary ways. *RI*-symmetrical rows have both a symmetrical series of intervals and an internal inversional symmetry that relates pitch classes at complementary order positions. Webern's row manifests this principle on both large and small scales. The *RI*-symmetry in Figure 4(a) relates the row's two hexachords at I_{11}, while (b) shows that the row's overlapping heptachords have a symmetrical interval series and possess their own unique internal inversional symmetry. By replicating the symmetrical interval series at the level of the heptachord, Webern converts the row's *RI* symmetry into an additional serial trait—the *Variations* row can chain together through shared heptachords, as I show through (b) and (c): the inversional symmetry characterizing $\mathbf{P_0}$'s final heptachord simultaneously fulfills the conditions necessary to chain it to $\mathbf{RI_4}$ through $RICH_7$.[21] In sum, the three row properties described by (a), (b), and (c) are mutually conducive: the symmetrical intervals produce the row's inversional symmetry at (a) and (b), and their replication at the heptachordal level allows for $RICH_7$ at (c).

When row chains repeatedly transform an *RI*-symmetrical row, they produce a larger series that mirrors the internal inversional symmetry of the

20 The *Variations* have been discussed in these terms by Whittall (1996), who engages with Bailey (1991, 224–36) at many points.

21 This chain, the largest in all of Webern's music, is so large that $RICH_7 \times RICH_7 = RICH_2$; that is, three $RICH_7$-ed rows are equivalent to two $RICH_2$-ed rows. Sebastian Bisciglia (2017) has taken a quantitative approach to this piece, and his analysis reveals how rare these combined properties are among classical row classes. While *RI*-symmetry itself is quite special (possessed by only 0.115 percent of row classes), the large heptachordal chain is extremely uncommon—only thirty-two rows (or 0.00032 percent) are capable of such a large chain.

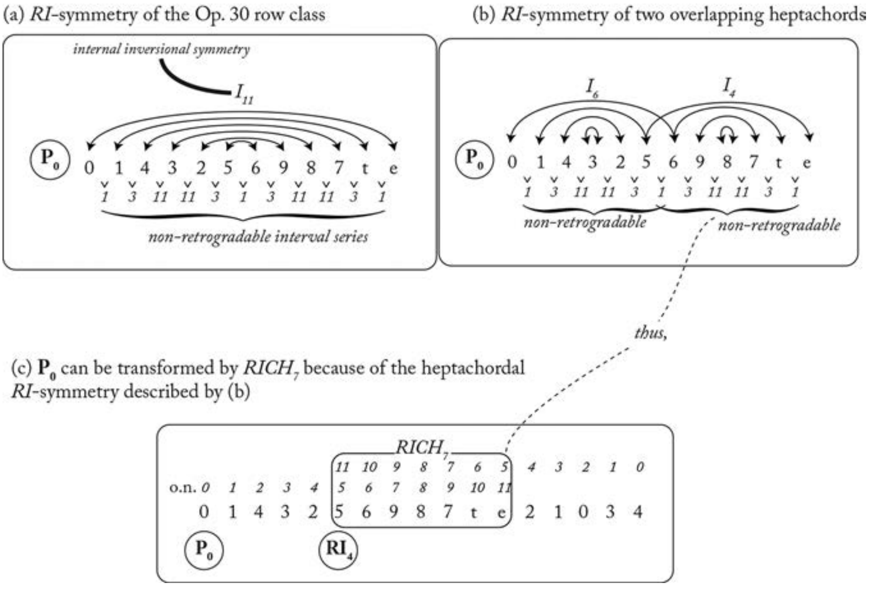


Figure 4. **Chains, cycles, and *RI*-symmetry in Webern's op. 30, *Variations for Orchestra.***

row (or rows) at the cycle's center. To demonstrate, in Figure 4, (d) shows a partial traversal of op. 30's 12-cycle, with its pitch classes written in integer notation to the right. The figure shows that the ensemble of rows chained together produces the same internal inversional symmetry as $\mathbf{P_0}$ does alone. In more general terms, when an *RI*-symmetrical row is chained repeatedly it will produce a partial (or complete) cycle whose inversional symmetry mirrors the row in one of two ways. If the partial cycle has an odd length, it will share its symmetry with the cycle's central row. At (d), the odd, three-row partial cycle shares its I_{11} symmetry with $\mathbf{P_0}$, as seen by comparing (d) with (a). But if the partial cycle has an even length, it will share its symmetry with the chained segment at its center. Therefore the even, four-row cycle at (e) shares its I_4 symmetry with the heptachord (⟨5, 6, 9, 8, 7, t, e⟩) that chains $\mathbf{P_0}$ to $\mathbf{RI_4}$; and the even, four-row cycle at (f) shares its I_6 symmetry with $\mathbf{P_0}$'s initial heptachord ⟨0, 1, 4, 3, 2, 5, 6⟩.

This sort of amplification is heard in the entwining of two melodies that form op. 30's first variation, given in Example 8. Each melody plays four-, five-, or six-note groupings that are arrayed in a large temporal symmetry: melody 1 (top staff) plays a 4 + 6 + 6 + 6 + 4 pattern, and melody 2 (bottom staff) plays a 4 + 5 + 5 + 4 + 5 + 5 + 4 pattern. Melody 1 begins the passage with a four-note violin solo that surrounds the interval class 3 dyad {B♭, D♭} that forms the gesture's registral peak. Three measures later (mm. 24–26, bottom staff), tutti violins play the second melody's first four-note gesture, and {B♭, D♭} returns—but at the gesture's boundaries. This initial melodic association pre-

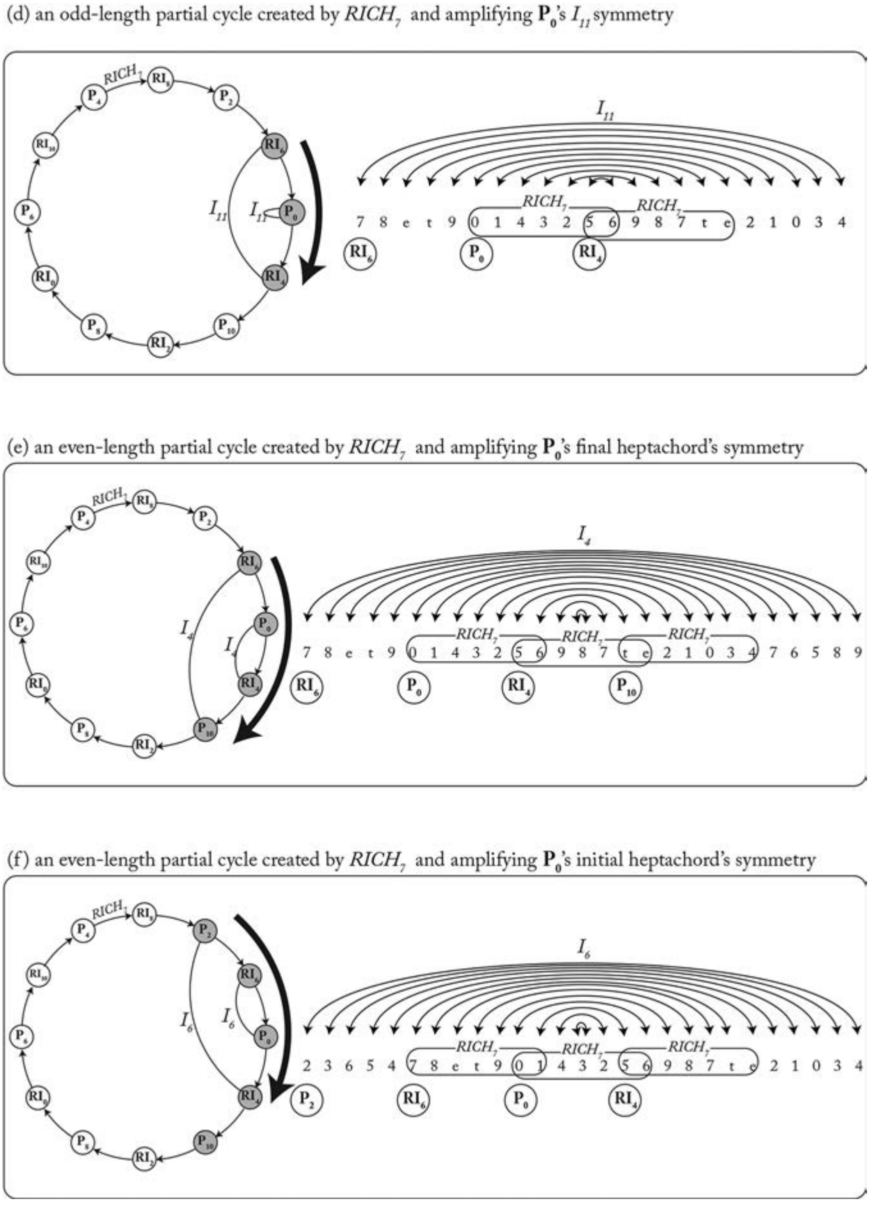
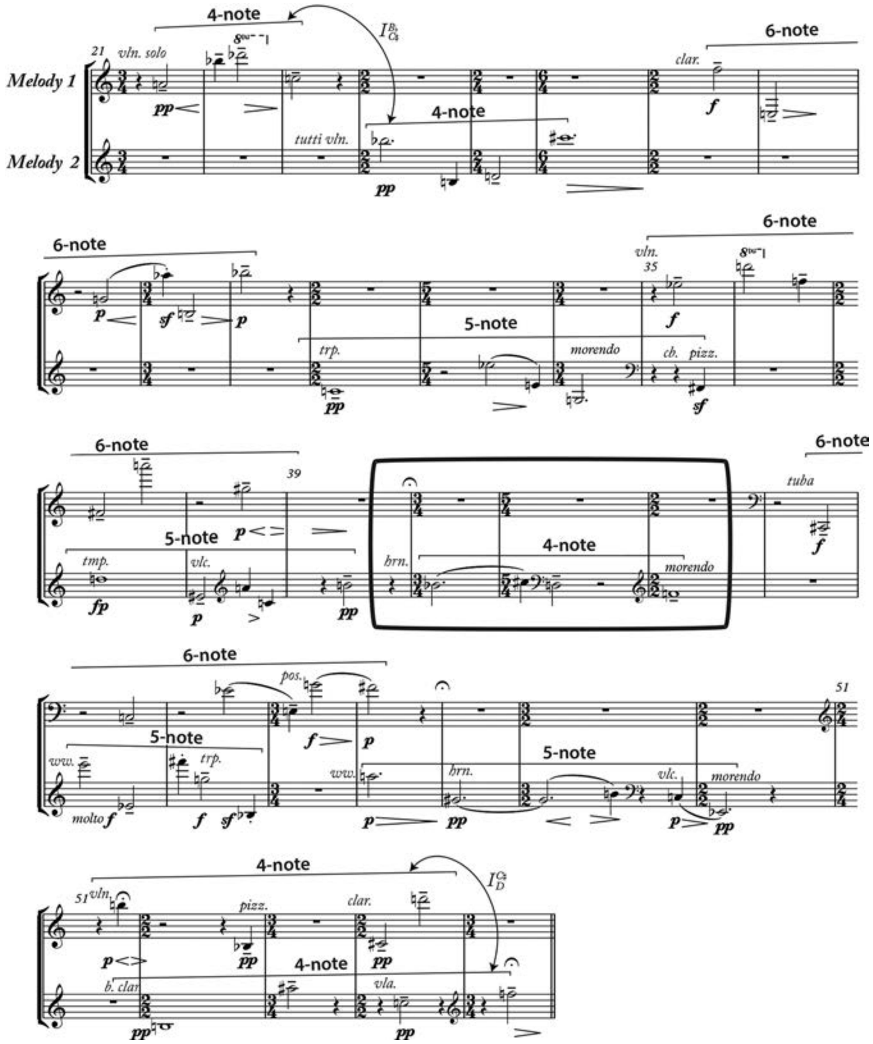


Figure 4 (continued). Chains, cycles, and *RI*-symmetry in Webern's op. 30, *Variations for Orchestra*.

pares this dyad's significance in the variation as a whole: {B♭, D♭} not only marks the variation's beginning over mm. 21–26 but returns in the middle (mm. 40–41, bottom staff) and at the variation's end (mm. 52–54, top and bottom staves), where it is formed from the interlocking of melodies 1 and 2. A similar role is played by the dyad {C♯, D}. That dyad concludes melody 2's



Example 8. Webern, *Variations for Orchestra*, op. 30, "Variation 1," mm. 21–55, melodic reduction.

initial four-note gesture in mm. 25–26 and is subsequently played at the center (mm. 41–42) and end (mm. 54).

While these associations are of local significance, they reflect a deeper structural principle associated with the cycles that produce each melody. Example 8 shows that at the beginning and end the associated dyads are produced by two fixed-axis inversions: $I_{\frac{B\flat}{C\sharp}}$ and $I_{\frac{C\sharp}{D}}$ hold those dyads invariant. In Figure 5, (a) illustrates that both inversions are mirrored in the two partial cycles that create the melody. Each is produced from partial traversals of the $RICH_7$-generated 12-cycle, shown twice there. Each cycle moves along the same cyclic path but plays only part of the cycle. Thus they are asynchronous: melody 1 plays seven rows against melody's 2's five. Because both cycles are odd, each creates a larger manifestation of the symmetry found in the row at the cycles' center, and those particular symmetries are quite suggestive. Melody 1's seven rows are related to one another by $I_{\frac{B\flat}{C\sharp}}$ (which associated the two four-note gestures at the variation's beginning) and melody 2's five rows are related by $I_{\frac{C\sharp}{D}}$ (which associated the two four-note gestures at its end).

In Figure 5, the schematic at (b) describes how the partial cycles' inversional structure underpins the melodic structure of the variation. In essence, the inversional symmetry of each partial cycle maps onto the two melodies'

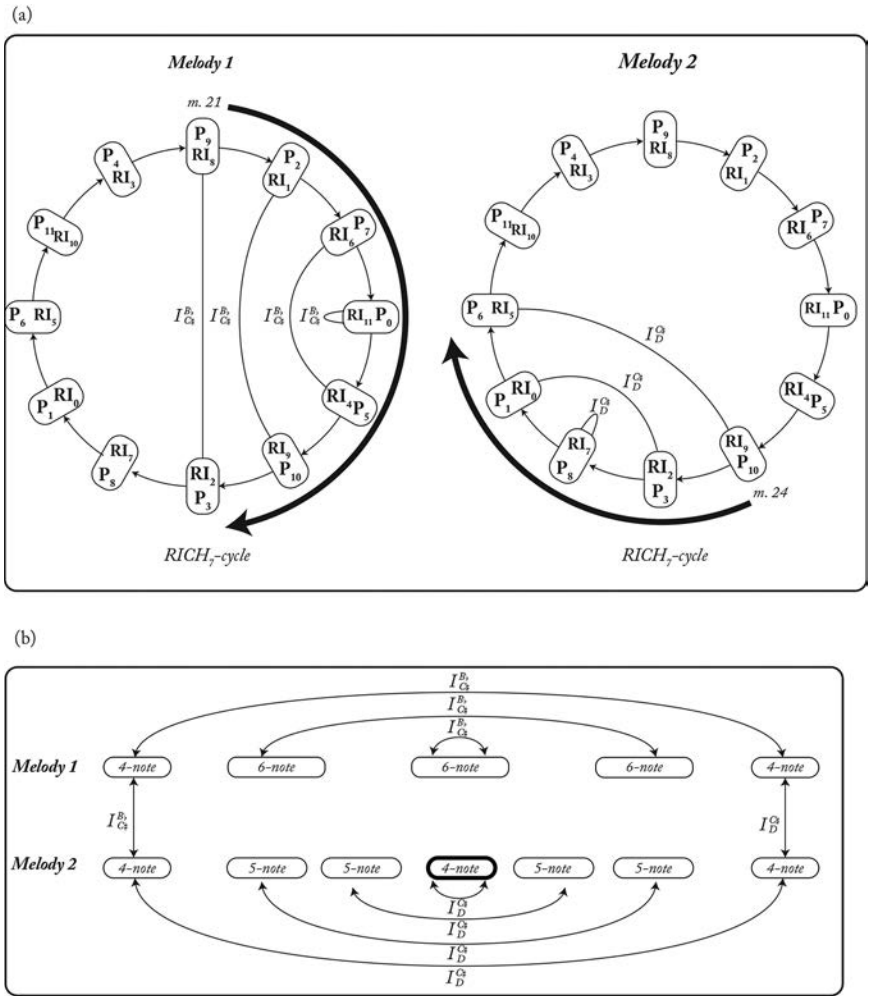


Figure 5. The two incomplete cycles comprising the variation shown in Example 8.

symmetrical grouping structure. At the same time, the two symmetries vertically align the asynchronous cycles by joining them through the four-note gestures shown in Example 8, at the variation's beginning and end. Notably, despite the prevalence of {B♭, D♭} and {C♯, D} as discrete segments throughout the passage, a single segment containing the three pitch classes occurs at only one place, at the center of melody 2. Figure 5 shows the location of this gesture in the abstract schematic, and Example 8 highlights it with a bolded box on the score. Isolated in mm. 40–42, the tetrachordal segment ⟨B♭, C♯, D, F⟩ articulates the $I_{C\sharp/D}$ symmetry that orients melody 2 such that the three associational and inversionally significant pitch classes are heard within a single instrument. In the larger strategy of the variation, it represents a way station in the variation's larger entwining: over mm. 21–26, both {B♭, D♭} and {C♯, D} are heard but are temporally separated and part of distinct melodic strands; in mm. 39–41, the {B♭, D♭} and {C♯, D} combine to form a single segment part of a single melodic strand; and at the end (see mm. 52–54), where the two melodies are completely entwined, {B♭, D♭} and {C♯, D} come together to form a segment created from the melodies interlocking. Indicative of the deeper inversional forces holding together each melody's cyclic substructure, the strategy suggests something of the metamorphosis Webern himself ascribed to the piece.

Cyclic row areas, formal combination, and the String Quartet, op. 28/1

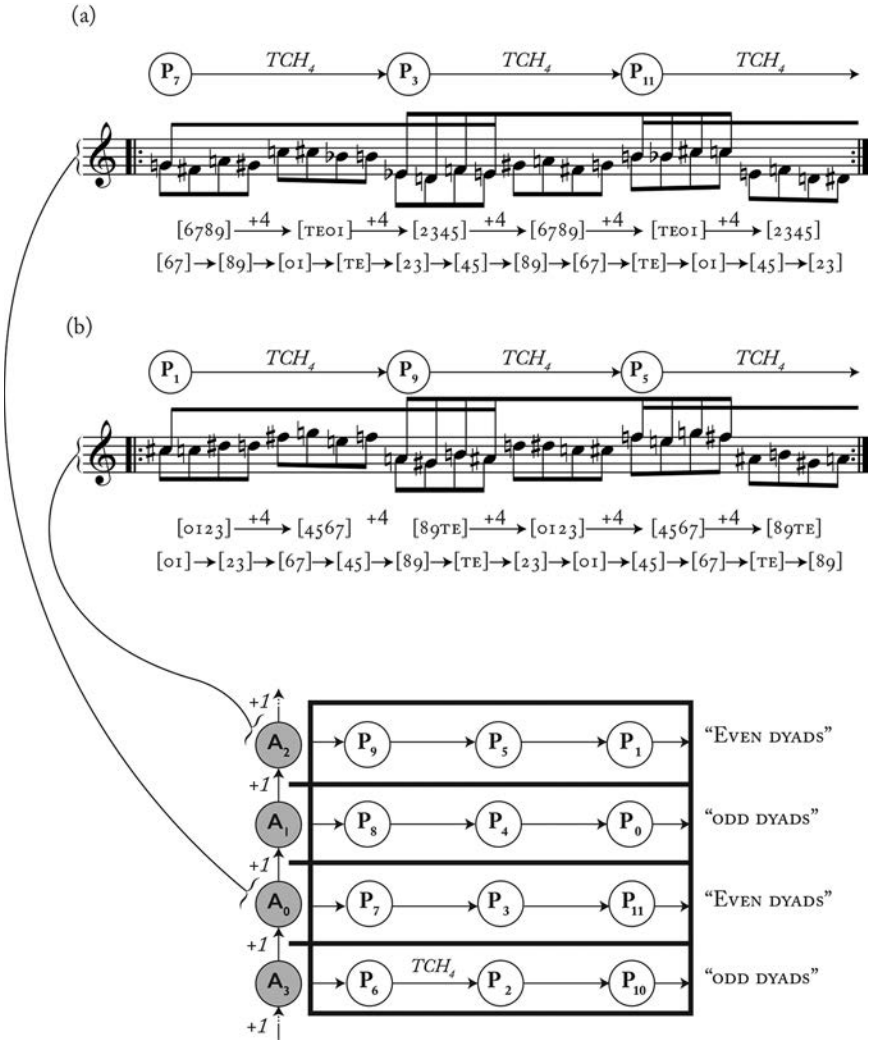
In each of the pieces considered thus far row cycles occupied two or more "voices." These cyclic combinations have come in three varieties:

- Overlapping: The two partial cycles from the *Variations*, op. 30, moved along the same cyclic path (Figure 5).
- Disjunct: Both op. 29/1 and op. 31/2 were polyphonic settings whose "voices" married unique cycles (Examples 4 and 7).
- Mixtures: Each of the canons in op. 28/1 occupied disjunct cyclic paths, but canon partners moved along overlapping ones (Figure 1).

The following discussion is concerned with the way that disjunct cycles divide a row class into distinct areas and how such a division is put to use in the formal amalgamation we find in the first movement of the String Quartet, op. 28.

Abstractly, a row class can be partitioned by slicing it into a complete collection of disjunct cycles. The number of unique areas (#partitions) depends on the size of the row class and the periodicity of the cycle, where #partitions = row class size ÷ cyclic periodicity.[22] To suggest an analogy with

22 For example, op. 29 (described in Example 4) contains a twenty-four-member row class, and TCH_2 has a cyclic periodicity of 4. Thus TCH_2 slices the row class into six unique partitions, of which Webern uses four. (The outer sections of the movement present the remainder.) Op. 31's forty-eight-member row class (Example 7) is partitioned



Example 9. Cycles and derivation in Webern's String Quartet, op. 28.

Schoenberg's practice of composition with combinatorial row areas, I refer to these partitions as *cyclic row areas*. Example 9 shows two row cycles generated by the four-note transposition chain, TCH_4. Both are presented above a derivation of the discrete tetrachordal and dyadic content of the rows to demonstrate how closely tied TCH_4 is to the row's segmental organization. Each row is generated from three chromatic "BACH" tetrachords related to one another by $T_{\pm 4}$. Because TCH_4 is itself equivalent to $T_{\pm 4}$, the chain produces a

into only four unique partitions by $RICH_2$, owing to the larger 12-cycle produced by $RICH_2$, and the piece presents them all. This idea of presenting an entire set of partitions is described in Moseley forthcoming, where it forms the basis for a theory of form for Webern's twelve-tone works.

cycle that preserves tetrachordal content: the row cycle at (a) contains a twice-repeated cycle of tetrachords: ⟨[6789], [te01], [2345]⟩; the row cycle at (b) contains a distinct twice-repeated cycle of tetrachords: ⟨[0123], [4567], [89te]⟩. Though the two cycles have distinct tetrachords, their dyadic derivations are equivalent. Both row cycles produce the same collection of discrete, "even-rooted" dyads: [01], [23], [45], [67], [89], and [te].

As a 3-cycle, TCH_4 partitions the twenty-four members of this row class into eight disjunct cycles. At (c) the four "prograde" cycles are given with an identifying name.[23] A_0 is the area whose rows contain the row cycle ⟨$\mathbf{P_7}$, $\mathbf{P_3}$, $\mathbf{P_{11}}$⟩; T_1 (A_0) = A_1, and corresponds with one "upward" motion (+1) in the space; T_2 (A_0) = A_2, and corresponds with two "upward" motions (+2) in the space; and so on. Because there are only four areas, T_4 (A_x) = A_x and the space "wraps around" from top to bottom, or vice versa. While each row of this space represents a distinct set of tetrachords, indications to the right show that rows related as A_x is to A_{x+2} have the same dyadic derivation, either "even" or "odd."[24]

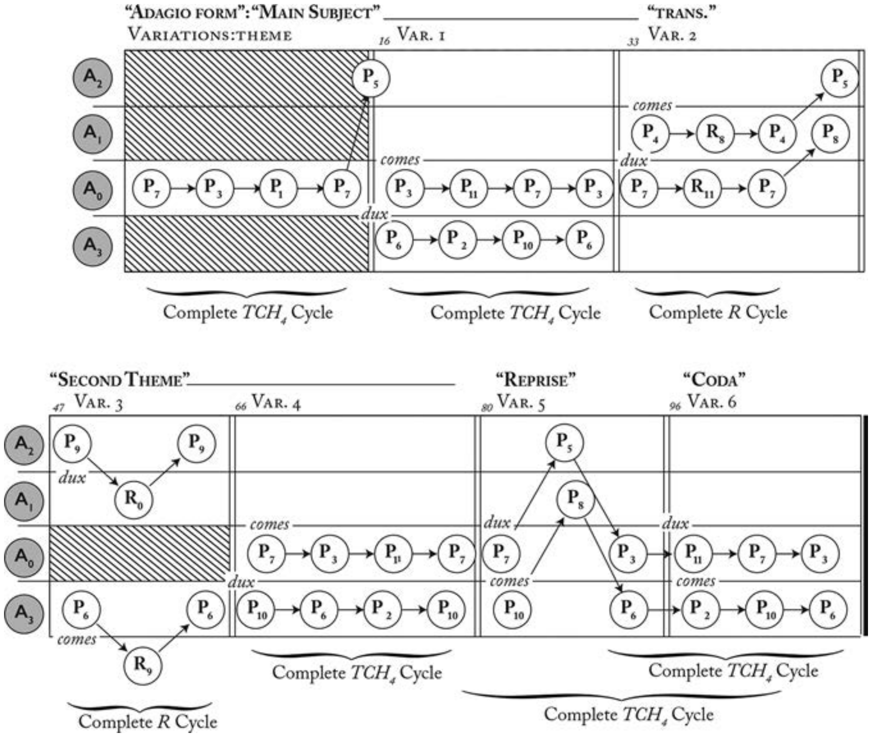
Imagined as a musical "map," the topography of this space elucidates some ways that cycles structure the amalgamated form of op. 28's first movement. Webern himself describes the combination in an analysis reprinted in Moldenhauer and Moldenhauer (1979, 752): "[It] is a *variation movement*; however, the fact that the variations also constitute an *adagio form* [ABA] is of primary significance. That is to say, *it* is the basis of the movement's formal structure, and the variations have come into being *in accordance* with it." At the same time, "the variations are purely *canonic* in nature!" Example 10 plots the movement's formal plan according to Webern's descriptions of each variation's formal function ("main subject," transition," etc.) along with the canonic function (*dux* or *comes*) of each row cycle.[25] Four significant formal characteristics are revealed from the chart:

- All seven parts of the form articulate complete row cycles whose similarities and differences reflect the characteristics of a three-part form: those passages associated with thematic and tonal stability (the "main subject," its "reprise," and the "coda") complete TCH_4 cycles; sections associated with tonal instability (the "transition" and "second theme") complete R cycles.

23 The "retrograde" cycles can be imagined by substituting P for R and reversing the arrows. These areas are similar to the tetrachordal orbits described by Hook and Douthett (2008, 110–19) and Clampitt (2009, 207–15). My spatial diagram, however, foregrounds a more fundamental opposition of dyadic structure that is of less significance to those authors.

24 In its cyclic structure and paradigmatic organization, the space's structure is similar, but not entirely equivalent, to Morris's (1995) "musical grammar." See also the idea of formal/spatial and figural/event networks discussed by Lewin (1993), Roeder (2009), and Rings (2011).

25 The structure of this space is similar to Hook and Douthett's (2008, 117) example 12 and Clampitt's (2009, 212) figure 7.3. The impetus behind their spaces, however, is the row's tetrachordal derivation, and tetrachords are the primary motivic unit only on occasion.



Example 10. A formal diagram and event network for Webern's String Quartet, op. 28/1.

- The *dux* and *comes* that comprise each variation's canon always occupy adjacent areas. If the *dux* plays in A_x, the *comes* plays in A_{x+1}. This arrangement has a significant effect on the sound of the movement. Because the canon voices occupy adjacent areas, *dux* and *comes* are always differentiated by their discrete semitonal content. If the *dux* is playing "even-rooted" dyads, the *comes* is playing "odd-rooted" ones. This dyadic differentiation is more fundamental, I believe, than the tetrachordal differences noted by Hook and Douthett (2008) and Clampitt (2009) because Webern often uses motivic segments that are smaller or larger than tetrachords.
- Longer-range motion through the four areas reflects Webern's descriptions of the three-part form's large sections. After beginning in A_0, the "transition" completes an R-cycle followed by a row area "modulation" whose "rise" prepares the "second theme." Shading on Example 10 shows that the three row areas (A_1, A_2, and A_3) heard in the "second theme" complement those of the "main subject" (A_0). The aural corollary of this spatial complement is that the "second theme's" tetrachords are entirely complementary of the "main theme's." Thus the large-scale tetrachordal relationship that defines the "adagio

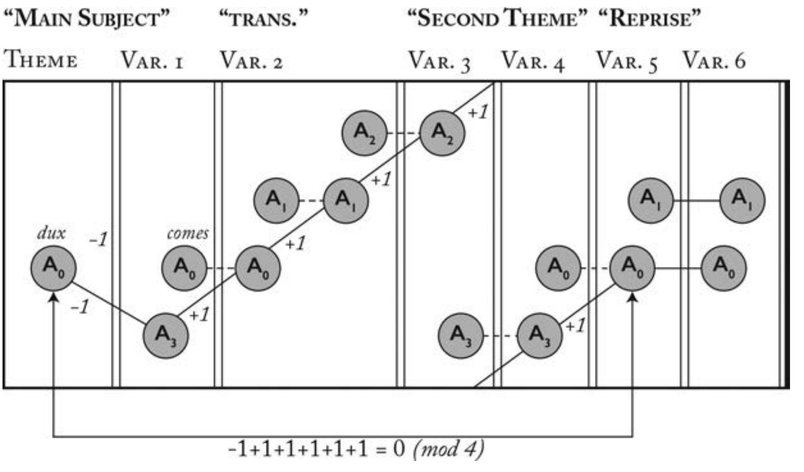
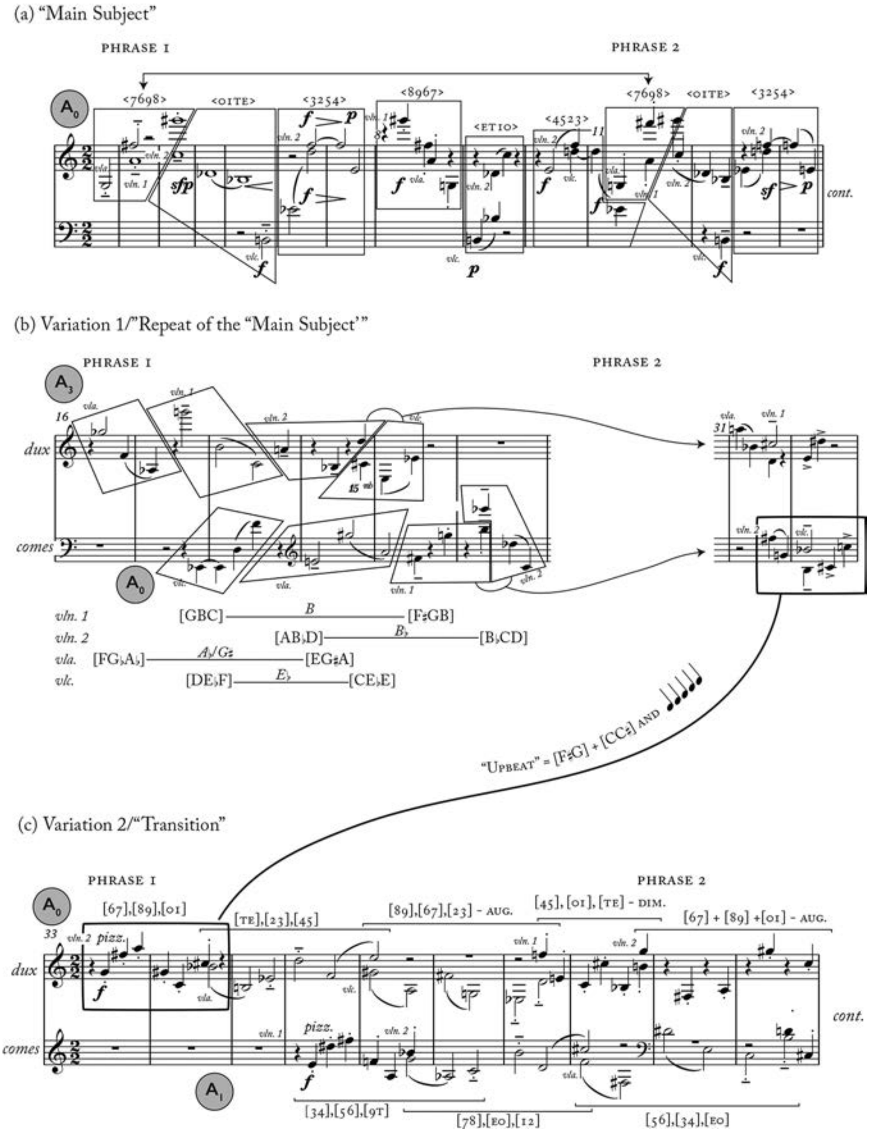


Figure 6. A reduced formal diagram and event network for Webern's String Quartet, op. 28/1.

form's" ABA echoes the complementary, "even"-versus-"odd" relationship of the canon's two voices (Moseley forthcoming).

- Figure 6 reduces the progression of cyclic row areas further and uses this description to depict a final way that the underlying canon is tied to the adagio form. In his comments about the movement, Webern writes that the final measure of each variation acts as an "upbeat" to the following variation. The figure interprets these "upbeats" with dotted lines connecting *dux* to *comes*. As the *comes* concludes each variation, its cyclic area anticipates—or acts as an "upbeat" to—the cyclic area of the following *dux*. By consequence, the area progression steadily "rises" through adjacent areas in the space, the "vertical" relationship of the *dux* and *comes* reflecting the "horizontal" motion of each. Notably, this consistent "rise" directly impacts the location of the adagio's reprise. Following its "dip" from A_0 to A_3 to begin the first variation, five +1 motions—each anticipated by the *comes*—return the *dux* to A_0 at "Variation 5," where the movement's theme returns to initiate the reprise.

These formal diagrams have great power in describing the movement's formal plan because they are oriented around the row's discrete segmental content, and the four strings derive their material exclusively from discrete segmentations of the row. Example 11 excerpts passages from the theme and first five variations to study alongside the formal maps. In the "theme" shown at (a), the four strings play dyads and trichords that belong to A_0 and whose overlap obscures the cyclic progression of tetrachords given above the passage. Nonetheless, that cyclic progression of tetrachords underlies the passage's phrase structure by creating a varied repetition of the first seven bars



Example 11. Significant moments in the form of Webern's String Quartet, op. 28/1.

at m. 8—where the first three tetrachords are heard in the same register and instrument but in retrograde order—and a genuine reprise at m. 11, where the rhythm of mm. 1–7 is diminished to begin the second phrase.

Diminution and augmentation are a primary compositional principle in the subsequent variations (Moldenhauer and Moldenhauer 1979, 752). In Variation 1, shown at (b), the four strings together articulate a canon whose motivic material is primarily trichordal. Because the *dux* and *comes* occupy adjacent cyclic areas (A_3 and A_0, respectively), they play unique trichords.

Example 11 (continued). Significant moments in the form of Webern's String Quartet, op. 28/1.

Throughout the variation Webern plays with this canonic differentiation through instrumentation. In the first phrase (mm. 16–21), each instrument plays precisely one of each canon's four trichords, which I have shown there with boxes. Those trichords—labeled below the passage—are unique but share a single pitch class whose recurrence highlights the canonic differentiation, as in the E♭ that initiates the cello's first trichord and ends its second.

As the variation comes to a close, these trichords recur in various diminutions and augmentations. In the *comes*, the final two trichords overlap to produce a set of pitch and rhythmic characteristics that anticipate—or act as an "upbeat" to—the following variation. Its boundary dyads, [F♯G] and [CC♯], become the boundary dyads of Variation 2's *dux*, and the composite rhythm of straight quarters becomes its rhythmic subject.

These "upbeats" connect every subsequent variation, and on Example 11 bolded boxes and lines highlight them. Variation 2, for example, cycles through overlapping hexachords whose simple rhythm is regularly augmented and diminished to reflect its transitional function. Its end, at (d), overlaps with the beginning of the second theme and third variation such that the *comes* culminates with the two tetrachords that initiate the variation's *dux*. The tetrachordal nature of the second theme, below (d), highlights the large-scale complement that relates it to the main theme. Tetrachords continue to percolate through the surface in Variation 4, where they create an even more explicit "upbeat" to the reprise at Variation 5. At this juncture, shown between (e) and (f), the fourth variation's *comes* is heard as three overlapping tetrachords that belong to A_0. Following a general pause in m. 79, the reprise begins with precisely those tetrachords, representing the *dux*'s return to A_0 and the culmination of a cyclic area progression that spans the movement.

Cycles, organicism, and "Kleiner Flügel Ahornsamen"

Webern's intellectual understanding of the world and his musical utterances are not generally separable from one another. His sense of the principles of natural and spiritual law inspired his compositional technique, his particular approach to twelve-tone composition, and his late cyclic techniques. Above all, Webern was a committed organicist. We know from his letters and lectures that the organicist outlook pressed him to find ways of expressing nature's deeper truths, as he saw them, in his music. We have already seen some organic patterns in the way large cycles control the musical fabric of his music to yield smaller patterns of cyclic organization. His fixation with organicism, however, went beyond this axiomatic sense of "part-whole integration." Webern's communications constantly emphasize the mysterious omnipresence of organicist relationships.[26] As Goethe (1988, 65) put it, "What is alike in idea may manifest itself in empirical reality as alike, or similar, or even totally unalike and dissimilar."[27] From this view, the absence of a perceived

26 Moseley 2017 offers an extended exploration of Webern's compositional technique as it was informed by the principles of organicism, particularly the way it expresses organicism's inherent mystery. Much of the argument there is inspired by studies of Webern's philosophy by Julian Johnson (1999) and Anne Shreffler (1994).

27 This passage from Goethe is discussed by Neff (1993).

connection between things does not negate the existence of such a connection. Nature—and, thereby, great music—communicates its organic structure in mysterious ways.

Webern's row cycles and their relationship to other musical objects frequently fit this description. In the music discussed above, those cycles generally represent a musical process hidden below the surface. They are omnipotent structures whose machinations exist at the deepest level of compositional design and order rows much as rows order pitch classes. Many of the analyses have revealed surface suggestions of that underlying organization, whether as cyclically alternating alignments in op. 29/1 and op. 31/2, recursive projections of inversional structure in op. 30, or cyclically organized motivic cells in op. 28/1 and 2. These suggest that the mysterious way in which surface and structure are related is a valuable analytic concern. Webern's late vocal music often affords us the best opportunity to study these ideas, not only because he and his frequent collaborator Hildegard Jone were attracted to organic accounts of nature and art but also because Webern felt very strongly that his music should reflect Jone's texts. His setting of Jone's "Kleiner Flügel Ahornsamen . . . ," the central movement of his Cantata, op. 29, is a particularly marvelous example of composition with row cycles that reveals the extraordinary extent to which Webern aimed to represent nature's mystery in his music.

Most simply put, Jone's poem describes the three-part cycle of a maple key (the seed-bearing object shown at the top of Figure 7), depicting its fall to the ground, its growth into a new tree, and the process's cyclic rebeginning. This three-part symmetrical cycle mirrors the three-part symmetrical structure of the maple key itself and is represented by Webern's three-part formal design, which is sketched above the poem in Figure 7. Outer A sections of the movement support large aligned cycles composed as canons. These canons are orchestral, operating independently of the soprano soloist, and their pointillistic, seemingly improvisatory realization clearly mirrors the maple key's windswept "float" to the ground described in the first and seventh lines. Those outer sections contrast markedly with the noncyclic B section. Jone's poem suggests a metaphor that joins the maple key's cycle to a human life cycle. Voice and orchestra come together during this passage. Their intersection and the passage's association with the A section's cycles seem to me a musical representation of the sort of organic transfiguration suggested in the poem.

Webern was quite excited that he could represent musically the sense of Jone's poem.[28] In a letter written to her at Christmas in 1939, he ventures

28 Webern writes to her: "I am sure you will understand all from the 'drawing' that has appeared through the notes" (Webern et al. 1967, 37). Jone did not read music, but she could likely see in the score many maple-key-like musical shapes and a profusion of gestures, most of which have a V-shaped contour resembling the maple key.

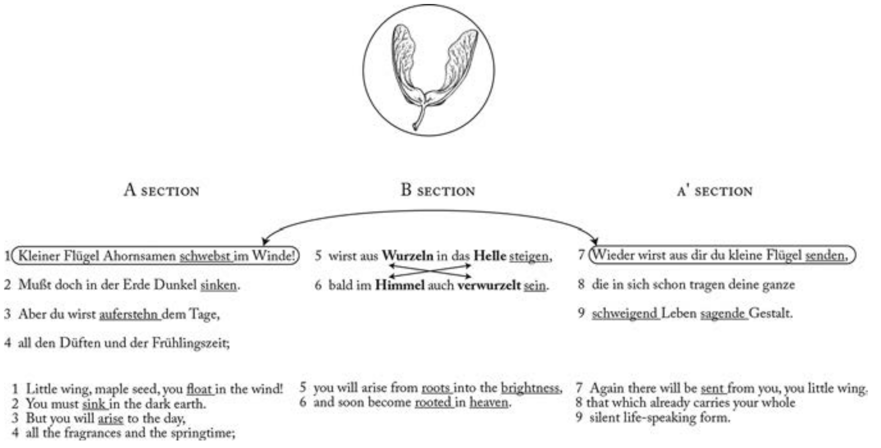


Figure 7. Hildegard Jone, "Kleiner Flügel Ahornsamen . . . ," from Fans Hortorum with annotations and a translation (Jone n.d.).

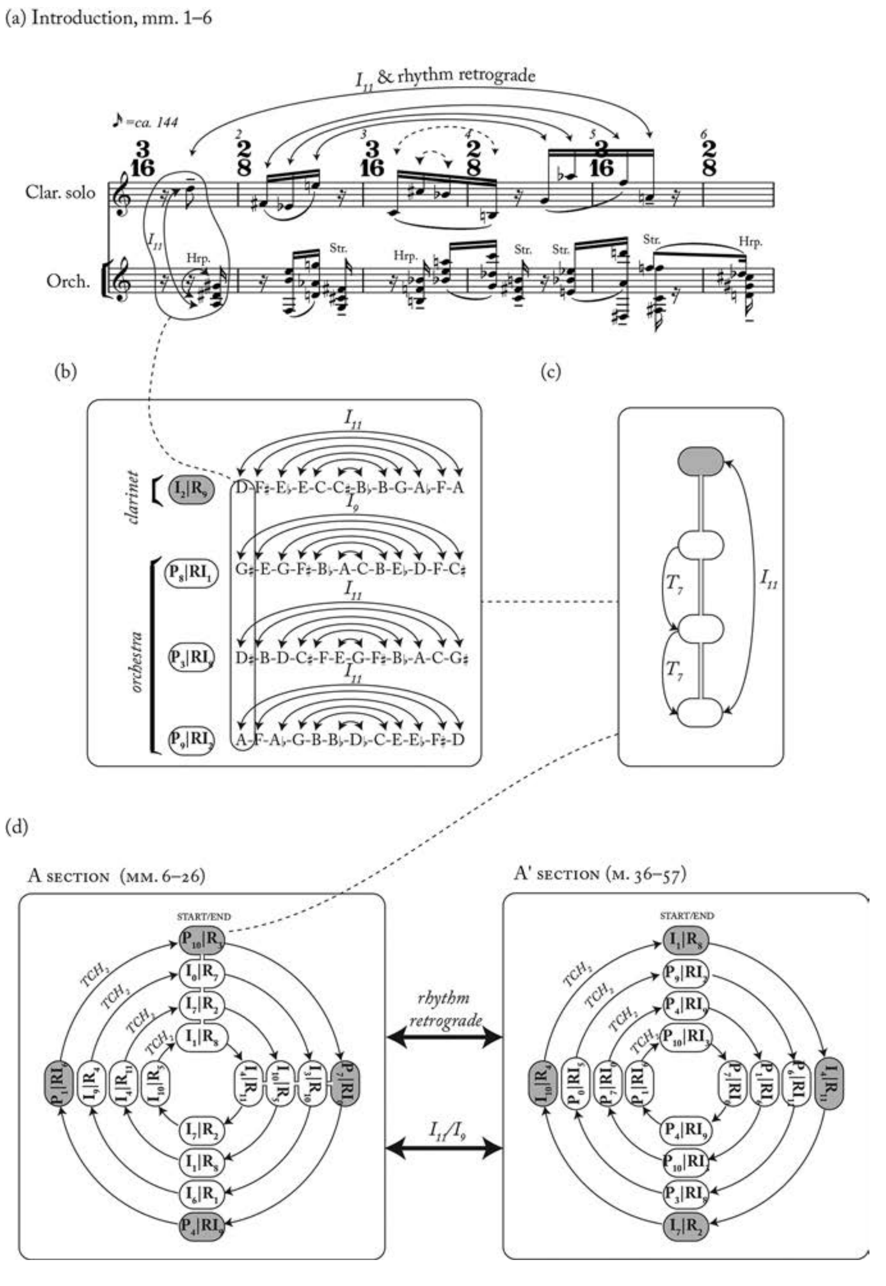
beyond describing the music's simple representational traits to explore a seemingly paradoxical interpretation of the poem that shaped his music:

> However freely it seems to float around ("float in the wind . . .")—possibly music has never before known anything so loose—it is the product of a regular procedure more strict, possibly, than anything that has formed the basis of a musical conception before (the "little wings," "they bear within themselves"—but really, not just figuratively—the "whole . . . form." Just as your words have it!) (Webern et al. 1967, 37)

Webern's letter seizes on an apparent contradiction. While the maple key's "little wings" cause it to flutter freely to the ground, that "loose" character belies the "strict" predetermination characterized by its seed. That is, though its flutter seems unpredictable it nonetheless bears within it the "whole . . . form."

Indeed, the strict/loose paradox offers a way into the formal, pitch, and rhythmic structure of this piece. Example 12 sketches a process of organic growth that is formed as a set of musical characteristics projected onto larger and larger spans, beginning with the introduction's solo clarinet and culminating in the aligned cycles that support the movement's A sections. First, the clarinet, shown on the top staff of Example 12(a), plays three (again, three) discrete tetrachords in a symmetrical rhythmic pattern.[29] Each tetrachord belongs to the same contour class, which itself resembles the shape of the maple key, and all three tetrachords are related in a large I_{11} pitch(-class) sym-

29 The final *tenuto* A4 plus rest corresponds to the eighth-note D5 that begins the clarinet's solo. Throughout this movement Webern routinely replaces longer note values with shorter values extended by a rest. Bailey (1991) describes this "value-replacement" technique, which is common in Webern's music.



Example 12. Webern's First Cantata, op. 29/2, "Kleiner Flügel Ahornsamen."

metry. One can hear the strict/loose relationship already in the clarinet's pitch symmetry. While the outer gestures produce that symmetry in register by surrounding B4/C5, it is broken by the inner gesture, whose looser, more abstract pitch-class symmetry is indicated with dotted arrows. The clarinet is imitated in the introduction by the orchestra (shown on the bottom staff of (a)). The orchestra's relationship to the clarinet further amplifies the symmetry in vertical and horizontal terms: when combined with the clarinet's initial D5, the resulting tetrachord, circled at (a), is a vertical presentation of the clarinet's strict I_{11} pitch symmetry. That strict pitch symmetry is then spun out into four unique series forms, shown at (b), that again reflect the clarinet's symmetry, albeit more loosely: three of the four row forms are I_{11} symmetrical; the fourth is I_9 symmetrical.[30] A transformation graph at (c) presents the abstract transformational structure binding these series together, and I_{11} is again shown to be significant. It joins the solo clarinet's row form, shaded at (c), to the three transpositionally related rows that create the orchestral accompaniment.

This abstract row structure becomes the basis of the alignments that produce the A section's cycles, shown at (d). These A sections contain the fluttering orchestral canons mentioned earlier and are produced from four-voice TCH_2 cycles. In their relationship to one another, we find a final, and much larger, manifestation of the introduction's symmetries: (1) they are associated by I_{11} and I_9, the same symmetries that related the pitch classes in the introduction's rows; and (2) they are large-scale rhythmic retrogrades of each other as well, echoing the rhythmic symmetry that created the clarinet solo. Summarizing Example 12 numerically puts the extent of this process of organic growth in context:

- At (a), two symmetries generate the clarinet's three-part, twelve-note solo.
- At (b), those symmetries produce both the clarinet's vertical relationship to the orchestra and the orchestra's row forms.
- At (c) and (d), the transformational structure of the introduction, imbued with the clarinet's pitch-class symmetry, becomes the basis for the alignment of the A section's cycles. Those cycles are transformational and rhythmic amplifications of the clarinet's two symmetries and involve nearly nine hundred pitch and rhythmic events—the bulk of the movement.

Yet much as the clarinet's symmetries had strict and loose components, the strict predetermination of each A section is realized in the loosest, most oblique way possible. None of the canon voices is played by a single instrument

30 In Webern's sketches (held at the Paul Sacher Stiftung in Basel, Switzerland), he first writes four rows that all have I_{11} symmetry. The subsequent sketch alters one to produce the I_9 symmetry we find in the final. It is not entirely clear why Webern makes this change, though I suspect that it is because he did not want to have the beginning and ending of the introduction feature the {A, D♯, G♯} trichord for reasons explored below.

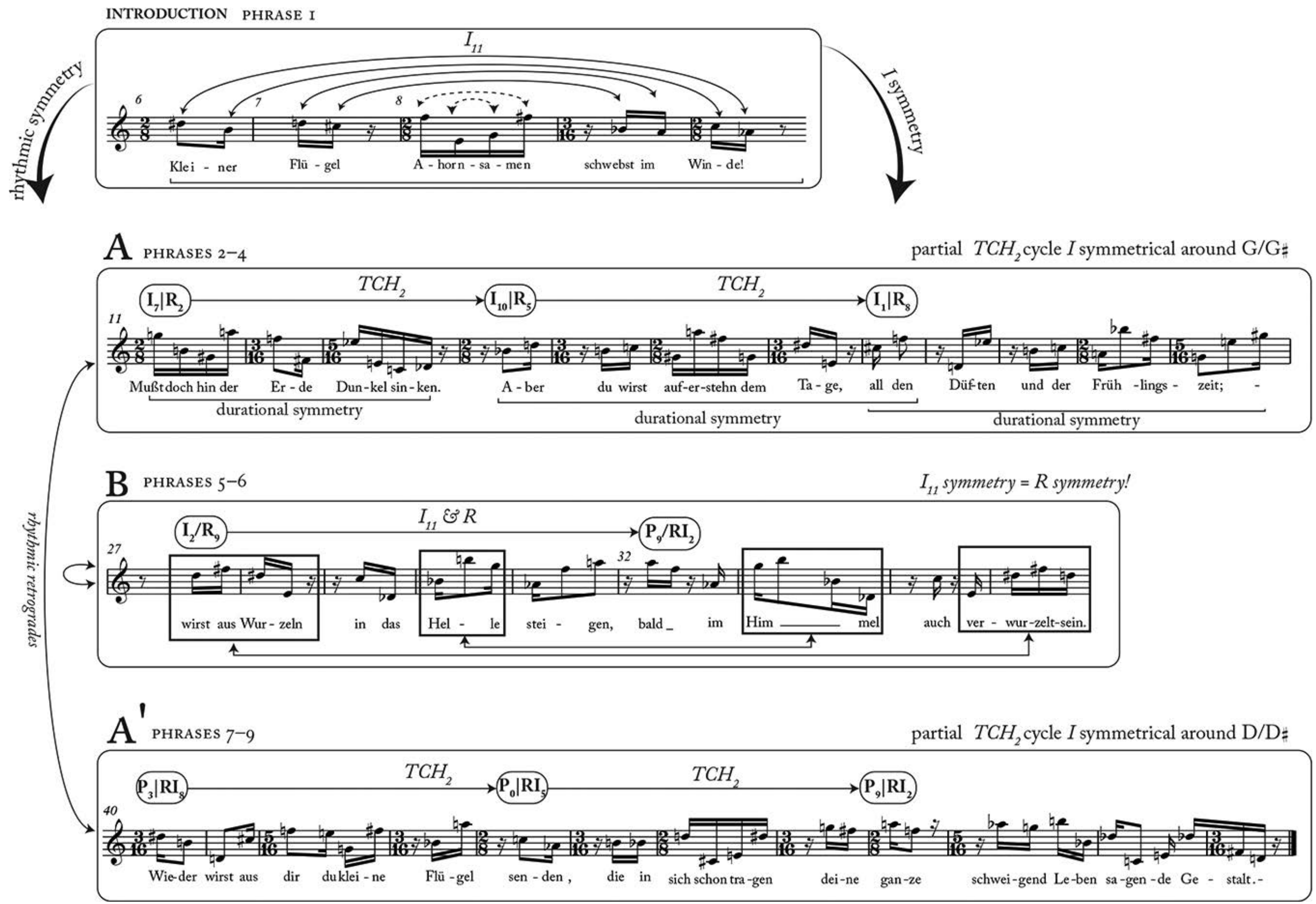
or in a single registral space, and though each is generated from an identical rhythmic series, Webern often replaces long note values with shorter ones (e.g., sixteenths become a thirty-second note plus a thirty-second rest). As a result, we hear short gestures tossed among the instruments—a seemingly random mélange of timbres, dynamics, and articulations whose carefully planned origins are entirely obscured.

Returning briefly to Jone's poem as a way into the movement's B section, Figure 7 highlights the metaphorical transfiguration mentioned earlier. Her careful retrograde association of "Wurzeln . . . Helle" and "Himmel . . . verwurzelt," forming the two center lines, ties the earthly "roots" (*Wurzeln*) reaching toward brightness to a divine, human "rooting" in heaven (*verwurzelt*). The retrograde assonance, and transformation of verb into noun, inspired a similar musical transfiguration, described in Examples 13 and 14.[31] While in the outer A sections, shown at the top and bottom of Example 13, the soprano does not interact with orchestra, it nonetheless absorbs the orchestra's symmetrical features—describing nature by taking on its characteristics.[32] In its own introductory phrase (mm. 6–10), the soprano echoes the clarinet solo's melody. Its three tetrachords present the "maple-key contour" and evocatively use "Ahornsamen" (maple key) as a fulcrum for a rhythmic and I_{11} symmetry that it shares with the clarinet. The subsequent phrases create larger symmetries, and at the movement's recapitulation, where the maple key is sent forth "again" in the poem ("Wieder wirst . . . senden"), Webern writes a musical rebeginning: the series form ($\mathbf{P_3|RI_8}$) that sets the soprano's introductory phrase begins a partial cycle realized as a rhythmic retrograde of the first A section. The recapitulation is therefore both a rebeginning and an expression of the way that the "little wings"—the "Ahornsamen" in the soprano's introductory phrase—"bear within themselves . . . the 'whole' . . . form."

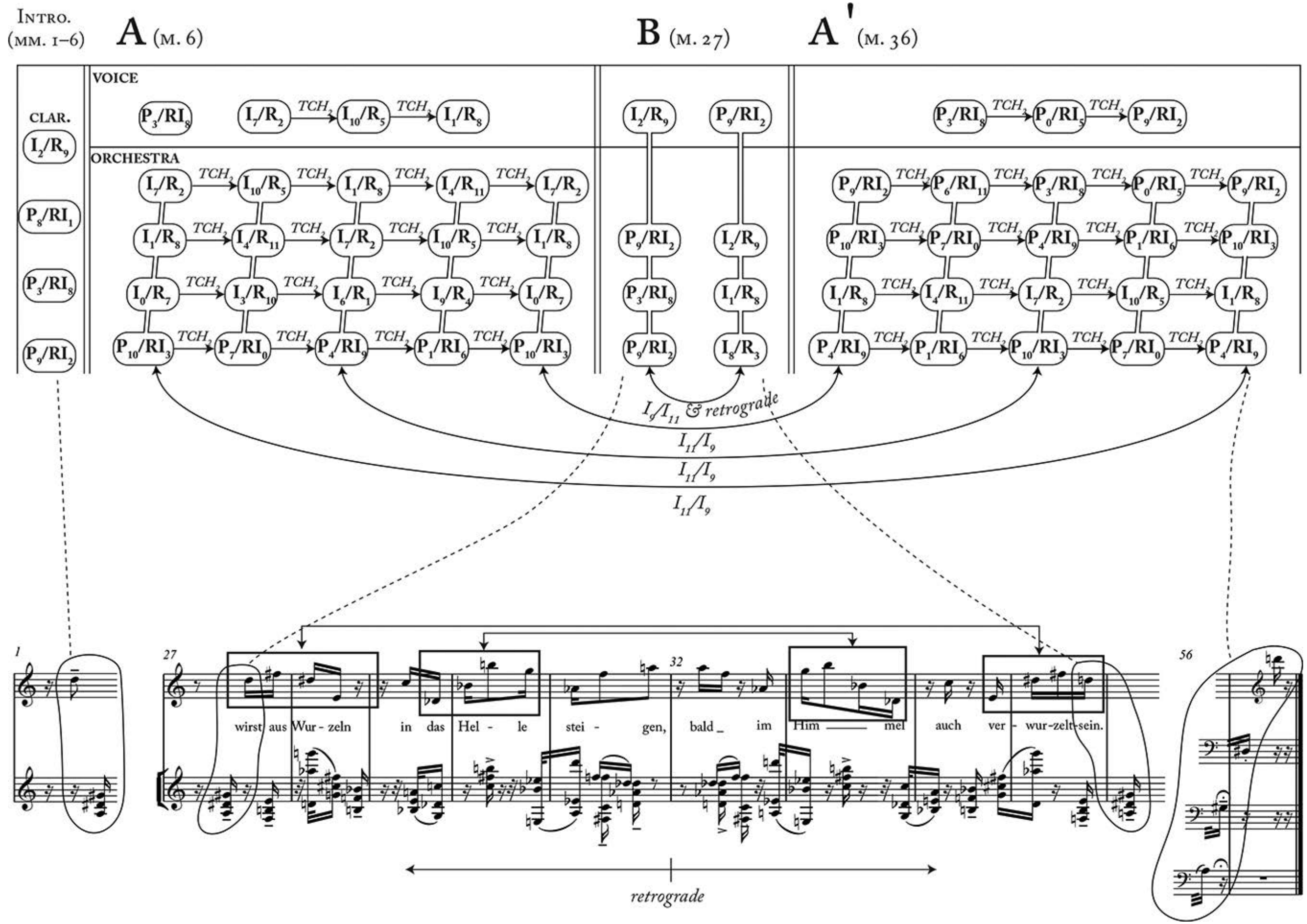
The B section is at the center of it all, and at this moment alone, the soprano comes together with the orchestra to assume the role that the clarinet played in the introduction. (In fact, it begins with the row form ($\mathbf{I_2|R_9}$) that organized the introduction's clarinet solo, underscoring the connection of the human to the natural.) But in the B section, there are no cycles; rather, Example 13 shows that Webern links row statements related to one another as we have seen elsewhere and in rhythmic retrograde. Significantly, though, this particular I_{11} is synonymous with pitch-class retrograde—a multiplicity made available by the *RI*-symmetry of the row class. Thus we hear the I_{11} symmetry transfigured. It becomes a retrograde, underscoring the poem's sense

31 In Webern's copy of the poem, held at the Paul Sacher Stiftung, he brackets those two lines. This correspondence between the earthly and the divine echoes the "correspondence theory" of Emmanuel Swedenborg. Swedenborg was a central figure in the Schoenberg circle (Covach 1992, 1996) and his ideas feature prominently in Webern's and Jone's conceptualization of the relationship of the natural and the divine (Johnson 1999; Reinhardt 1995).

32 In fact, the soprano's rhythm is derived from the orchestral canon's rhythmic subject. The soprano, though, echoes the orchestra nearly a phrase later.



Example 13. Rhythmic and *I*-symmetry in the soprano's music for Webern's First Cantata, op. 29/2, "Kleiner Flügel Ahornsamen."



Example 14. Large formal plan and a reduction of the central passage of Webern's First Cantata, op. 29/2, "Kleiner Flügel Ahornsamen."

of transfiguration by allowing Webern to associate musically "Wurzeln . . . Helle" to "Himmel . . . verwurzelt."

This central section is given below the large diagram of the movement in Example 14. The diagram reveals how the movement's middle is symmetrically joined to its surroundings. Like the large cycles, themselves echoes of the introduction, the B section is under the influence of a similar structural principles, but one that takes on a larger significance as I_{11} and I_9 become retrograde. Webern reinforces this larger relationship, also noted by Phipps (1984), with the circled tetrachords shown below the diagram. These associate the first and last sounds of the movement with the B section and are themselves I_{11} symmetrical. Thus in the movement's middle we hear a culmination of organic growth, a moment of musical transcendence, and a representation of the notion that even the "loosest" music, like those mysteries of nature and the divine, may suggest a set of "strict" principles through which it all was created.

Conclusions

Webern's first attempts at twelve-tone composition occurred nearly a hundred years ago, and though he composed only a small number of twelve-tone works, the ensuing century has generated an enormous outpouring of analytic studies demonstrating his grasp of the method's possibilities and his creative appropriation of them. The present study is in many ways a continuation of that analytic tradition. Like so many other compositional dimensions, Webern's interest in cycles did not take one simple form but was pursued in multiple directions, and he seems to have mined each of these for its compositional and expressive potential. At its foundation, his attention to cycles was a way of serially expanding the dimensional confines of the twelve-tone principle. Row cycles produce "horizontal" constructs that are longer than twelve notes but are determined serially and bound by the same pitch and intervallic constraints as the row itself. Aligned, the "vertical" polyphonic complexes of unfolding cycles are themselves imbued with the structural sense of the row, and—it must be emphasized—the cyclic, polyphonic complex itself became an object for compositional exploitation. In many of the late works, the properties and realizations of these cycles mirror the thematic content of the poems they set. The four-voice row cycle in "Blitz und Donner" (op. 31/1) possessed a set of chordal potentialities artfully aligned with the text to produce a set of "misremembrances." The three-part form of "Sehr tiefverhalten" (op. 31/2) was imbued with symmetries resulting from patterns of invariance embedded in $RICH_2$'s 12-cycle, which produced an unfolding of all forty-eight rows in a mirror of the poem's description of the circularity of time. In all of these late works, cyclic constructions have significant formal implications. Cycles unfurling at different speeds interlocked at a central formal moment in the first subject of the *Variations*, op. 30, and in the first movement of the String Quartet, op. 28, a formal fusion was fashioned from the complementary segmental derivation of two pairs of cycles. The abstract characteristics of a massive cycle of series forms were reflected formally and in miniature in “Kleiner Flügel Ahornsamen” (op. 29/2).

While we can only conjecture as to the reasons Webern found row cycles so appealing late in his life, the creative potential and distinctiveness of the approach must have been suggestive to him. In context, these cyclic compositional techniques also reveal a connection between Webern and other composers of his time who were interested in cycles as a way to conjoin object and process. Gollin (2007, 169) observes, in a study of Bartók’s cyclic techniques, a general principle that just as well applies to Webern’s music: “The structure of musical materials is not passive: their internal structural relationships have ramifications, impose constraints upon, and can actively shape the way those materials are used by a composer.” Here I showed how Webern’s cyclic practice demonstrates this reciprocal relationship through its reliance on transformation chains. When transformation chains generate cycles, the row’s intervallic properties are amplified onto the cycle: not only do the row’s intervals themselves dominate the cycle, but they also determine the cycle’s length, its invariance potential, and the relationship of the cycle’s parts. Practiced as such, twelve-tone cyclicism ensures that the row’s influence stretches the length of the cycle and becomes formally determinate.

Thus, when cycles structure musical form, the formal image itself has its origins in the row. I have suggested that this deep relationship reflects Webern’s organicist world view. Integrating cycles into his technique allowed compositional parts to reflect compositional wholes, as in the surface cycles in the first movement of the String Quartet, op. 28, which suggested the deeper ones that generated its form. This omnipresent structural force of cycles is often hidden but nearly always suggested in a way that is analytically interesting: the interlocking invariances that framed the passage from the *Variations*, op. 30, were surface manifestations of a more structural relationship between cycles; and the surface shapes and symmetries that began “Kleiner Flügel Ahornsamen” presaged deeper ones that were telescoped onto the movement’s middle. In this way, cycles seem to have been a means of satisfying Webern’s central aesthetic concern, which was to mirror musically his understanding of nature (Webern 1963, 11). It remains a pressing analytic concern, one for the next century of analysis, to better understand and describe how the masterful control of technique that we find in his music reflects the “deeper truths” that structure this music’s conception.

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