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Transposition Networks and Network Chains in Schoenberg's *Sechs kleine Klavierstücke*, Op. 19

by Mark Sallmen*

Abstract. Using David Lewin's (1987) discussion of Schoenberg's Op. 19, No. 6 as a starting point, this article develops an analysis of all six movements of Op. 19 based on transposition networks. The analysis associates not only multiple statements of a given network but also networks related by retrograde, inversion, or both, which are said to be of the same *network type*. Network-type repetition elucidates pitch-class connections within phrases, between adjacent and non-adjacent phrases within the same movement, and among passages from different movements. Since Schoenberg's pattern repetitions are often somewhat hidden, the analysis identifies features of the musical surface that help to clarify the network relationships. The networks often create *network chains*, which are (overlapping) series of networks of the same type and provide coherent ways to hear through complete phrases and movements. *Network-type chains*, which involve multiple network types, organize the large-scale network structure of the entire opus.

Keywords and phrases: Atonal music, transposition network, pitch class, Lewin, Schoenberg.

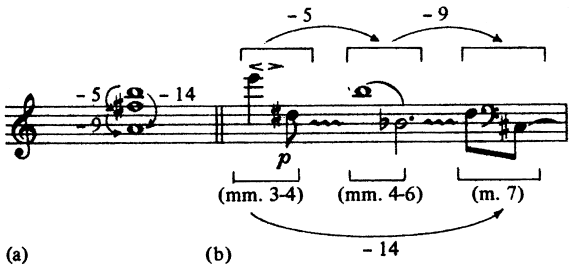
Introduction

David Lewin's discussion of Schoenberg's *Sechs kleine Klavierstücke*, Op. 19, No. 6, illustrates that the network of intervals −5 then −9 (overall −14) governs both the initial chord and the transposition of the falling ninth motif over much of the rest of the piece, a penetrating insight that clarifies the relationship of detail to large-scale structure.[1] Lewin's figure is reproduced here as Example 1. Using Lewin's analytic model as a starting point, I develop network interpretations involving all movements of the same opus. I adapt Lewin's model as needed to consider pitch-class instead of pitch relations, longer networks, more repetitions of a given network, and more than two levels of structure. The analysis associates not only multiple statements of a given network but also networks related by retrograde, inversion, or both. Such networks are said to be of the same *network type*. Coherence arises because each network type is articulated multiple times and a multifaceted account of the work emerges because these network-type recurrences vary in scope and analytic function.

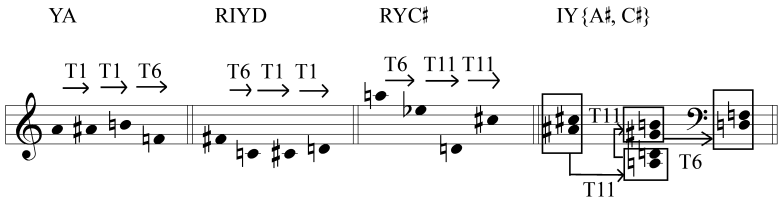
Various kinds of chains figure prominently in the analysis. I define a *network chain* as a series of networks of the same type that unfolds continuously (or nearly continu-

* I gratefully acknowledge Gail Dixon, Dave Headlam, Neil Minturn, and Robert Morris, who introduced me to these pieces and to the work of David Lewin and others.

[1] See Lewin (1987, 159–160). As Lewin notes, the last interval is actually a minor sixteenth, a compound minor ninth.



Example 1. Figure 7.1 from Lewin, Generalized Musical Intervals and Transformations *(1987); the falling-ninth motif in Schoenberg's Op. 19, No. 6.*



Example 2. Four orientations of network-type Y.

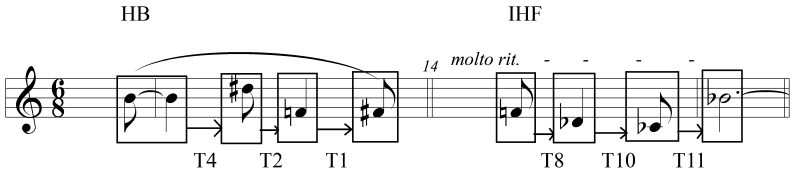
ously) over a part of the composition. A special kind of network chain is the retrograde-inversion chain, hereafter *RI-chain*, which is an overlapping series of RI-related networks that forms a consistent recurring pattern of transpositions.[2] Network statements that are temporally separated from others of the same type are said to be independent and do not participate in network or RI-chains. A *network-type chain* is a larger-scale phenomenon in which each link in the chain is a set of networks of one network type—which may include any combination of network chains, RI-chains, and independent networks—meaning that multiple network types work together to provide a coherent account of global network organization.

The general shapes of the networks employed in the analysis are straightforward, similar to one another, and closely related to Lewin's model. Each network articulates an ordered series of transpositions, as well as an overall transposition from beginning to end: T_4–T_2–T_1 (overall T_7), T_1–T_7 (overall T_8), and so forth.[3] For concision, the "overall" transposition is customarily omitted because it can be readily inferred from the ordered series, hence T_1–T_7, T_4–T_2–T_1, etc. Network types are labeled with uppercase letters in italics (*H*, *J*, etc.). Each network type can be articulated by any one of four series of transpositions, one for each orientation: prime (P), retrograde (R), inversion (I), and retrograde inversion (RI). Individual network statements are labeled by orientation, type, and referential pc(s), as with the examples of network-type *Y* shown in Example 2: YA, RIYD, RYC♯, and IY{A♯, C♯}, which articulate networks T_1–T_1–T_6, T_6–T_1–T_1, T_6–T_{11}–T_{11}, and T_{11}–T_{11}–T_6, respectively. By convention, the referential pc(s) appear at the beginning of P and I forms and at the end of R and RI forms. Networks are often articulated by a series of individual pcs (as with YA, RIYD and RYC♯) but also frequently by a series of dyads (as with IY{A♯, C♯}). Additional statements of a given network by the same series of pcs are differentiated by "prime" symbols (e.g. YA, YA′). RI-chains are labeled by their opening network and the subscript "RICH", as with JB_{RICH}, and other network chains simply list their component networks in order, as with YA–RIYD–RYC♯–IY{A♯, C♯}.

The analysis includes ten network types (*H, J, K, L, M, Q, W, X, Y, Z*) and seventy-five network statements, at least three of each type. Of these seventy-five, thirty-two organize into seven RI-chains, eighteen form other network chains, and twenty-five are independent. Five of the ten network types participate in network-type

[2] The use of RI-chains links this study to Gillespie (1992), an exploration of "Nacht" from *Pierrot Lunaire* that identifies various RI-chains constructed from a single network, T_3–T_8 (overall T_{11}). As Gillespie points out, the prevalence of this network in "Nacht" is first mentioned in Lewin (1982–1983, 335). RI-chains (RICH) are introduced in Lewin (1987, 180–188).

[3] Pitch-class transpositions in these networks replace pitch intervals in Lewin's model. The changes from pitch to pitch class and from interval language to transformation language should not be controversial because Lewin's original presentation of the analysis (1982–1983, 335–337) employed pc transpositions T_7 and T_3 (overall T_{10}) and because Lewin later states: "This is interval-language. Alternatively, we could use transposition-language to put the matter as follows: The three transposition-operations T_{-5}, T_{-9} and T_{-14} … move the falling-ninth motif *forwards in time* over Figure 7.1(b) …" (1987, 160; emphasis Lewin's).



Example 3. Schoenberg, Sechs kleine Klavierstücke. *Network-type* H *in movement 1. Used by permission of Belmont Music Publishers, Los Angeles.*

chains. Some network-type repetitions elucidate connections within movements, either within a single phrase, between adjacent or non-adjacent phrases, or throughout the movement. Others link passages from different movements, such as a specific connection between the end of one movement and the beginning of the next, or a mélange of references that simultaneously recalls multiple movements. Network-type chains contribute to a coherent view of the six-movement work as a whole.

As is often the case in Schoenberg's music, some features of the musical surface clarify a given pitch-class relationship while others obscure it. For example, a pc connection may be clarified or obscured by pitch layout, rhythm, register, meter, chordal/linear presentation, and/or the presence/absence of interpolated notes. The discussion of such features, which is crucial to making pc relations vivid and hearable, invokes several constructs from the music-theoretic literature in order to deal sensitively with the musical surface. At various times the analysis borrows Friedmann's (1985) *Contour Adjacency Series* and Morris's (1987) $CINT_1$, two names for the ordered string of contour intervals formed by adjacent notes in a series, and Morris's (1993) *contour maxima* and *minima*, which denote registral high and low points, respectively. Also, taking a cue from Lewin's (1987) and Morris's (1987) discussions of duration and time, the paper considers ordered series of durations from the attack point of one note to the attack point of the next. In addition, to address a musical situation where one pitch class does not participate in an otherwise precise transformation, I invoke Straus's (1997 and 2003) *near-transposition* (called *pseudo-transposition* by Lewin [1998]). In general, since the transposition-network approach focuses on *ordered* series of transpositions, it complements Greenbaum's (2009) analysis of the entire opus, which relies primarily on *unordered* "like-interval cells," especially 4–28[0369] and 3–12[048].[4]

The article is in three parts. Part 1 addresses network-type repetition within individual movements. It relates the first and last phrases of movement 1 to one another, provides movement-encompassing interpretations of movements 2 and 4, and links the final three phrases of movement 5 to one another. Part 2 identifies connections between and among movements. It begins by identifying relationships involving the four movements from Part 1 (1, 2, 4, and 5) and goes on to show that one phrase from movement 3 and all of movement 6 embed network types from other movements. Part 3 assists with a coherent global view by identifying patterns of network-type repetition, including network-type chains, and by exploring relationships among the network types.

1. Intra-Movement Connections

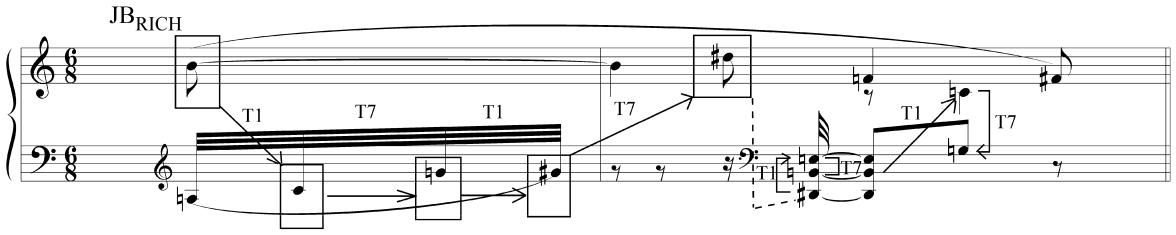
1.1 Movement 1

Network-type *H* frames the melody (see Example 3). The opening HB = B–D♯–F–F♯, which articulates T_4–T_2–T_1, is answered by the closing IHF = F–D♭–C♭–B♭, which articulates T_8–T_{10}–T_{11}. Not only does IHF invert HB's transposition network, but it also inverts/reverses other features of HB. Both HB and IHF include pcs B/C♭ and F but in HB they are ordered B–F and in IHF F–B(C♭). HB begins with its longest duration and concludes with an eighth–quarter–eighth rhythm whereas IHF starts with eighth–quarter–eighth and concludes with its longest note. In HB, B and F are the longer notes and in IHF they are the shorter ones. While HB ends on a metrically weak eighth, IHF ends on a downbeat, with a B♭ that is sustained for the remaining three measures of the movement.

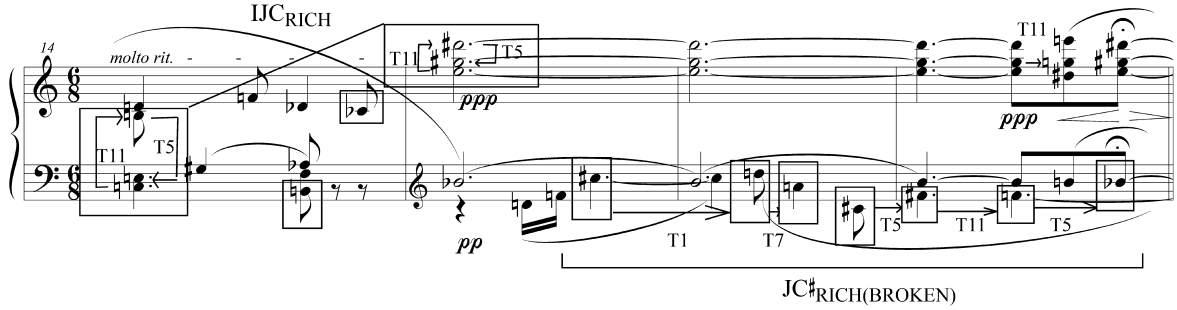
Network-type *J* also plays a primary role at the beginning and end of the movement. As shown in Example 4(a), the opening phrase embeds JB_{RICH} = B_4–C_4–G_4–$G♯_4$–$D♯_5$/$D♯_2$–E_3–B_2–C_4–G_3, an RI-chain that articulates a clear and lengthy alternation of T_1 and T_7.[5] Several aspects of the musical surface suggest thinking of JB_{RICH} in two halves. Its first half unfolds one pc at a time in major-seventh, minor-second, and perfect-fifth intervals whereas its second half is stated by two chords (three pcs then

[4] In addition to identifying these cells and their subsets throughout the work, Greenbaum discusses convergent melodic motion, linear symmetries such as D–E♭/B♭–A (+1/−1), contour symmetries, which are brief arch-forms such as A–B♭–A, and inter-movement connections that involve recurring sets of pitch classes.

[5] JB_{RICH} embeds networks JB = B–C–G, RIJG♯ = C–G–G♯, JG = G–G♯–D♯, RIJE = G♯–D♯–E, JD♯ = D♯–E–B, RIC = E–B–C and JB′ = B–C–G.



(a) Movement 1, beginning.



(b) Movement 1, end.

Example 4. Network-type J in movement 1. Used by permission of Belmont Music Publishers, Los Angeles.

two pcs) that emphasize minor ninths and perfect fourths. Also, if we think about network interaction it makes sense to consider the first half as a unit because it begins on B_4 and ends on $D♯_5$, the pitches that articulate HB's initial T_4. Further, this dividing point occurs as D♯ is articulated in *two* registers, as $D♯_5$ at the end of the first half and as $D♯_2$ at the beginning of the second, the highest and lowest pitches of the passage.

The end of the movement also contains both linear and chordal presentations of *J* (Example 4[b]). The linear ones appear during $JC♯_{RICH(BROKEN)}$ = C♯–D–A...C♯–F♯–F–B♭, which is an incomplete, somewhat re-ordered T_2 copy of JB_{RICH}. (An unbroken, complete, order-exact T_2 copy of JB_{RICH} would be $JC♯_{RICH}$ = C♯–D–A–B♭–F–F♯–C♯–D–A.) C♯–D–A is a leisurely T_2 recollection of the opening's ultra-quick B–C–G, and C♯–F♯–F–B♭ is a *retrograde* of B♭–F–F♯–C♯, the segment that an unbroken $JC♯_{RICH}$ would have produced. Chordal presentations articulate IJC_{RICH} = C–B–E–D♯–G♯–G. The downbeats of measures 14 and 15 state C–B–E and E–D♯–G♯ as chords. Although extra pcs minimally conceal the connection (D at the top of the first chord and B♭ at the bottom of the second), other features serve to clarify it: the identical pitch-space layout of the chords (major third plus perfect fifth), the pc that they share (E), and the intervening bass B and soprano C♭ that allow for a linear statement of C–B(C♭)–E from the first chord to the second. The G introduced during the final measure's half-step neighboring motion concludes IJC_{RICH} and completes its 6–20[014589], which, when combined with $JC♯_{RICH(BROKEN)}$'s [014589], completes the pc aggregate.[6]

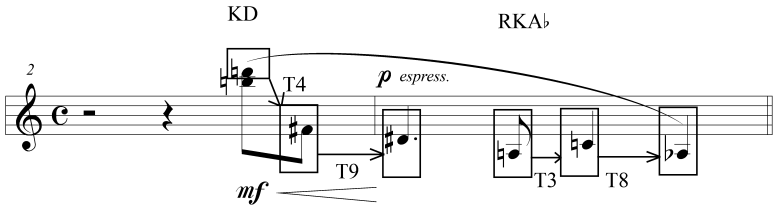
1.2 Movement 2

The analysis of movement 2 also features two network types. *K* organizes the opening phrase and *L* provides an interpretation of the movement as a whole. As shown in Example 5, the opening phrase begins with KD = D–F♯–D♯, which articulates T_4–T_9, and ends with RKA♭ = A–C–A♭, which articulates T_3–T_8. The division of network chain KD–RKA♭ into its component networks is reinforced by the appearance of the longest duration of the melody so far (dotted quarter) at the end of KD.

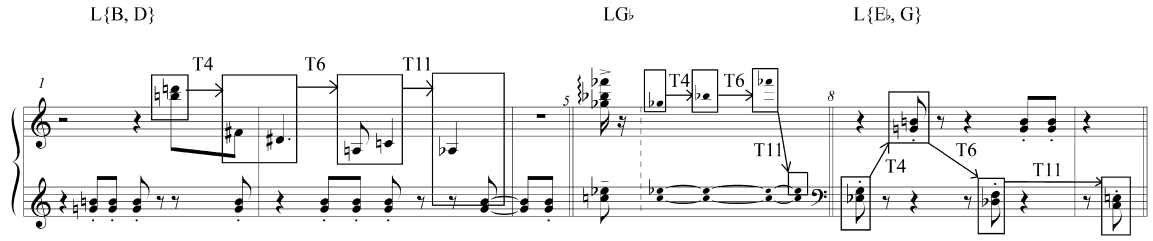
Network-type *L* provides another way to hear the opening phrase, one that relates it to the rest of the movement. Example 6 points out articulations of *L*: L{B, D}, LG♭, and L{E♭, G}, each of which articulates T_4–T_6–T_{11}. L{B, D} is a series of minor-third dyads (and one minor tenth) that

[6] Webern's *Bagatelle* Op. 9, No. 4—a work composed in the wake of his teacher's Op. 19—also features an aggregate composed of recurring T_1–T_7 and T_{11}–T_5 patterns (see Sallmen 2003, 36).

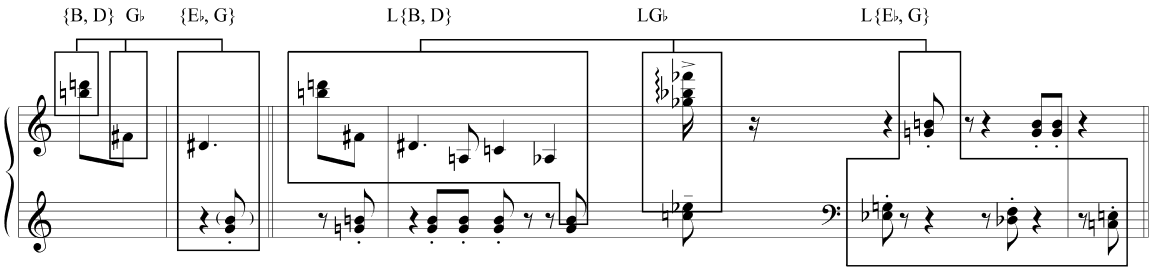
Overall, the *H* and *J* network relations interact somewhat with insights in Kramer (1988, 180–181) and Baker (1990, 187). Kramer points out that the opening phrase's B–D♯, A–C–(G)–G♯, {D♯, B, E}, and F–F♯ return at the end, transposed or retrograded, as {E, G♯}, D–F–C♯, D–A–C♯, and F♯–F, respectively. Baker identifies that the {E, D♯} dyad is transferred from the bass register within {D♯, B, E} at the beginning to the treble register within {E, G♯, D♯} at the end.



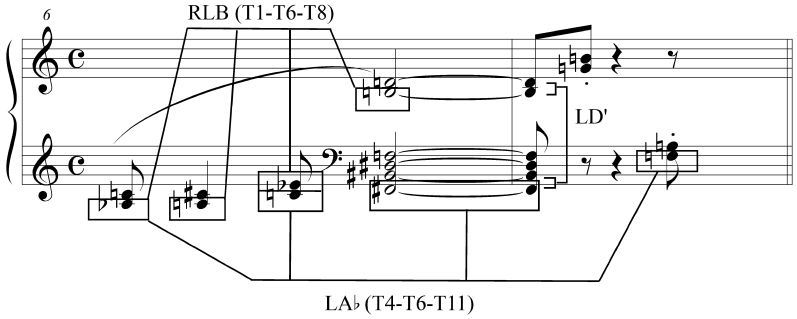
Example 5. Network-type K *in movement 2. Used by permission of Belmont Music Publishers, Los Angeles.*



(a)



(b) L{B, D}–LG♭–L{E♭, G} as an enlargement of opening.



(c) Additional *L*.

Example 6. Network-type L *in movement 2. Used by permission of Belmont Music Publishers, Los Angeles.*

extends from the beginning to the end of the initial phrase. Consistent registral ordering clarifies the T_4–T_6–T_{11} and facilitates the identification of upper and lower strands, respectively, LD = D–F♯–C–B and LB = B–D♯–A–A♭. Also, while the initial minor third is a simultaneous dyad, each of the others articulates its notes consecutively, in each case an eighth-note duration apart. Longer attack-point durations and large pitch intervals create divisions that reinforce the dyadic segmentation. The melody's largest pitch interval occurs between the first and second dyads, and attack-point durations of a dotted quarter and quarter separate the second, third, and fourth dyads from one another.

The next articulation of *L*, LG♭ = G♭–B♭–F♭–E♭, involves the strange gesture in m. 5 that contains the movement's only sixteenth notes, its only arpeggiated chord, its only accent markings, and its highest pitch. The *L* relationship shared with the opening melody is particularly gratifying because it justifies the presence of a fragment that is,

at least on the surface, very difficult to relate to the rest of the movement. Moreover, the *L* connection helps to *explain* some of the surface anomalies at LG♭. The arpeggiation creates G♭–B♭–F♭, *in that order*, and the brief duration allows E♭ to sound prominently thereafter—without disrupting the established pattern of {C, E♭}–{G, B} oscillations.

Finally, L{E♭, G} is a series of simultaneously struck major thirds woven into the repeating rhythmic pattern that traverses the last three measures. Once again, consistent registral ordering makes T_4–T_6–T_{11} clear and facilitates the identification of upper and lower strands, respectively, LE♭ = E♭–G–D♭–C, and LG = G–B–F–E. L{E♭, G} is particularly attractive because it concludes at {C, E}, the final bass dyad of the piece.

These articulations of network *L* provide deeper-level manifestations of surface phenomena. First, L{B, D}–L{E♭, G} provides a large-scale expression of the competition between major and minor thirds that is frequently apparent at the musical surface. In this regard, the {G, B}–{C, E♭} oscillations are of particular interest because, as a unit, they articulate 4–19[0148], the same set-type as the index pcs of L{B, D}–L{E♭, G}.[7] Second, L{B, D}–LG♭–L{E♭, G}, taken as a unit, is a large-scale articulation of the first five pcs of the movement, where its index pcs appear (Example 6[b]). The enlargement of an opening surface detail to create later, larger-scale structure recalls Lewin's analysis of movement 6.[8]

LA♭ = A♭–(A)–C–F♯–F, shown in Example 6(c), provides an *L*-related way to fill in the relatively lengthy gap between the end of LG♭ and the beginning of L{E♭, G}. Despite some wide pitch intervals and an interpolated pitch class, LA♭ unfolds in a straightforward way in the lower voice, starting shortly after LG♭ and concluding just before L{E♭, G} begins. As LA♭ unfolds, LB and LD receive varied, veiled re-presentations. That is, the parallel thirds embed RLB = A♭–A–E♭–B. The change from lower-voice A♭–A to upper-voice E♭ only slightly obscures RLB, and, although the six-note chord tends to conceal the connection of E♭ to B, we are preconditioned to hear E♭–B by the preceding two measures, where precisely these pitch classes appear (an octave higher) as the upper notes of the {C, E♭}–{G, B} oscillations. The retrograde relationship between LB and RLB creates a sense that mm. 2–6 are a tonally closed unit culminating with the exclamatory six-note chord, whose outer pairs of pitches articulate the notes within LD′ = D–F♯–C–B all at once. Taken as a unit, {LA♭, RLB, LD′} projects 3–10[036], precisely the set type that makes up the six-note chord that appears in their midst. Overall, L{B, D}–LG♭–{LA♭, RLB, LD′}–L{E♭, G} forms a network chain that stretches from the beginning of the movement to the end.[9]

1.3 Movement 4

Network-types *M*, *Q*, *W*, and *X* create local and large-scale coherence in the fourth movement. *M* suggests a musical rhyme involving phrases 1 and 2. That is, MD♭ = D♭–C–F–B–A articulates T_{11}–T_5–T_6–T_{10} with individual pitch classes at the end of phrase 1 and IM{E, F♯} articulates T_1–T_7–T_6–T_2 with a series of major seconds at the end of phrase 2 (see Example 7[b]). Two surface features help to clarify this connection. Attack-point durations divide MD♭ into two parts, D♭–C and {F, B}–A; this 2 + 3 division corresponds precisely with the partitioning of IM{E, F♯} suggested by its largest pitch interval, the major sixth. Further, D♭ is an anacrusis to C in MD♭ as is {E, F♯} to {G, F} in IM{E, F♯}.

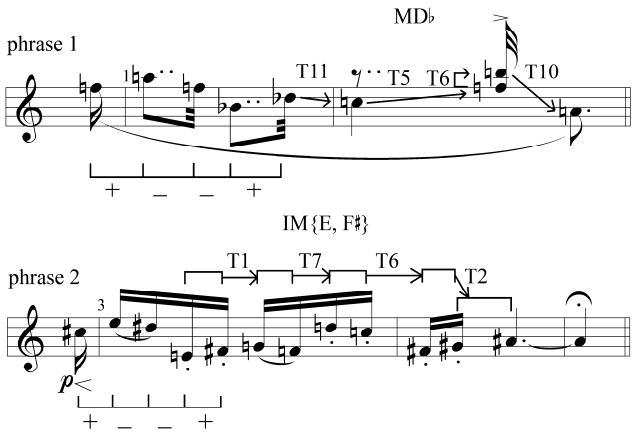
These supporting factors notwithstanding, many other surface features obfuscate rather than clarify the *M* relationship and so it may be helpful to practice hearing the connection. For example, consider Example 7(b),

[7] For other surface major/minor third interaction, consider the opening dyads ({G, B} and {B, D}); the T_3, T_4, T_8, and T_9 within KD and RKA♭, precisely the transformations associated with major and minor thirds; the *major* thirds ascending by half step that are answered immediately by *minor* thirds descending by the same interval (m. 6); and the six-pc chords (mm. 6 and 9) that are each generated by T_{11}—one based on 3–10[036], which emphasizes minor thirds, and the other on 3–12[048], which is saturated with major thirds.

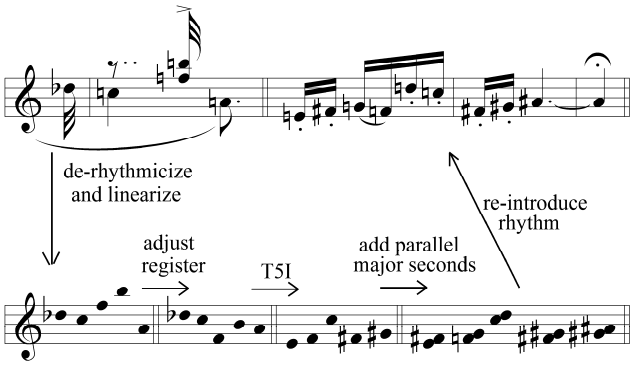
Numerous studies have addressed the major and minor thirds that saturate the movement. These sources focus variously on inversion (Guck 1977; Boge 1985; Dunsby and Whittall 1988; Delio 1994; Brown 2003), the dyad {G, B} as an "interval of reference" (Forte 1963), and melodic steps versus harmonic thirds/fourths (Kramer 1988; Greenbaum 2009).

[8] It also creates a pre-serial, atonal supplement to the extended tonal and twelve-tone examples of enlargement offered by Alegant and McLean (2001; in "Traumleben," Op. 6, No. 1, and *Piano Concerto*, Op. 42).

[9] The network interpretation of movement 2 functions independently of the numerous sources that address tonality and/or prolongation. For those not inclined towards the tonal/prolongational views, the networks provide an alternative; others can hear the network and tonal/prolongational interpretations as reinforcing, complementing, and/or contradicting one another. There has been lively debate over tonality in this movement. Travis (1966) provides a tonal-prolongational view of pitch structure in C major; Stein (1977) and Smith (1977) likewise provide discussions of tonal voice leading; Straus (1987) defines a set of criteria for prolongation, uses Travis's analysis as a negative example, and provides an alternative set-type analysis; Dunsby and Whittall (1988) also provide thoughtful consideration/critique of Travis's work. Lerdahl (1989) posits an atonal prolongational structure that invokes salience criteria and Väisälä (1999, 230) responds with a prolongational view in which "the structural status of harmonies and intervals is crucially influenced by the registral disposition of pitches." Leichtentritt (1951) suggests tonal centers for this movement (E minor, E major-minor, or B major) and for other movements in the set, while Hicken (1984) provides a Roman-numeral analysis of the entire opus.



(a) Comparing phrases 1 and 2.



(b) Hearing the *M* relationship.

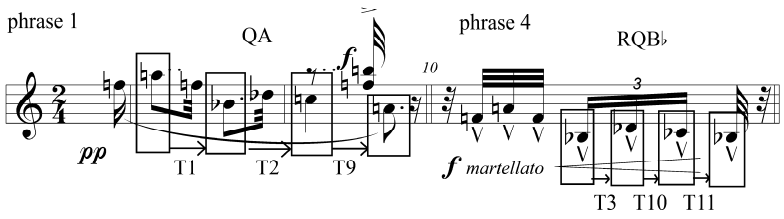
Example 7. Network-type M *in movement 4. Used by permission of Belmont Music Publishers, Los Angeles.*

which gradually transforms MD♭ into IM{E, F♯} through a six-step process. Following the arrows on the example, MD♭ is de-rhythmicized, linearized, adjusted registrally, subjected to T_5I, supplemented with parallel major seconds and then re-rhythmicized to create IM{E, F♯}. The reader may hear the relationship more vividly after traversing the example at first in its entirety in the order suggested by the arrows and then with intermediate steps gradually omitted until they are unnecessary. The articulation of a transposition network once by individual pitch classes and once by dyads corresponds to the *L* analysis of movement 2 as well as Lewin's analysis of movement 6. The *M* relationship also interacts with other features of this passage. The musical rhyme involving phrase endings complements the Contour Adjacency Series parallelism at phrase beginnings (<+−−+>)[10] and the *M* pair composes out the material that precedes it. That is, MD♭ and IM{E, F♯} end with pitch classes A and A♯ (=B♭), respectively, precisely the pitch classes of the first measure's metrically and durationally accented contour maximum and minimum.

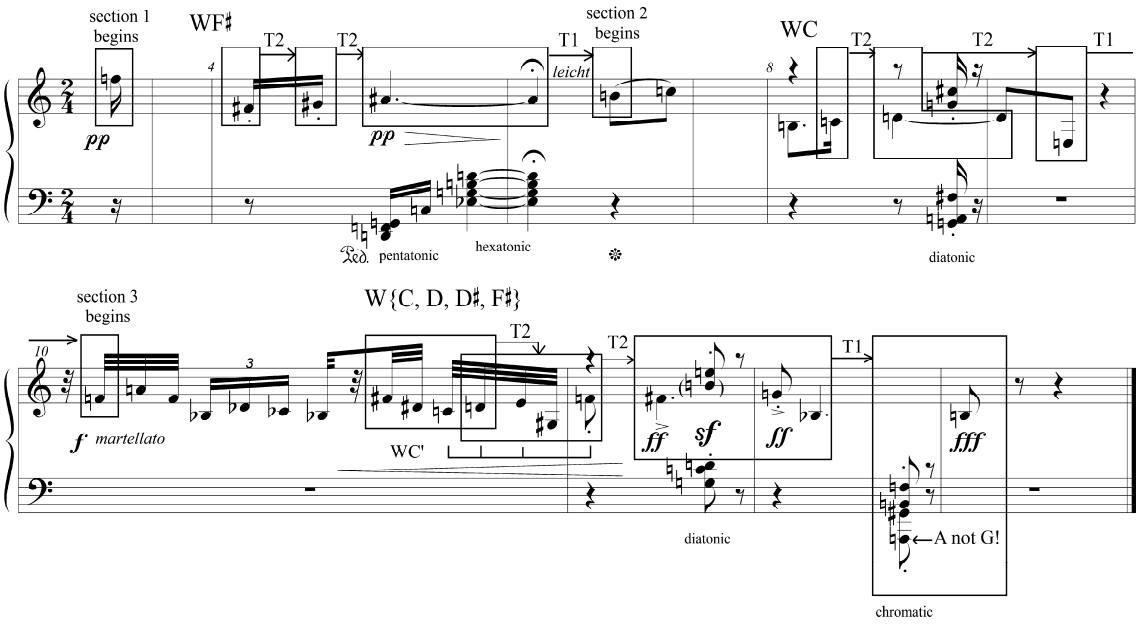
Phrases 1 and 4 each begin with F–A–F–B♭–D♭, but their continuations are different, C–{F, B}–A in phrase 1 and C♭–B♭ in phrase 4. Network-type Q provides a way to relate phrase 4's continuation to phrase 1. That is, phrase 1's metrically and durationally accented notes form QA = A–B♭–C–A, which articulates T_1–T_2–T_9, and phrase 4 ends with RQB♭ = B♭–D♭–C♭–B♭, which articulates T_3–T_{10}–T_{11}. As seen in Example 8, QA and RQB♭ each unfold in a consistent attack-point rhythm, QA in quarters and RQB♭ in triplet sixteenths. Taken as a unit, QA–RQB♭ composes out A–B♭, the first two pcs of QA.

Network-type *W* has a more global impact because

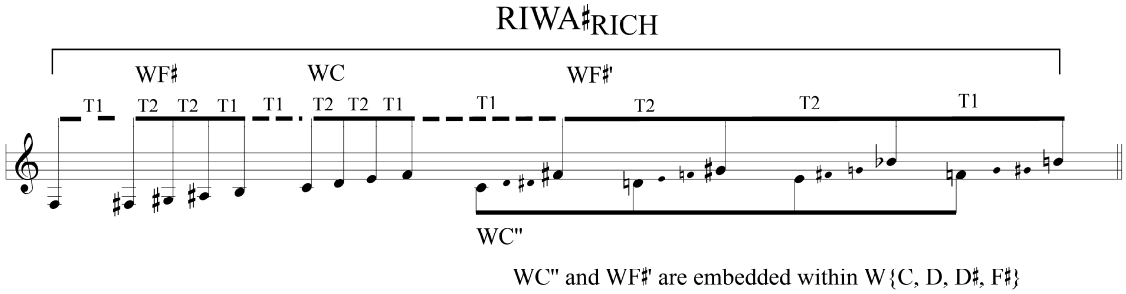
[10] These repeated contour-interval successions overlap with some of the contour relations set forth by Morris (1993) and Carter-Ényì (2016). For example, Morris identifies the articulation of <43021> by both A_5–F_5–$B♭_4$–$D♭_5$–C_5 in phrase 1 and E_5–$D♯_5$–E_4–($F♯_4$)–G_4–F_4 in phrase 2 (211–212). Morris defines the overall form; identifies the important set class, motives, and contour; develops a contour reduction algorithm; and explores the algorithm's implications for pitch-class structure. Carter-Ényì demonstrates contour recursion and auto-segmentation in an analysis of the movement.



Example 8. Network-type Q *in movement 4. Used by permission of Belmont Music Publishers, Los Angeles.*



(a) Anchor pcs and network-type *W*.

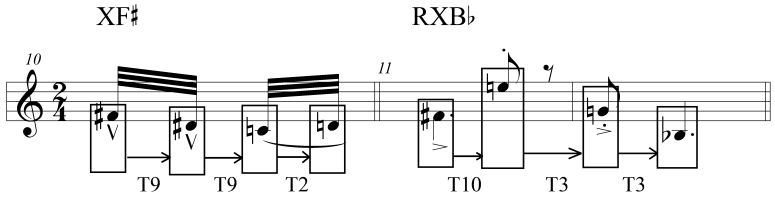


(b) Model of overall *W* interpretation.

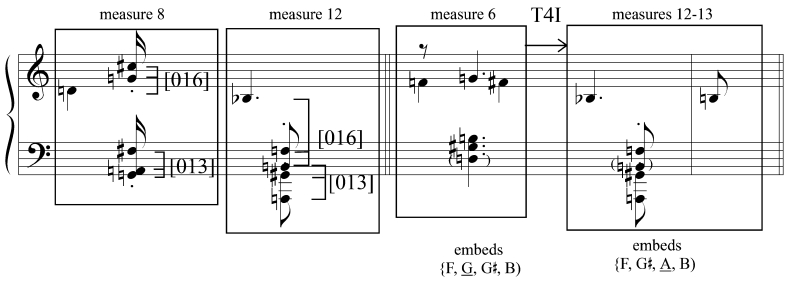
Example 9. Network-type W *in movement 4. Used by permission of Belmont Music Publishers, Los Angeles.*

it suggests a coherent listening strategy that spans from the first note to the last and incorporates many prominent features along the way. In this interpretation, the tritone-related pitch-classes F and B function as tonal anchors—especially F_5 at the beginning of section 1, B_4 at the beginning of section 2, F_4 at the beginning of section 3, and B_3 at the end. The middle two of these anchors are approached in similar fashion; that is, $F♯_4$–$G♯_4$–$A♯_4$ at the end of section 1 leads to B_4 at the beginning of section 2 in the same way that C_4–D_4–E_3 at the end of section 2 leads to F_4 at the beginning of section 3, creating T_6-related segments WF♯ and WC, respectively (Example 9[a]). The prominent and consistent formal placement of these pitch classes helps to clarify the relationship.

These note-to-note articulations of T_2–T_2–T_1 lead to the grand finale, W{C, D, D♯, F♯}, a series of 4–12[0236] that



Example 10. Network-type X *in movement 4. Used by permission of Belmont Music Publishers, Los Angeles.*



(a) 3-2[013] and 3-5[016]. (b) T4I.

Example 11. The anomalous A in the final chord. Used by permission of Belmont Music Publishers, Los Angeles.

is clarified by features of the musical surface. Beginning after a brief rest, the first and second [0236], which overlap by one pc, create a constant stream of thirty-second notes leading to F on the following measure downbeat. (This stream embeds yet another *W* reference, WC′.)[11] W{C, D, D♯, F♯}'s third [0236] includes the next three melody notes (F♯, G, and B♭) as well as E, the highest note of the punctuating chord that appears during the sustained F♯. The fourth [0236] in W{C, D, D♯, F♯} is stated by the final punctuating chord, over which the melody's B♭–B creates a retardation-like formation. That is, B♭ enters alone as the final note of the penultimate [0236], sustains through the arrival of the final [0236], to which it does *not* belong, and then resolves up by half step to B, which *is* part of the final [0236]. The sustaining of B♭ through the final punctuating chord creates a vertical sonority that embeds the chromatic tetrachord {G♯, A, B♭, B}, the piece's only simultaneously sounding 4–1 [0123]. This abrasive harmonic event acts along with *fortissimo* dynamics, *sforzandi*, and a hammering eighth–eighth–quarter attack-point rhythm to create a striking conclusion.[12]

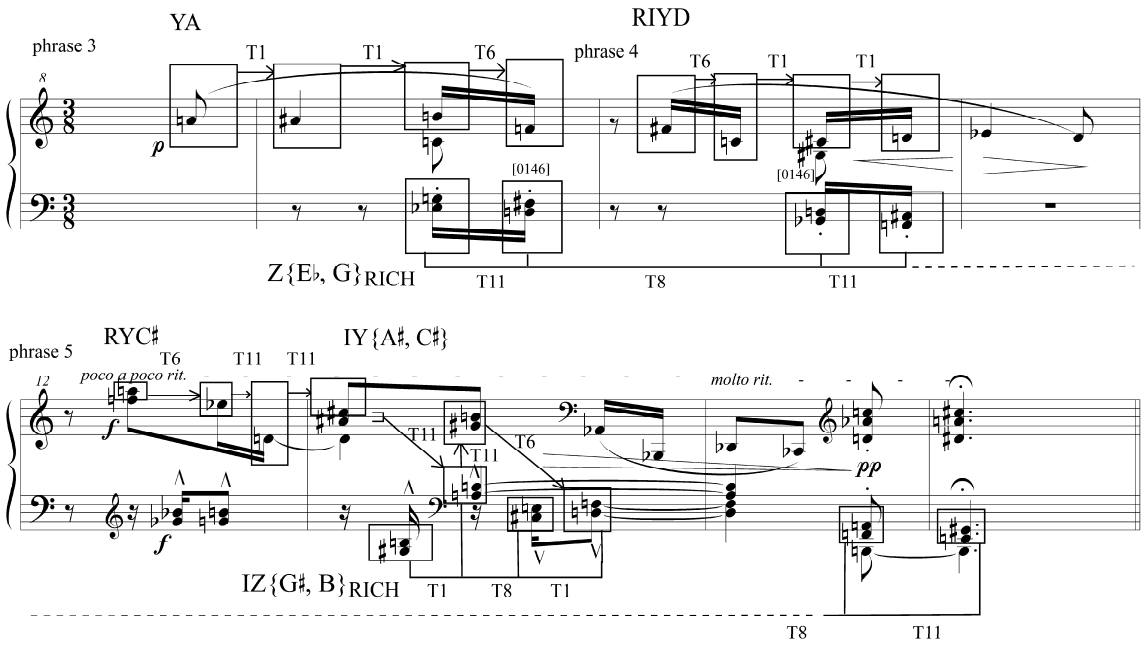
A brief aside to address two issues relating to W{C, D, D♯, F♯}: first, network-type *X* helps to strengthen the connection between the first and third [0236]. That is, XF♯ = F♯–D♯–C–D articulates T_9–T_9–T_2 and RXB♭ = F♯–E–G–B♭ articulates T_{10}–T_3–T_3. The RT_4 relationship between XF♯ and RXB♭ is clearly supported by R-related Contour Adjacency Series, <−−+> and <+−−>, and by the consistent use of intervallic inversion (in the tonal sense of the term), in which XF♯'s minor-third-then-major-second give way to RXB♭'s minor-seventh-then-major-sixths.

Second, there is an anomaly within W{C, D, D♯, F♯}'s final [0236]. A precise T_1 transformation of the third set would yield {F, G, G♯, B} but the final chord is actually {F, A, G♯, B}, a *near* transposition of the previous set. Perhaps G is omitted because G has already been so heavily emphasized: it appears on the preceding two beats and in all but one of the movement's other three-or-more-note chords. The choice of A as replacement also seems far from haphazard. First, it helps to create the aforementioned embedded chromatic tetrachord. Second, although {F, A, G♯, B} is not *the* [0236] that would create precise T_n relationships, it is *a* [0236] nonetheless, one related by T_4I to the expected one. Third, pitch-class A participates in a bass-register 3–2 [013], which, along with the tenor-range 3–5 [016], establishes a connection to the sonority in m. 8, shown in Example 11(a).[13] Finally, the final chord's A_1 strengthens a T_4I relationship with m. 6; the melodic F♯–F and

[11] WC′ is a subset of F♯–(D♯)–C–D–E–(G♯)–F–F♯, which, as Morris (1993, 201–211) points out, is T_6 of C–F♯–G♯–A♯–B–C in mm. 3–5.

[12] Morrison (1992) and Leong (2005, 2011) comment on syncopation and other rhythmic features of the piece. Morrison also addresses movements 2 and 3.

[13] Morris (1993, 215) identifies a registral descent articulated by A_5 (m. 1), A_4 (m. 2), A_3 (m. 7), and A_2 (m. 8). The series of [0236] also resonates with Morris's analysis, which identifies that phrase 2's "depth 2" maxima and minima, $C♯_5$–E_5–E_4–D_5–$A♯_4$, articulate set-class 4–12[0236], "the same set class as the *sforzando* chord at the end of the piece" (215).



Example 12. Network-types Y *and* Z *in movement 5. Used by permission of Belmont Music Publishers, Los Angeles.*

B♭–B are related by T_4I, as are the chordal {G, G♯, B} and {A, G♯, F}. (Each passage also contains one additional pc that does not participate in the T_4I relation.) Invariance under T_4I results in the appearance of F, G♯, and B in each passage—in fact, m. 6 embeds {F, G, G♯, B}, precisely the [0236] for which the later passage's {F, A, G♯, B} is a near match (see Example 11[b]).

Returning to the larger context, W{C, D, D♯, F♯} seems a fitting conclusion to the *W* interpretation for at least two other reasons. First, it embeds $WF♯' = F♯_4–G♯_3–B♭_3–B_3$ *and* $WC'' = C_4–D_4–E_5–F_3$, specific T_0 recollections of WF♯ and WC/WC′. Various surface features suggest a tendency to hear WF♯′ as primary. $F♯_4$ begins W{C, D, D♯, F♯}, B_3 ends it, and $G♯_3$ and $B♭_3$ are melodic contour minima.[14] This primacy is attractive for the global view because it suggests a recurring $\underline{T_1}–T_2–T_2–T_1$ pattern extending from the very first note of the composition to the very last. That is, the initial anchor pitch, F_5, along with WF♯, WC and WF♯′, create an RI-chain, $RIWA♯_{RICH}$.[15] Example 9(b) gives an arhythmic, registrally normalized, mildly re-ordered presentation of $RIWA♯_{RICH}$, in which T_1 and T_2 are articulated by ascending half and whole steps. The resulting "stepwise ascent" lends a sense of large-scale continuity to a piece that actually articulates a clear but unsystematic overall registral *descent*—for example, note the pitch anchors F_5/B_5 near the beginning, $B_3/F_4/B_4$ in the middle, and $B_2/F_3/B_3$ at the end. Overall, this movement-encompassing, *W*-based, stepwise scheme helps to account for the massive structural weight attached to the final note, B.[16]

1.4 Movement 5

Two network types, *Y* and *Z*, organize the pitch material in the final three of the movement's five phrases. Phrases 3, 4, and 5, given as Example 12, are separated from one another by eighth rests. Phrases 3 and 4 each feature a single-line melody accompanied only by a brief pair of chords. Phrase 3's melody, YA = A–A♯–B–F articulates $T_1–T_1–T_6$; phrase 4 begins with RIYD = F♯–C–C♯–D and concludes with E♭–D. This two-phrase melody is further unified by the lengthy series of T_1 that it embeds: A–A♯–B–. . .–C–C♯–D–E♭. Accompanying this melody, a string of bass/tenor major thirds articulates $T_{11}–T_8–T_{11}$, the beginning of $Z\{E♭, G\}_{RICH}$. The subsequent T_8-related 4–Z15[0146]s make $Z\{E♭, G\}_{RICH}$'s T_8 particularly vivid.

[14] Morris (1993, 210) points out the registral adjacency of the last three of these pitches.

[15] $RIWA♯_{RICH}$ = F–F♯–G♯–A♯–B–C–D–E–F–F♯–G♯–B♭–B also embeds RI orientations of *W*, $RIWA♯^{()}$ = F–F♯–G♯–A♯/B♭ and RIWE = B–C–D–E.

[16] Note that only the final phrase of this piece concludes with an anchor pc, a feature that seems to resonate with Ashforth's (1978, 206) comments on cadence: "in the recitative-like middle phrase of Op. 19, No. 4, the semi-cadence effect [in measure 9] is pronounced. On the other hand, this final fall may be made to sound more conclusive if followed by a compensatory step upwards, as in the final phrase of this same piece."

	1	2	3	4	5	6
H	**HB** **IHF**	IH{G, B}	HB_{frag}			
J	**JB_{RICH}** **$JC\sharp_{RICH(BROKEN)}$** **IJC_{RICH}**			IJD♭	RIJD♭	RIJ{C, B}
K	RKD♭–RKD♭′	**KD–RKA♭**	IKD♯			KD′
L		**L{B, D}–LG♭–{LA♭, RLB, LD′}–L{E♭, G}**	LF	RILA		
M				**MD♭–IM{E, F♯}**	MD♭′	
Q			RQD	**QA** **RQB♭**		RQ{B, B♭}
W		IW{F, A}		**$RIWA\sharp_{RICH}$ ....**		RWF♯ IW{E, D♯}
X			IXD	**XF♯–RXB♭**	RXF	
Y				IYD♭′	**YA–RIYD–RYC♯–IY{A♯, C♯}**	RYD♯
Z		RIZ{C, E}	RIZD	IZF_{RICH}.....	**$Z\{E\flat, G\}_{RICH}$** **$IZ\{G\sharp, B\}_{RICH}$**	RIZ{B, B♭}

Example 13. Network overview organized by network type and movement.

Phrase 5, which is longer than phrases 3 and 4 combined, and which has a thicker texture that reaches six voices at the end, answers phrases 3 and 4 in several *Y*- and *Z*-related ways. First, the upper voice of phrase 5 opens with RYC♯ = A–E♭–D–C♯, an answer to YA and RIYD in phrases 3 and 4. Second, the minor thirds that arrive on the eighth-note beats of measure 13 articulate IY{A♯, C♯} = T_{11}–T_{11}–T_6. The resulting network chain, YA–RIYD–RYC♯–IY{A♯, C♯}, involves all four orientations of *Y* (Y, RIY, RY, and IY). Third, the left-hand part of phrase 5 responds to phrases 3 and 4, not only with the left-hand *minor* thirds that articulate $Z\{G\sharp, B\}_{RICH}$ in a sixteenth-note attack-point rhythm, but also with *major* thirds at the very end that extend $Z\{E\flat, G\}_{RICH}$.[17]

[17] There are other pertinent ways to address this passage. For example, taking the top note articulated on each of the first four sixteenth-note subdivisions of phrase 5 yields A–B♭–E♭–D, precisely the series of pcs articulated by the relatively long melodic notes of phrases 3 and 4. Further, the treble-register major thirds that begin and end phrase 5, {F, A}–{G♭, B♭}–{G, B}. . .{A♭, C}–{A, C♯}, articulate a series of T_1 that recalls A–A♯–B–. . .–C–C♯–D–E♭ within phrases 3 and 4. Moreover, study of transpositions at the beginning of phrase 5 also reveals that the first two eighth-note beats treat major thirds in nearly the same way that the next two beats treat minor thirds. In each case a pair of right-hand dyads states T_{-2} in an eighth-note attack-point rhythm, a pair of left-hand dyads states T_{+1} in a sixteenth-note attack-point rhythm, and the second dyad of the right-hand pair arrives together with the second dyad of the left-hand pair. The only anomaly arises where a complete T_{-2} transformation of $\{F_5, A_5\}$ would yield $\{E\flat_5, G_5\}$, but the G_5 is missing, perhaps because G_4 appears in the left-hand dyad at precisely that moment. Finally, it is possible to hear the articulation of T_{10}–T_6 by C♯–B–F three times in succession: first, atop the minor thirds on the eighth-note beats of m. 13; then, respelled as D♭–C♭–F, in the bass register on the eighth-note beats of m. 14; and finally, unfolding much more slowly, atop the final chord of movement 5 and the first two chords of movement 6.

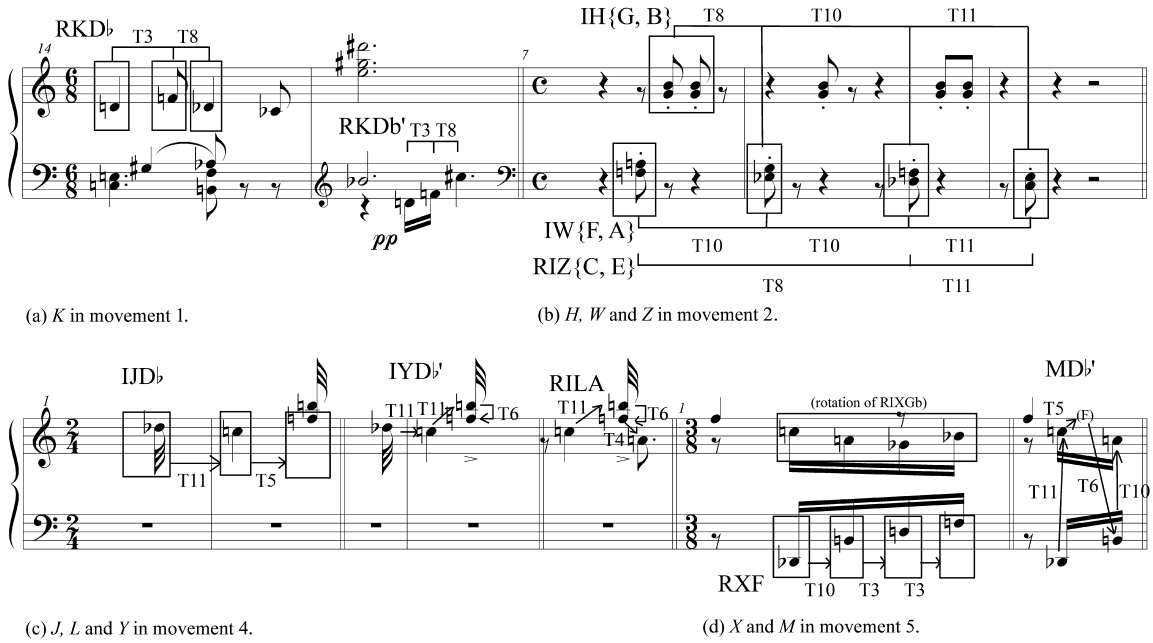
2. Inter-Movement Connections

The analysis so far has identified instances of each network type within a single movement and each network type helps to organize some aspect of its movement. Part 2 of the paper points out that these network types also appear in the other movements: *K* in movement 1; *J*, *W*, and *Z* in movement 2; *H*, *L*, and *Z* in movement 4; and *M* and *X* in movement 5. It also brings movements 3 and 6 into the fold. A single phrase in movement 3 embeds five network types (*H, K, Q, X, Z*) and movement 6 articulates *K*, *W*, and *Y* in local contexts and *Q*, *W*, and *Z* in an interpretation of larger-scale structure that engages and expands upon Lewin's falling minor ninths. Example 13 provides a chart of all network chains and other statements, organized by network type and movement. Networks from Part 1 are in boldface type and those from Part 2 are in plain text. This chart helps to summarize Part 1, to look ahead to Part 2, and to set the stage for the large-scale interpretations in Part 3.

2.1 Movements 1, 2, 4, and 5

The end of movement 1 includes RKD♭ = D–F–D♭, which articulates T_3–T_8, and a T_0 repetition of RKD♭ a measure later, RKD♭′ (Example 14[a]). RKD♭ overlaps with the beginning of IJF and RKD♭′ leads to the broken $JC\sharp_{RICH}$. RKD♭–RKD♭′ moves from the right hand to the left at the same time as chordal articulations of IJC_{RICH} move from left hand to right. The appearance of RKD♭–RKD♭′ near the end of movement 1 creates a link to the beginning of movement 2, where, as outlined in Part 1, the melody states KD–RKA♭.[18]

[18] The T_7 relationship between RKD♭ and RKA♭ is particularly clear because of the similar surface features (pitch interval and rhythm)



(a) *K* in movement 1.

(b) *H, W* and *Z* in movement 2.

(c) *J, L* and *Y* in movement 4.

(d) *X* and *M* in movement 5.

Example 14. Inter-movement network-type relationships among movements 1, 2, 4, and 5. Used by permission of Belmont Music Publishers, Los Angeles.

In addition to L{E♭, G}, the concluding element in the *L* interpretation discussed in Part 1, the end of movement 2 embeds network types originally found in movements 1, 4, and 5. First, IH{G, B}, which articulates T_8–T_{10}–T_{11}, uses the same set of major thirds as L{E♭, G} but reverses the order of the first two. This order reversal is possible because of the omnipresent {G, B}, which can be considered before or after {E♭, G}. The presence of IH{G, B} at the end of this movement refers to IHF at the end of the previous movement, creating a musical rhyme. Second, IW{F, A}, which states T_{10}–T_{10}–T_{11}, references movement 4. Third, omitting the second dyad of IW{E♭, G} uncovers RIZ{C, E} (T_8–T_{11}), which evokes the bass-register major thirds that state Z{E♭, G}$_{RICH}$ in movement 5. Overall, IH{G, B}, IW{F, A}, and RIZ{C, E} create connections among the *endings* of all four movements discussed so far (see Example 14[b]).

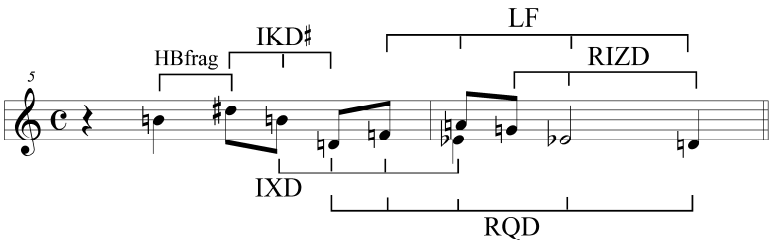
As shown in Example 14(c), the passage that articulates MD♭ at the beginning of movement 4 also articulates network types originally found in movements 1, 2, and 5. IJD♭ (T_{11}–T_5) recollects *J* in movement 1, IYD♭′ (T_{11}–T_{11}–T_6) alludes to *Y* in movement 5, and RILA (T_{11}–T_6–T_4) recalls *L* in movement 2. IJD♭ simply articulates the first three pcs of MD♭, but the simultaneous articulation of MD♭, IYD♭′, and RILA depends on the order ambiguity of {F, B}, which is ordered F–B in MD♭ but B–F in IYD♭′ and RILA. IYD♭′ also creates a specific connection to phrase 5 of movement 5, where its T_0 copy, IYC♯, appears as the upper notes of the minor thirds that state IY{A♯, C♯}, a connection bolstered by {F_5, A_5}–B♭$_4$, which precedes both IYD♭′ and IYC♯.

Finally, the opening of movement 5 articulates *X* and *M*. The bass line begins with RXF, which creates an immediate connection to RXB♭ in the penultimate measure of movement 4, and MD♭′ is a T_0 copy of MD♭ from near the beginning of movement 4 (see Example 14[d]). Despite the textural contrast of the two passages and the articulation of MD♭ by D♭–C–{F, B}–A and MD♭′ by {D♭, C}–F–{B, A}, several features make the connection clear. First, the double-dotted rhythms of MD♭ tend to separate D♭–C from B–A, creating the same dyads articulated by the one-against-one counterpoint in MD♭′, {D♭, C} and {B, A}. Second, the metrically-accented notes of MD♭ (C–A) appear in one voice of MD♭′ while the anacrusis notes of MD♭ (D♭–B) appear in the other voice of MD♭′. Third, F_5 is present, not only in the middle of both MD♭ and MD♭′ but also *before* both MD♭ (the anacruses to both beats of measure 1) and MD♭′ (the sustained quarter note). Overall, the MD♭/MD♭′ and RXB♭/RXF relationships simultaneously connect the opening of movement 5 to the beginning *and* end of movement 4.

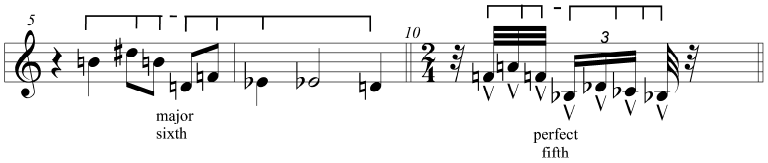
2.2 Movements 3 and 6

The discussion of movement 3 is limited to an excerpt from its third phrase, which features an intense jum-

and because of their surrounding material: the sustained major third {C, E} and descending minor third B–G♯ along with RKD♭ and, spread over a much longer period of time, the repeated major third {G, B} and descending minor third F♯–E♭ along with RKA♭.



(a) Network-types *K*, *Z*, *X*, *Q*, and *L*.



(b) Comparing movement 3, phrase 3 with movement 4, phrase 4.

Example 15. Movement 3, phrase 3. Used by permission of Belmont Music Publishers, Los Angeles.

ble of now-familiar network types. This phrase consists of a soprano-register melody that begins accompanied, first by only one other voice, then by several others, and finishes unaccompanied; Example 15(a) provides the soprano melody along with one alto-voice note. The melody begins with B_4–$D♯_5$, precisely the pitches that begin HB at the beginning of movement 1, continues with IKD♯, and concludes with RIZD. Further, IXB and RQD emerge clearly if one focuses on the stepwise connection between the melody's F and the alto-voice E♭ that immediately follows it, as does LF if one hears through the note G. RQD is of particular interest because, when combined with the melody's opening B–D♯–B, it creates a clear and specific reference to F–A–F and RQB♭ = B♭–D♭–C♭–B♭ in movement 4, phrase 4. This connection is very strong because of the *pitch-space* correspondences. Indeed, the passages would be perfectly transposed copies of one another except for an intervallic adjustment (descending major sixth B_4–D_4 versus descending perfect fifth F_4–$B♭_3$) and the addition of two notes (A–G covering the alto-voice E♭) (see Example 15[b]).

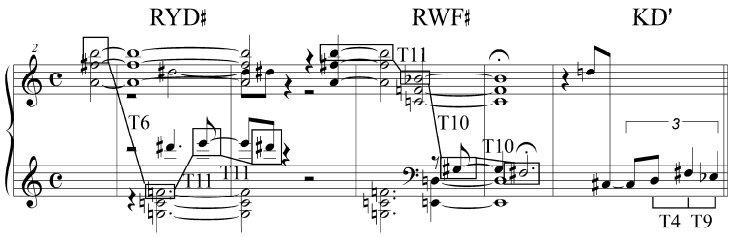
The analysis of movement 6 shows that each of Lewin's falling minor ninths is part of (or adjacent to) a string of pcs that creates a network-type connection to earlier movements, and that there are two additional minor ninths, which, when combined with Lewin's three, articulate further network connections to previous movements.[19] First, individual series of pcs articulate network-types *Y*, *W*, and *K*. As shown on Example 16(a), mm. 2–4 embed RYD♯ = B–F–E–D♯, which begins with the upper notes of the movement's primary trichords, B_5–F_4, skips over precisely the pitch that a contour reduction of the upper notes of the passage would prune out, $D♯_6$, and ends with E_6–$D♯_6$. RWF♯ = B–B♭–G♯–F♯ is clearly articulated in mm. 5 and 6 and KD′ = D–F♯–E♭ appears within the dramatic solo melody of m. 7. In all, RYD♯, RWF♯, and KD′ unfold along with the three falling minor ninths that comprise Lewin's network interpretation cited at the outset of this paper: E–D♯ at the end of RYD♯, B–B♭ at the beginning of RWF♯, and D–C♯ immediately preceding KD′.

Second, Lewin's interest in minor ninths can be extended to the final two measures of the movement. The penultimate measure of the movement features the "falling" minor ninth $\underline{C_5}$–$\underline{B_3}$.[20] C_5 is the upper note of the seven-voice texture and B_3 is the upper note of the left-hand part. Aspects of the harmony reinforce this minor ninth, especially once the half-step inner-voice motions are complete. At this point the right hand's {D_4, $G♯_4$, $\underline{C_5}$} is copied, precisely a minor ninth lower, by the left hand's {$C♯_3$, G_3, $\underline{B_3}$}. Adding the alto-register E♭ into the mix, the top and bottom tetrachords articulate T_{11}-related instances of 4–Z29[0137], with the middle-voice D being part of both sets (see Example 16[b]).[21] The final measure features the compound minor ninth, $\underline{B_5}$–$\underline{B♭_2}$. This repeats the

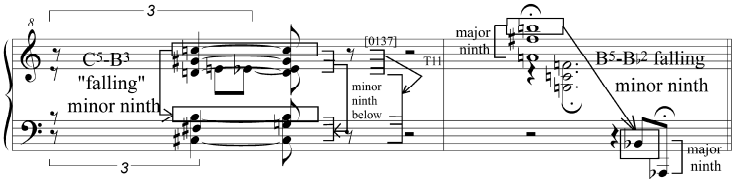
[19] Op. 19, No. 6 has seen a variety of other analytic approaches, such as Forte (1973; set class and K/Kh chart), Lewin (1981; rhythm), Dunsby and Whittall (1988; extended/implicit tonality, symmetry, motive, and set class), Lerdahl (1989, 2001; prolongation), and McKee (2005; historical context and narrative). Lewin (1990, 83–85) employs numerous network interpretations of the opening chord as part of the introduction of Klumpenhouwer networks.

[20] Although C_5 and B_3 enter together and are sustained for the same duration, it is still possible to hear a *falling* minor ninth. The ability to hear one note then another, even though they enter together, is well established by Lewin's interpretation of the opening chord of the movement.

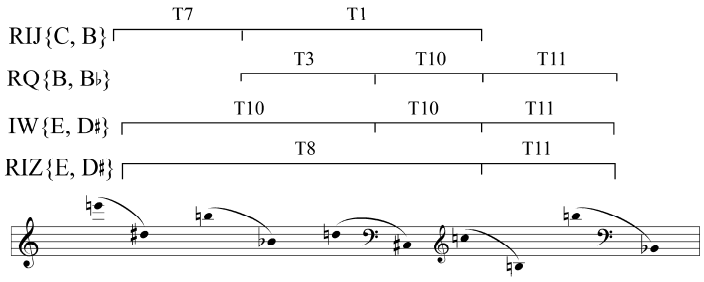
[21] The articulation of T_1/T_{11}-related 4–Z29[0137]s here comple-



(a) *Y*, *W* and *K*.



(b) Two additional falling ninths.



(c) Networks involving the falling minor ninths.

Example 16. Movement 6. Used by permission of Belmont Music Publishers, Los Angeles.

pitch classes of B_5–$B♭_4$, the second of Lewin's falling minor ninths, and articulates a minor twenty-third, which is an octave wider even than the minor sixteenth D_5–$C♯_3$ from Lewin's interpretation. B_5 and $B♭_2$ top major-ninth dyads: {$\underline{B_5}$, A_4}, the outer notes of the initial trichord, and, precisely a minor twenty-third lower, {$\underline{B♭_2}$, $A♭_1$}.

Appending C_5–B_3 and B_5–$B♭_2$ from Example 16(b) to the trio of minor ninths from Lewin's analysis (Example 1) creates the series of five minor ninths shown in Example 16(c). This series, which articulates T_7–T_3–T_{10}–T_{11}, establishes connections to earlier movements through several well-known network types. First, omitting the third and fifth dyads in the series leaves RIJ{C, B}, which articulates T_7–T_1, a reminder, primarily, of movement 1. Second, omitting the first dyad in the series leaves RQ{B, B♭}, which articulates T_3–T_{10}–T_{11}; a reference to network-type *Q* related phrases 1 and 4 of movement 4, and also appeared in movement 3, phrase 3. Third, omitting the second dyad in the series of falling minor ninths leaves IW{E, D♯}, which articulates T_{10}–T_{10}–T_{11}. IW{E, D♯} recalls movement 4, where *W* is primary, as well as IW{F, A} at the end of movement 2. We can now hear *W*-based endings to each even-numbered movement, which divides the opus into three pairs of movements; that is, movement 2's IW{F, A} and movement 6's IW{E, D♯} articulate "descending stepwise" motion (T_{10}–T_{10}–T_{11}), in contrast to movement 4's W{C, D, D♯, F♯}, which articulates "ascending stepwise" motion (T_2–T_2–T_1). Fourth, omitting the second and third dyads of the series leaves RIZ{B, B♭}, which articulates T_8–T_{11}, a reference to network-type *Z*, a primary feature of movement 5 that also appears in movements 2 and 3.[22] Overall, the network statements in this movement create a slow, contemplative summary of the remainder of the opus.[23]

ments the T_3/T_9-, T_4/T_8-, and T_2/T_{10}-related [0137]s articulated by L{B, D}, L{E♭, G}, and the last four dyads of M{E, F♯}, respectively.

[22] There is a contour-related reason for choosing precisely these three dyads. Taking the highest note of each dyad produces E_6–B_5–D_5–C_5–B_5. Applying the contour reduction algorithm to this series prunes out B_5–D_5, leaving E_6–C_5–B_5, precisely the top notes of RIZ{B, B♭}.

[23] As is well documented, movements 1–5 were all composed in a single day and movement 6, alone, several months later in response to Mahler's death. McKee (2005) provides a thorough treat-

1	2	3	4	5	6
	L{B, D}– LG♭–{LA♭, RLB, LD′}–L{E♭, G}		RIWA♯$_{\text{RICH}}$.....		

(a) Accounting for pitch structure throughout an entire movement.

1	2	3	4	5	6
			MD♭ –IM{E, F♯}	YA–RIYD–RYC♯–IY{A♯, C♯} Z{E♭, G}$_{\text{RICH}}$ IZ{G♯, B}$_{\text{RICH}}$	

(b) Relating adjacent phrases within the same movement.

1	2	3	4	5	6
HB/JB$_{\text{RICH}}$ IHF/JC♯$_{\text{RICH(BROKEN)}}$ IJC$_{\text{RICH}}$			QA RQB♭		

(c) Relating non-adjacent phrases within the same movement.

1	2	3	4	5	6
RKD♭–RKD♭′	KD–RKA♭		XF♯–RXB♭	RXF	

(d) Linking the end of one movement to the beginning of the next.

1	2	3	4	5	6
			MD♭	MD♭′	

(e) Linking movement beginnings.

1	2	3	4	5	6
IHF	IH{G, B} IW{F, A} RIZ{C, E}		RIWA♯$_{\text{RICH}}$ IZF$_{\text{RICH}}$	Z{E♭, G}$_{\text{RICH}}$	IW{E, D♯} RIZ{B, B♭}

(f) Linking movement endings.

Example 17. Network-type relationships organized by formal placement.

3. Large-Scale Network Organization and Network-Type Relationships

The foregoing analysis employs ten network types and seventy-five network statements. It identifies many and varied intra- and inter-movement connections involving three complete movements and portions of three others. Part 3 aims to clarify the overall view of this complex picture in three ways: it reviews network relationships by formal placement, identifies some opus-encompassing network-type chains, and creates super-networks that help to illustrate relationships among network types. Throughout the ensuing discussion, please consult Example 17.

Two network types account for pitch structure throughout an entire movement: *L* in movement 2 and *W* in movement 4. Some network relationships link adjacent phrases within the same movement, as with *M* in phrases 1 and 2 of movement 4 and *Y* and *Z* in phrases 3–5 in movement 5, while others relate non-adjacent phrases, as with *Q* in phrases 1 and 4 of movement 4 and *H* and *J* at the beginning and end of movement 1. Network types link the ending of one movement to the beginning of the next (*X* in movements 4 and 5), the beginnings of adjacent movements (*M* in movements 4 and 5), and the endings of multiple movements (*H* in 1 and 2; *W* in 2, 4, and 6; and *Z* in 2, 4, 5, and 6).

It is attractive to consider how one or a few network types might provide a way to hear all six movements as a unified whole. There is no single network type that relates all six movements to one another, although *Z* comes close, appearing in all but the first, as shown in Example 18(a). However, as shown in Example 18(b), there is an interesting way to hear through the six movements that engages only three network types. *K*, *W*, and *Y* appear in this order, forming a network-type chain, in the first five move-

ment of Op. 19, No. 6 as Schoenberg's musical response to Mahler's death, including multi-faceted historical research, connections to nineteenth-century musical tradition, and a narrative reading of the movement. For an account of Op. 19 in the context of Schoenberg's atonal works, consult Simms (2000).

	1	2	3	4	5	6
Z		RIZ{C, E}	RIZD	IZF$_{\text{RICH}}$.....	Z{E♭, G}$_{\text{RICH}}$ IZ{G♯, B}$_{\text{RICH}}$	RIZ{B, B♭}

(a) A network type that appears in movements 2–6.

	1	2	3	4	5	6
K	RKD♭–RKD♭′	KD–RKA♭	IKD♯			KD′
W		IW{F, A}		RIWA♯$_{\text{RICH}}$....		RWF♯
Y				IYD♭′	YA–RIYD–RYC♯–IY{A♯, C♯}	RYD♯

(b) A network-type chain in movements 1–5 and its retrograde summary in movement 6.

	1	2	3	4	5	6
H	HB IHF	IH{G, B}	HB$_{\text{frag}}$			
K	RKD♭–RKD♭′	KD–RKA♭	IKD♯			KD′
L		L{B, D}–LG♭–{LA♭, RLB, LD′}–L{E♭, G}	LF	RILA		
X			IXD	XF♯–RXB♭	RXF	
Y				IYD♭′	YA–RIYD–RYC♯–IY{A♯, C♯}	RYD♯

(c) A network-type chain that spans all six movements.

Example 18. Network-type chains.

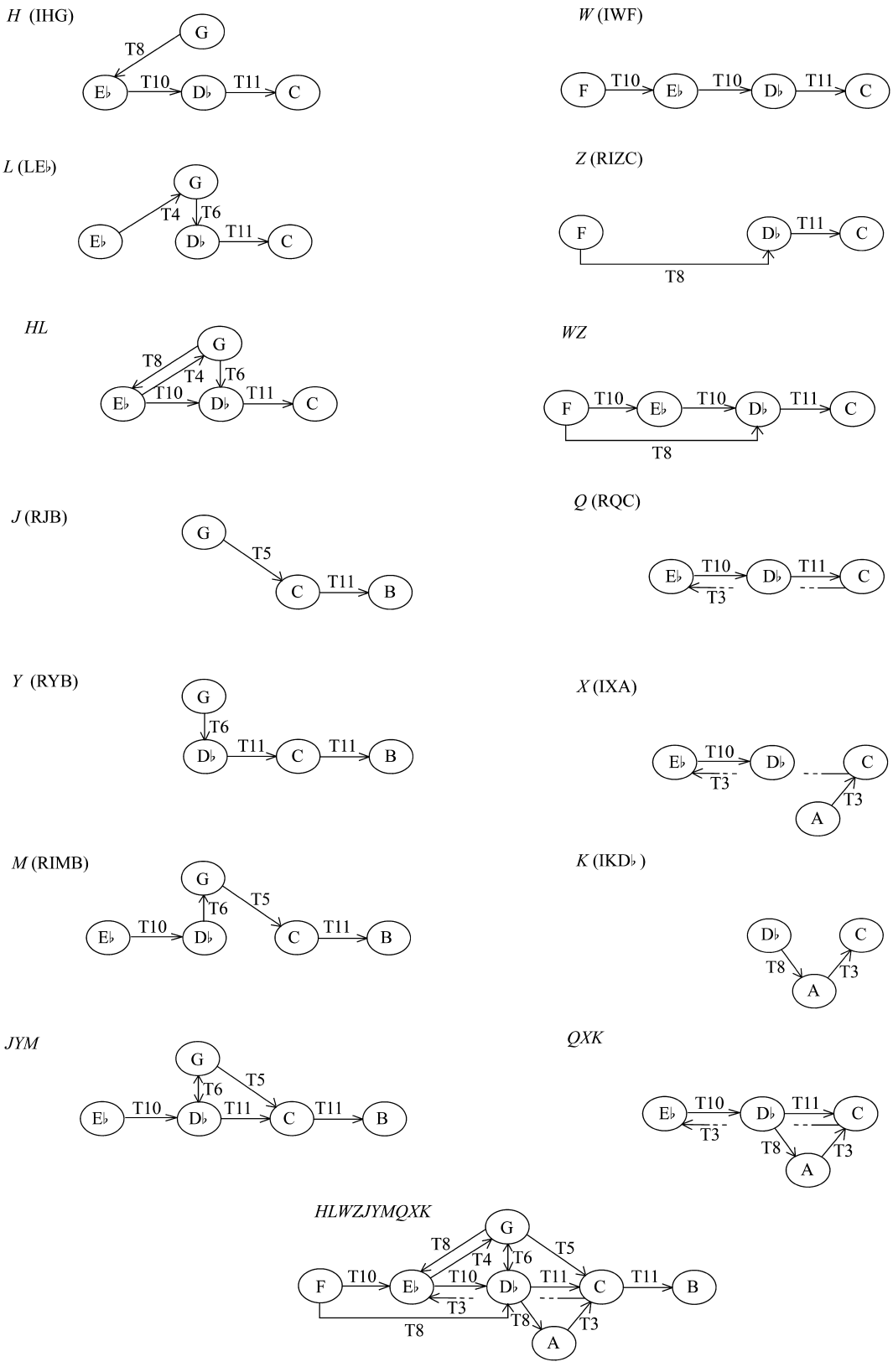
ments (*K* in movements 1–3, *W* in movements 2 and 4, and *Y* in movements 4–5). These network types are then summarized in retrograde by RYD♯–RWF♯–KD′, which, as shown in Example 16(a), is the series of networks that extends over much of movement 6. Moreover, Example 18(c) illustrates how *five* network types create a network-type chain that extends from the beginning to the end of the entire opus. *H* and *K* appear in movements 1–3, *L* in movements 2–4, *X* in movements 3–5, and *Y* in movements 4–6.

A striking feature of the analysis is that a given passage often receives multiple network interpretations, as when a set of only five major thirds near the end of movement 2 projects instances of *H*, *L*, *W*, and *Z*. In such cases, notes that are either anomalous or superfluous for one interpretation are often explained by the other, and surface features that support one interpretation may work to conceal another. Such situations give a sense that Schoenberg is able to balance multiple compositional considerations simultaneously, that a passage has many potential subsets that can be varied and re-presented in other contexts, and that the ten network types overlap with one another in various ways.

Example 19 aims to clarify network-type overlap. The example includes fifteen networks. Ten represent the ten network types (*H*, *J*, *K*, etc.) and five represent super-network types suggested by network combination (*HL*, *WZ*, *JYM*, *QXK*, and *HLWZJYMQXK*). The choice of network representatives, their layout on the page, and the super-networks all help to illustrate these network-type relationships. The representatives of *H* and *L* use the same four nodes in nearly the same order, and *Z*'s representative articulates a subset of *W*'s, in precisely the same order. Representatives of *J* and *Y* traverse several nodes of *M*'s, one in precisely the same order and one with a mild ordering change. The representatives of *Q*, *X*, and *K* create a similar set of embedding and ordering relationships. These relationships suggest super-network-types *HL*, *WZ*, *JYM*, and *QXK*. The *HLWZJYMQXK* super network embeds the representatives of all ten network types; it features seven nodes, five of which articulate a series of "stepwise" motions, T_{10}–T_{10}–T_{11}–T_{11}, and six of which form a complete whole-tone scale—although none of the networks are whole-tone subsets because each traverses the non-whole-tone node (C). Playing, singing, and thinking through these networks and super-networks may help the reader to internalize these network-type relationships, allowing a more integrated view of the whole set of network types to emerge.

Conclusion

Overall, the network approach taken here addresses ordered phenomena by tracking the series of transpositions that they articulate. Often depending on pitch-class structure, it uncovers relationships that may not be apparent upon first hearing. It aims to make these relationships vivid by identifying them and by pointing out which features of the musical surface support the pc connection. As a whole the analysis is complex and varied; ten network types articulate a range of local and global connections. Hopefully this is enough to do some justice to these endlessly fascinating pieces. But the approach is also manageable, not only because of various chains and other network relationships, but also because it relies on one fundamental musical skill—the ability to identify and relate series of transpositions.



Example 19. Relating the network types to one another.

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