Tonal and Transformational Approaches to Chick Corea's Compositions of the 1960s

STEVE STRUNK

Jazz pianist and composer Chick Corea's compositions of the 1960s exhibit a range of innovative harmonic and tonal structures, from those works having a relatively close affinity with the bebop style to those featuring tonal ambiguity and passages of nonfunctional harmony. The harmonic content of four compositions is analyzed using methods suitable to each. "Windows" receives a real-time phenomenological approach with Roman numeral analysis, Schenkerian voice-leading graphs, and a "layered approach" originally developed for bebop harmony. The latter two methods are tried with "Litha," but the layered approach particularly seems unsuitable, thereby revealing ways in which its harmonic orientation differs from that of the bebop style. A review of general principles of organization for passages of nonfunctional harmony, including linear intervallic patterns, equal divisions of tonal space, the transposition operation, Neo-Riemannian operations, and other contextual operations (the latter two as plotted on a *Tonnetz*) leads to a new view of "Litha" and passages from three other compositions, "Tones for Joan's Bones," "Steps," and "Now He Sings, Now He Sobs."

Keywords: Jazz, jazz harmony, transformational theory, hexatonic system, *Tonnetz*, Chick Corea.

Jazz theorist Steven Strunk died in 2012. He and I, along with Henry Martin and Steve Larson, collaborated frequently on joint conference presentations and jazz performances from 1998 through 2009. The following two articles include his previously unpublished paper, "Tonal and Transformational Approaches to Chick Corea's Compositions of the 1960s," and my own article, "Chick Corea and Postbop Harmony," which provides a response to Strunk and continues with my own analytical investigations. Strunk delivered the Corea paper twice in 2000, at the Music Analysis Conference at Oxford University and at the West Coast Conference of Music Theory and Analysis at the University of Oregon.[1] (Keith Waters)

INTRODUCTION AND HISTORICAL BACKGROUND

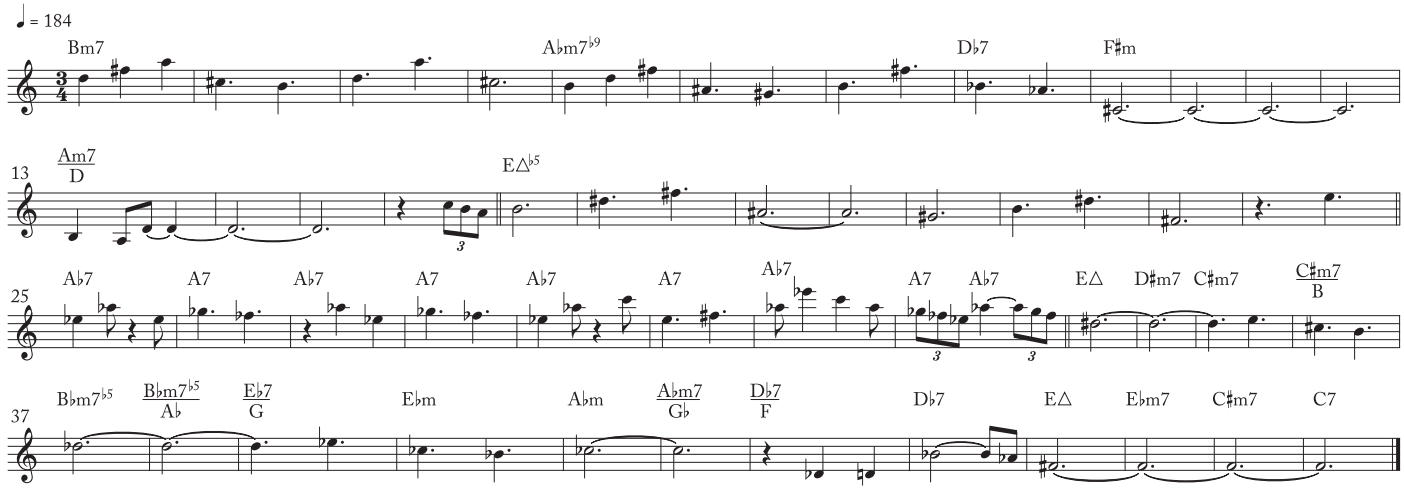
The 1960s were a time of upheaval in jazz. Bebop was considered by some to be exhausted, even stagnating, in the hands of its current practitioners.[2] The attention of the public and the press was captured first by the developments of free jazz, then by those of fusion. Most of the prominent names of the decade can be associated with one or both of those trends. At the same time, many of these well-known musicians continued to compose and record music directly connected to the bebop tradition and its melodic craftsmanship but which was evolving in new harmonic and tonal directions at the same time. The harmonic developments have been noted in passing but have not been subjected to close scrutiny, perhaps because they were eclipsed by free jazz and fusion, but also possibly because they are difficult to understand. Many musicians took part in these developments, such as Wayne Shorter, Herbie Hancock, and Chick Corea. All three played with Miles Davis, and all three contributed significantly to the compositional repertoire of the period.

This article will study the organization of harmony, tonality, and melody in several tunes Corea composed in the period 1964–68, while he was collaborating with Blue Mitchell (1964–66), recording on his own (from 1967), and beginning to play with Miles Davis (1968). Corea's tunes vary somewhat in their harmonic style and, therefore, require different analytic methods. I begin with a real-time phenomenological approach, which incorporates Roman numeral analysis,[3] Schenkerian voice-leading graphs, and a layered analytical approach developed for bebop harmony. These approaches are suitable for the first compositions that I analyze, but become less applicable to harmonically nonfunctional repertoire from this era. At this point, I consider general principles of organization for passages of nonfunctional harmony arranged from simple to complex, which include, but are not limited to: linear intervallic patterns, equal divisions of tonal space, the transposition operation, Neo-Riemannian operations, and other contextual operations. Application of these concepts reveals hidden relationships and aids in the understanding of

1 Strunk's original title was "Analytical Approaches to Chick Corea's Compositions of the 1960s." There are only a few minor editorial changes made here. Special thanks go to Jordan Lynch for his extensive help in formatting Strunk's essay and for his careful proofreading of it and my article.

2 See, for example, Collier (1978, 453).

3 This in-time interpretation, as it might be perceived by a performer, may be called "phenomenological," as it involves implications and continuous reassessment of potential realizations, thereby connecting with the approach described in Lewin (1986).



EXAMPLE 1. *Published lead sheet for "Windows." By Chick Corea Copyright © 1978 UNIVERSAL MUSIC CORP. This arrangement Copyright © 2014 UNIVERSAL MUSIC CORP. All Rights Reserved. Used by Permission. Reprinted by Permission of Hal Leonard Corporation.*

nonfunctional passages in Corea's tunes. The first approach, called an "experiential" interpretation, will demonstrate how a listener's understanding of tonality and harmonic meaning might develop as a piece unfolds in time.

AN EXPERIENTIAL INTERPRETATION OF "WINDOWS"

Corea's "Windows" (1966) is an interesting study in tonal and harmonic ambiguity (Example 1).[4] Upon hearing the opening Bm7 chord, we assume that it must be the tonic. As the melody arpeggiates through A_5, we may remember that tonic chords in minor do not often have independent minor sevenths, and as $A♭^{Ø}7$ follows, the most likely interpretation becomes ii^7–$vii^{Ø7}$ in A, with a second possibility of iv^7–$ii^{Ø7}$ in F♯ minor.[5] However, the independent seventh, A_5, is also somewhat unusual on a iv chord, and the $B♭_4$ of m. 6 is quite unexpected on a $ii^{Ø7}$ in F♯ minor. Perhaps, after the next move to D♭7 (V^7) with its $B♭_4$ melody, we should expect F♯ major. The following cadence on F♯ minor (m. 9) then comes as a surprise. At this point the evident interpretation is either F♯ minor: iv^7–$ii^{Ø7}$–V^7–i or perhaps a move from a B-minor tonic to a ii–V–i cadence on the minor dominant, F♯ minor.

The next chord, Am7/D, requires a new key for its interpretation: F♯m to Am7 would happen most naturally in E major, as a major scale-derived subdominant (ii) changing to a minor scale-derived subdominant (iv^7) in support of the line C♯–C♮–B, assuming that the next chord contains a B. The D in the bass of the Am7 produces a $iv^7/♭VII$, one of the usual substitutes for iv.[6] One could also hear the move from F♯m to Am as a transposition (T_3),[7] which stresses the chromatic third relationship of the two triads.[8] The melodic $C♮_5$ does move to B_4 harmonized by Emaj7, completing the progression ii–$iv^7/♭VII$–I in E. All is not perfectly clear, however, as the $A♯_4$ returns in m. 19 to suggest that the Emaj7 may be IV, not I. This interpretation would again set the first chord, Bm7, as tonic.

No confirmation of the role of Emaj7 as IV is given by the next chord, A♭7, which, if E were tonic, might be destined to act as V^7 of vi. Again, the ideas of triadic transposition (T_4 this time) and chromatic third relationship assert themselves in this rather surprising move. During mm. 25–32 the A♭7 is prolonged by a chromatic upper neighbor chord, A7, which four times departs from and returns to the A♭7, and thereby tells us nothing about the function of the Emaj7 or the A♭7 itself. (The A7 may also be thought of as a substitute dominant replacing E♭7, V of A♭.) The return to Emaj7 at m. 33 is again a surprise,

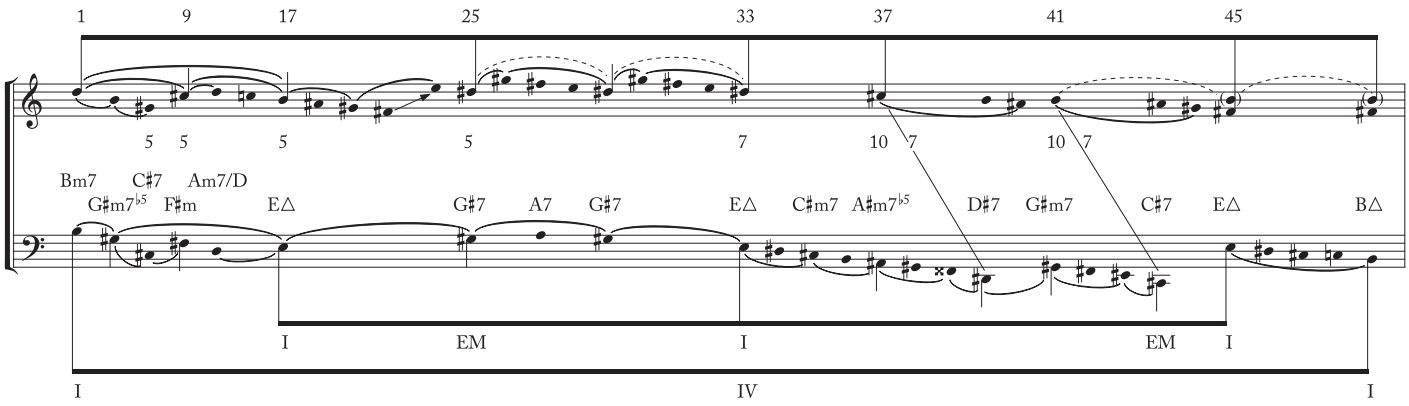
4 Corea (1994, 117).

5 In this discussion, I enharmonically maintain Corea's chord labels, although chords such as $A♭^{Ø}7$ may be more accurately rendered as $G♯^{Ø7}$ (when progressing ultimately to F♯ minor). In later discussions here (the Schenkerian and layered approaches), I replace the enharmonic notation of the lead sheet with diatonic spellings. Throughout, I will replace Corea's lead sheet "triangle" chord symbol with "maj7" in the text but not in the graphs.

6 See the discussion of "subdominant modal intensification" and subdominant substitution sets in Strunk (1979). The chord $iv^7/♭VII$ is not listed as such, but as it is equivalent to ♭VII dominant seventh sus4; the listed ♭VII dominant seventh (a dominant seventh built on the subtonic) qualifies it as a minor subdominant representative.

7 This article uses conventions of notation for operations derived from Rahn (1980). Rahn distinguishes between pitch-class transposition and pitch transposition. The former is labeled by T_n, in which the letter "T" indicates pitch-class transposition and the "n" indicates the level of transposition in semitones (mod 12) counted upward by definition. The latter is labeled by T_pn, in which the combination "T_p" indicates pitch transposition and the "n" indicates the level of transposition in semitones either up or down (not mod 12) allowing "n" to be any positive or negative integer.

8 Corea often uses chromatic third relationships in his compositions (Strunk 1999).



EXAMPLE 2. *"Windows" middleground graph 1*

but it does invalidate the idea that the A♭7 might be V^7 of vi (C♯ minor)—unless one can hear the Emaj7 as the third, fifth, seventh, and ninth of C♯m, which is, in my opinion, an unlikely interpretation. Most importantly, the return to Emaj7 at m. 33 enables us to describe the A♭7 as an embellishing chord in relation to the Emaj7.[9] As such, it is a nonfunctional chord in this context.

At last the key of B is confirmed in mm. 33–37 by a normative diatonic progression, Emaj7–D♯m7–C♯m7–C♯m7/B–B♭$^{\varnothing}$7 (IV^7–passing iii^7–ii^7–passing ii$^4_2$–vii$^{\varnothing 7}$). The Emaj7 at m. 17 is also confirmed as IV. From the Emaj7, the piece follows a circle-of-fifths progression arranged with mostly stepwise bass motion leading to C♯7, which will probably function as V of V. The chords form the usual ii–V groups of bebop (B♭$^{\varnothing}$7–E♭7, A♭m7–D♭7). The chords at mm. 35–41, which progress from C♯ minor to A♭ minor, provide a varied transposition (T_2) of mm. 1–12 (which progress from B minor to F♯ minor).

One unexpected progression remains, D♭7 to Emaj7 at mm. 44–45. Again, triadic transposition (T_3) and the chromatic third relationship are expressed, followed by the return of the progression at m. 33. The third chord of that progression, C♯m7 (m. 35), moved to a dominant substitute chord, B♭$^{\varnothing}$7 (vii$^{\varnothing 7}$); similarly the corresponding C♯m7 (m. 47) moves to a dominant substitute, the C7 (♭II dominant seventh). The latter chord sends the performer back to the beginning Bm7 for another chorus. Was the C♯7 the V^7 of V or was it, like the A♭7, nonfunctional? Yes, it was V^7 of V, if one waits for its resolution to the substitute dominant C7. Here, the surface emphasis on the chromatic third relationship masks the normative middleground progression to the dominant.

TWO GRAPHS OF "WINDOWS"

Having arrived at a general idea of the tonal structure of "Windows," we can consider a Schenkerian voice-leading graph.[10] I will present two different graphs, each reflecting a distinct point of view. "Windows" has much in common with bebop and makes use of many of its typical harmonic progressions. However, "Windows" asserts some new tonal characteristics not generally associated with bebop. An analyst can choose to stress either the former or the latter view.

Example 2, a middleground graph, stresses the newer harmonic elements. This graph relies on the emphasis given to the Emaj7 (IV) throughout the piece, as well as the lack of a literal V chord, to suggest that "Windows" relies on a tonic-subdominant axis, in which a subdominant chord replaces the usual structural dominant.[11] The graph shows IV prolonged by two embellishing chords, labeled "EM" below their bass notes: G♯7 above it (m. 25) returning to IV at m. 33, and C♯7 below it (m. 43) returning to IV at m. 45.[12] Both these chords are in a nonfunctional chromatic third relationship with IV. The bass line strongly supports the interpretation of a subdominant axis, especially given the brief passing nature of the substitute dominant C7 at m. 48, the only dominant-functioning chord in the piece's tonic key.

The presence of clear tonic-subdominant axes in some 1960s compositions of Wayne Shorter supports applying the axis to "Windows." The upper voice seems to be a 3-line that changes from minor to major at m. 25, but its harmonization is not that of the usual *Ursatz*. The change to a major tonic at the end takes into account Corea's recorded performances of the period,[13] which provide a coda that prolongs a major tonic after the final chorus.[14]

9 The term as used here appears in Salzer (1962, 105, fn. 2).

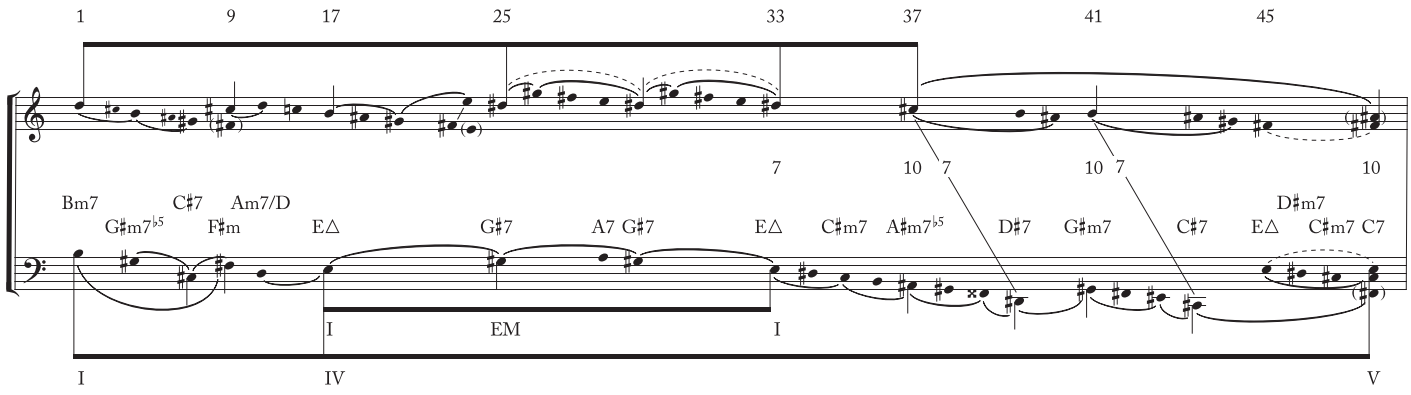
10 For discussion of the applicability of Schenkerian analysis to jazz, see Larson (1998) and Martin (1996, especially Chapter 2).

11 In explaining harmonic developments of the nineteenth century, some analysts have suggested that in many late nineteenth-century compositions the usual tonic-dominant harmonic axis may have been replaced by a tonic-subdominant axis, also called a plagal axis. See, for example, Stein (1983). Because I take the position here that "Windows" has such an axis, I do not call the IV chord, which is prolonged from mm. 17–45, an embellishing chord as some might.

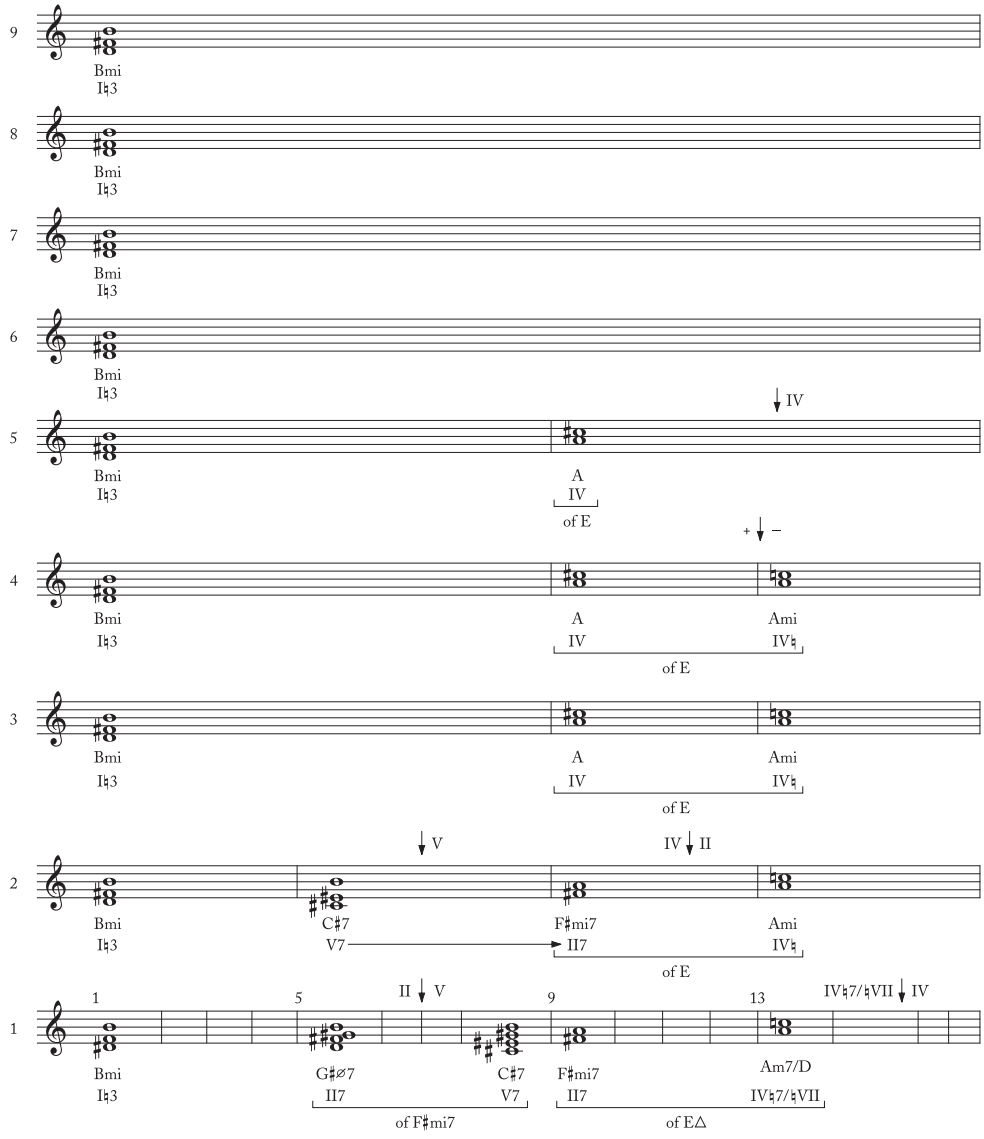
12 Remember that Corea's enharmonic chord labels are changed here to reflect their diatonic function: m. 25 is now indicated as G♯7 rather than A♭7.

13 Other performers loop back to the beginning (Strunk 1998).

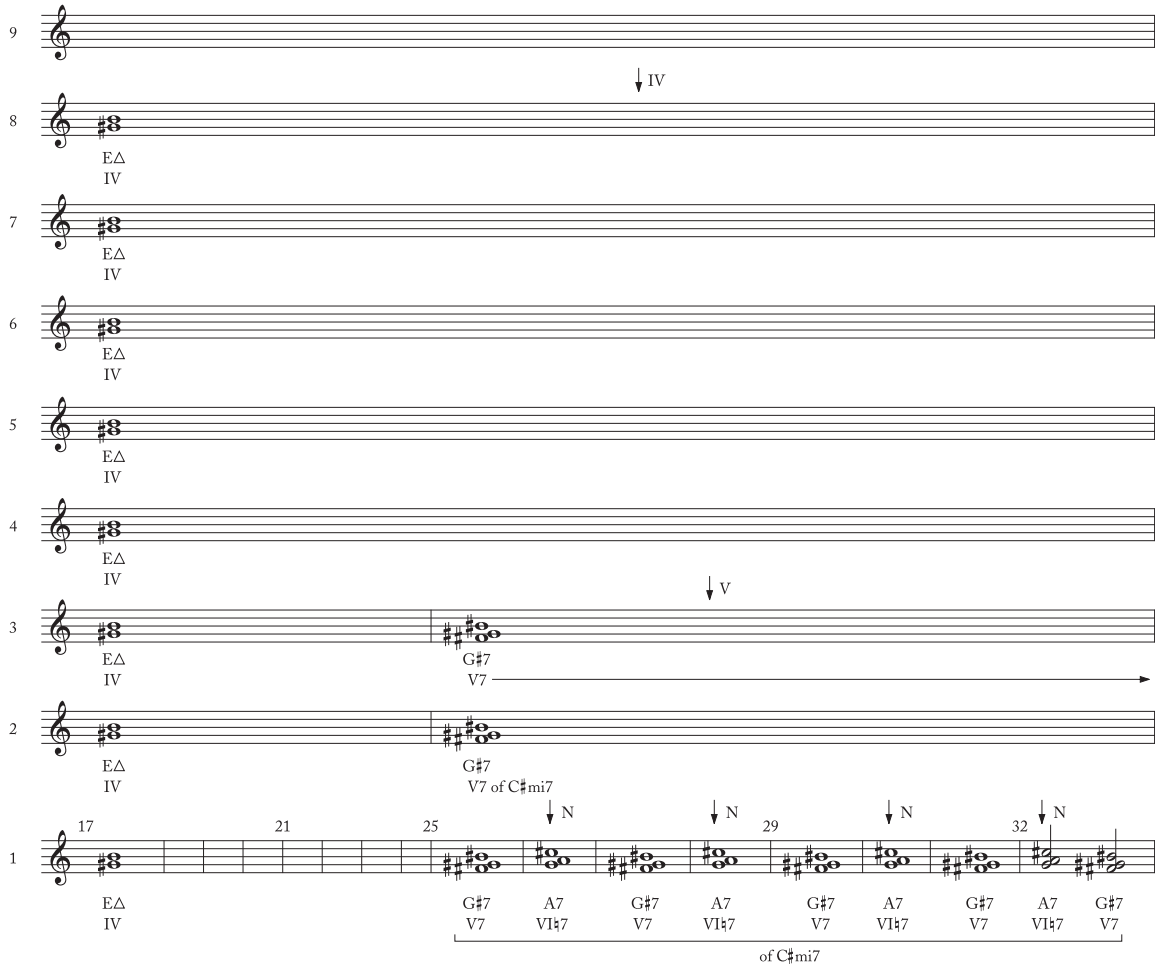
14 The 10-7 linear intervallic pattern noted in mm. 37–44 corrects the 10-6 pattern (based on misleading *Real Book* notation) presented in Strunk (1996, 85).



EXAMPLE 3. *"Windows" middleground graph 2*



EXAMPLE 4. *"Windows": A Layered Approach*



EXAMPLE 4. *(Continued)*

Example 3, another middleground graph, stresses this tune's connection to standard bebop harmony and tonal structure. This graph shows the basic structure of "Windows" as the normative I–IV–V–(I). The unusual surface features involving G♯7 and C♯7 can still be seen, but these are embedded in a standard progression supporting an interrupted 3-line as *Urlinie*.

The following turns to a system of analysis designed in the early 1970s for explaining bebop harmony in order to investigate whether, through the use of this methodology, I might reconcile differences between the two graphs and shed light on the area of greatest disagreement, the function of mm. 45–48.

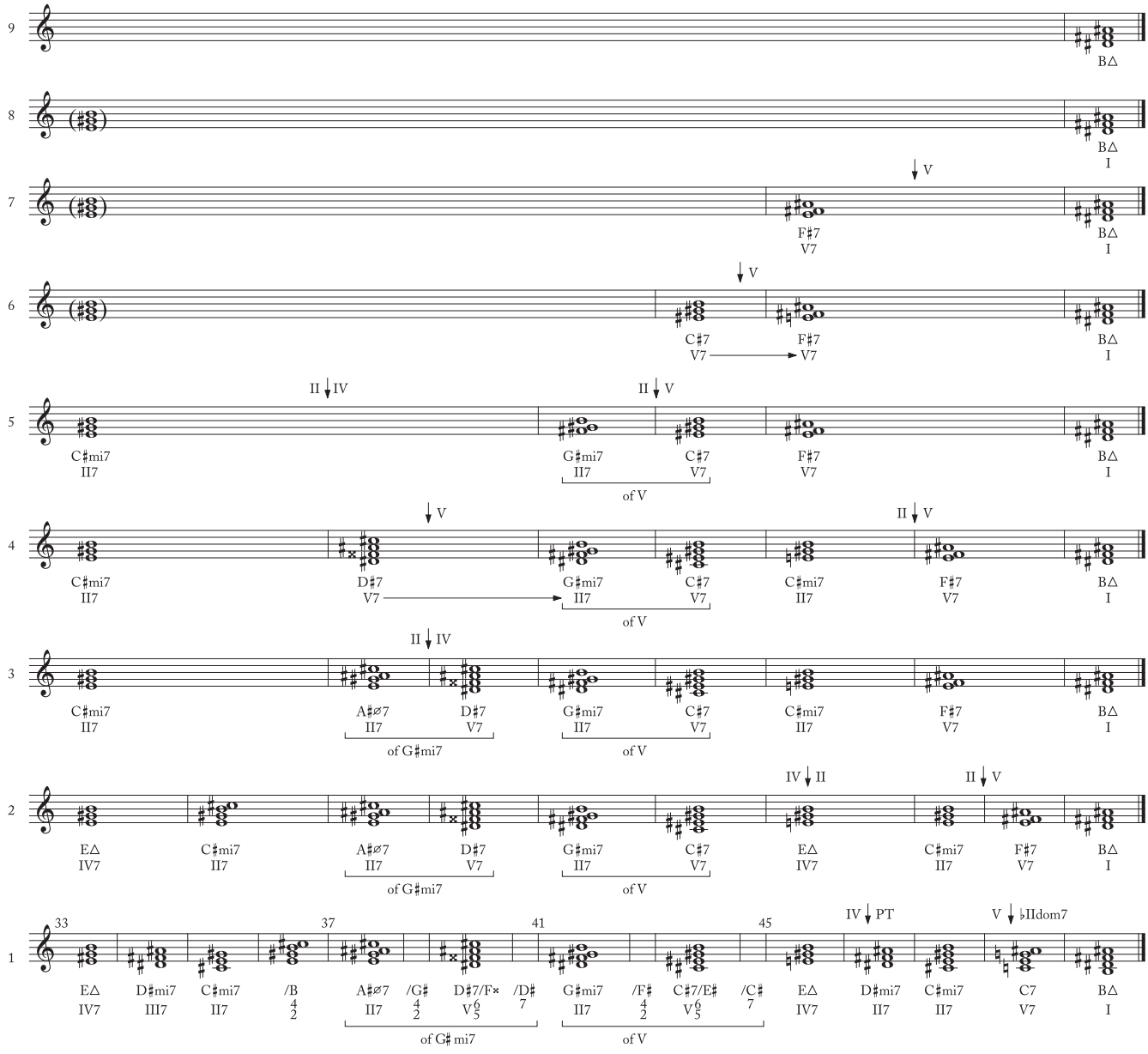
"WINDOWS": A LAYERED APPROACH

The "layered approach" illuminates harmonic function generatively, with no fixed melody and only a probable bass line.[15] Example 4 gives a layered analysis of "Windows." The notes in the staves show voice leading and essential lines connecting the chords. Between the staves are symbols for transformational operations, demonstrating how each level is an elaboration of the one above it. Events on the levels are temporally aligned, connecting the foreground, middleground, and background, and giving rhythmic meaning to all the levels. Only capital Roman numerals are used.

The lowest staff, Level 1, shows the chords of "Windows" with measure numbers. Levels 7 through 9 show how a tonic triad is developed into a I–IV–V–I progression by the application of a subdominant and a dominant prefix.[16] Level 6 applies another dominant prefix, yielding the C♯7 above mm. 41–44. At Level 5, the IV prefix is applied to the Emaj7 chord, yielding

15 I will explain the relevant aspects of this analysis, but for a complete treatment of the system, see Strunk (1979).

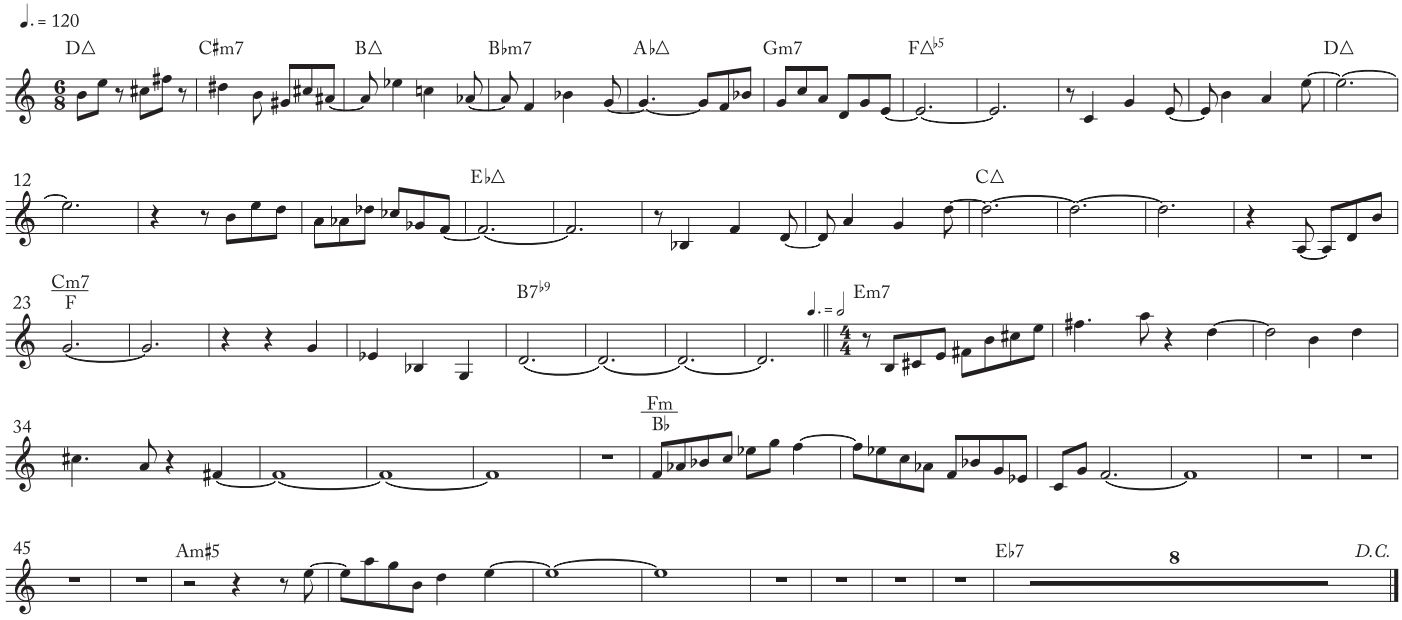
16 Note the location of the background V above mm. 45–48. Usually the V prefix precedes the IV prefix, because usually V is considered structurally superior to IV. By applying the IV prefix first, this layered interpretation allies itself with the first Schenkerian graph (Example 2) and with the theory of the tonic-subdominant axis. A reversal of Levels 7 and 8 would ally the layered interpretation with the second Schenkerian graph (Example 3) and with the generally accepted theory of the tonic-dominant axis. Although there are two Schenkerian graphs, I do not present two layered approaches, as they would differ only in the order of Levels 7 and 8.



EXAMPLE 4. *(Continued)*

the A chord above mm. 9–16; the latter part of the IV (E) becomes a II^7 (C♯m7) above mm. 33–36 by substitution within the "subdominant substitution set"; and the C♯7 above mm. 41–44 is developed into a II–V group. In Level 4, the A chord above mm. 9–16 is subjected to "subdominant modal intensification" (Strunk 1979, 13), which means it changes from major to minor, thereby leading its C♯$_5$ more strongly to B$_4$ by passing through C♮$_5$. Also in Level 4, a V prefix is applied to the G♯m7 above mm. 37–40 and the F♯^{7} is developed into a II–V group above mm. 45–48. At Level 3, the G♯7 is produced by a V prefix to the C♯m7 above mm. 25–32,[17] and the D♯7 is developed into a II–V group above mm. 37–40. At Level 2, F♯m7 replaces A above mm. 9–12 by subdominant substitution, and the new chord is given a V prefix, C♯7, above mm. 5–8; also at Level 2, part of the duration of the C♯m7 above mm. 33–36 reverts back to Emaj7 by subdominant substitution, as does all of the duration of the chord above mm. 45–46; the remaining F♯7 above mm. 47–48 is developed again into a II–V group, thereby shortening its foreground duration (in the background it began at m. 45). Level 1 develops the C♯7 in mm. 5–8 into a

17 Earlier, I remarked that the interpretation of G♯7 as V of C♯m (represented by Emaj7) was unlikely. It is used here because this system of analysis, as originally designed, had no other way of generating the chord. This difficulty again demonstrates the distance between the practice of "Windows" and that of early bebop harmony.



EXAMPLE 5. *Published lead sheet for "Litha." By Chick Corea Copyright © 1967 UNIVERSAL MUSIC CORP. Copyright Renewed. This arrangement Copyright © 2014 UNIVERSAL MUSIC CORP. All Rights Reserved. Used by Permission. Reprinted by Permission of Hal Leonard Corporation.*

II–V group, substitutes the IV♮^{7}/♭VII for the IV in mm. 13–16, adds the neighboring A^{7}s in mm. 25–32, inserts diatonic passing D♯m7 chords after mm. 33 and 45, and replaces the cadential F♯7 with its substitute dominant, C7, at m. 48.[18]

Not only does this approach clarify the nature of the intuited dominant function in mm. 45–48, but it also seeks to show that there is nothing unusual in the harmony of "Windows"—that all can be explained as circle-of-fifths or subdominant-dominant-tonic paradigms. The latter view, I believe, misses something important, which was brought out in Example 2. These three approaches (Example 2, Example 3, and Example 4) represent a continuum of views that might be characterized as ranging from radical to conservative. Most people (myself included if forced to choose) would probably prefer the middle-of-the-road Example 3. However, I believe all three views are valid in different ways.

THE SCORE OF "LITHA"

Corea's "Litha" (Example 5), like "Windows," begins with a tonally ambiguous sequence and achieves a cadence in its second half.[19] The score is marked with a *da capo* but no *fine,* suggesting endless repetition. The progression E♭7 to Dmaj7 from the end back to m. 1, indicated in the score, might suggest that D is the tonal center of the piece. On the recording,[20] the great predominance of A♭s over G♮s in the voicings of the "E♭7" imply that a more accurate representation of that chord would be B♭m7/E♭, the same type of chord as appears in mm. 23 and 39. The use of the latter chord structure weakens slightly the tonicizing quality of the progression to D. The score indicates the progression beginning at m. 23 as Cm7/F–B7♯9–Em7–Fm/B♭–Am♯5–E♭7. In the recording, the chord Fm/B♭ sounds like Fm^7/B♭, and although the pitch-class F (♯$\hat{5}$) is added to Am, more often the chord sounds like Am7. The corrected notation, which I use in my analyses, reads Cm7/F–B7♯9–Em7–Fm7/B♭–Am7–B♭m7/E♭. Throughout the choruses, the tonic seems to be D, because of the prolongation of that chord at the beginning and the presence of the substitute dominant at the end of each chorus. On the recording, however, Corea ends with the progression B7♯9–Em7 at mm. 27–31, improvising a coda on the Em7.

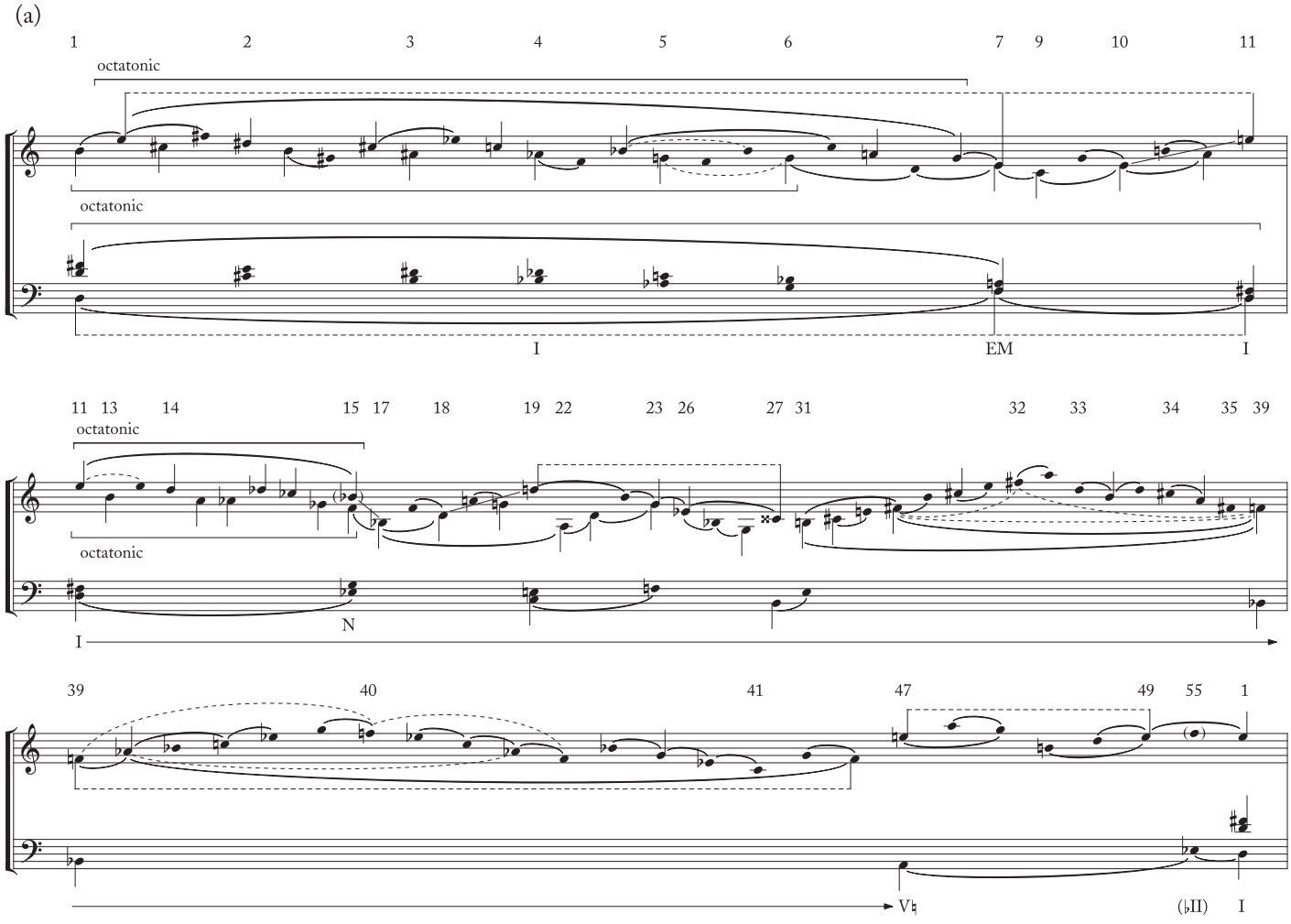
VOICE-LEADING GRAPHS OF "LITHA"

Example 6 presents Schenkerian foreground and middleground voice-leading graphs of "Litha" based on the corrected notation and a D tonal center. Example 6(a), the foreground graph, marks the compound melody of mm. 1–6 and 11–15 as an alternation between two forms of the descending octatonic scale. The parallel thirds indicated in the bass also express this scale in mm. 1–11. The upper voice involves

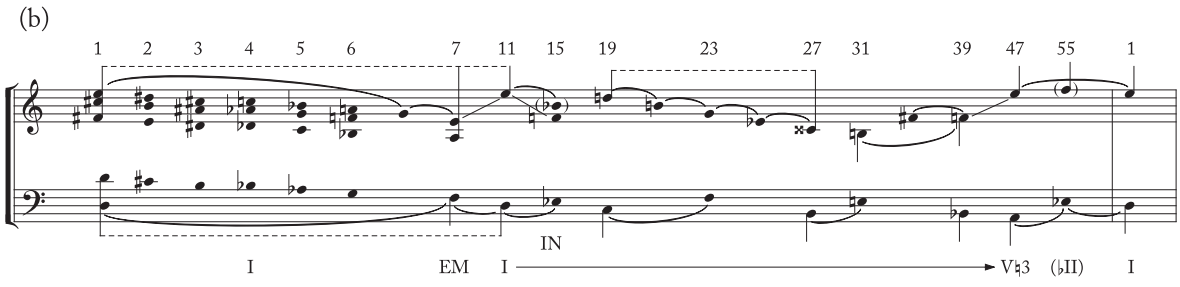
18 There is no universally used Roman numeral for the substitute dominant. Some possibilities include V'^{7} (Strunk 1979), ♭II^7, and ♭IIdom7. It is, of course, related to an augmented-sixth harmony, symbols for which are also variable.

19 Corea (1994, 114).

20 Originally recorded in 1966 and released in 1967 as Vortex 2004; released under license from Atlantic Recording Corp. in 1999 as Collectables Col-CD-6238.



EXAMPLE 6(A). *"Litha" foreground graph*

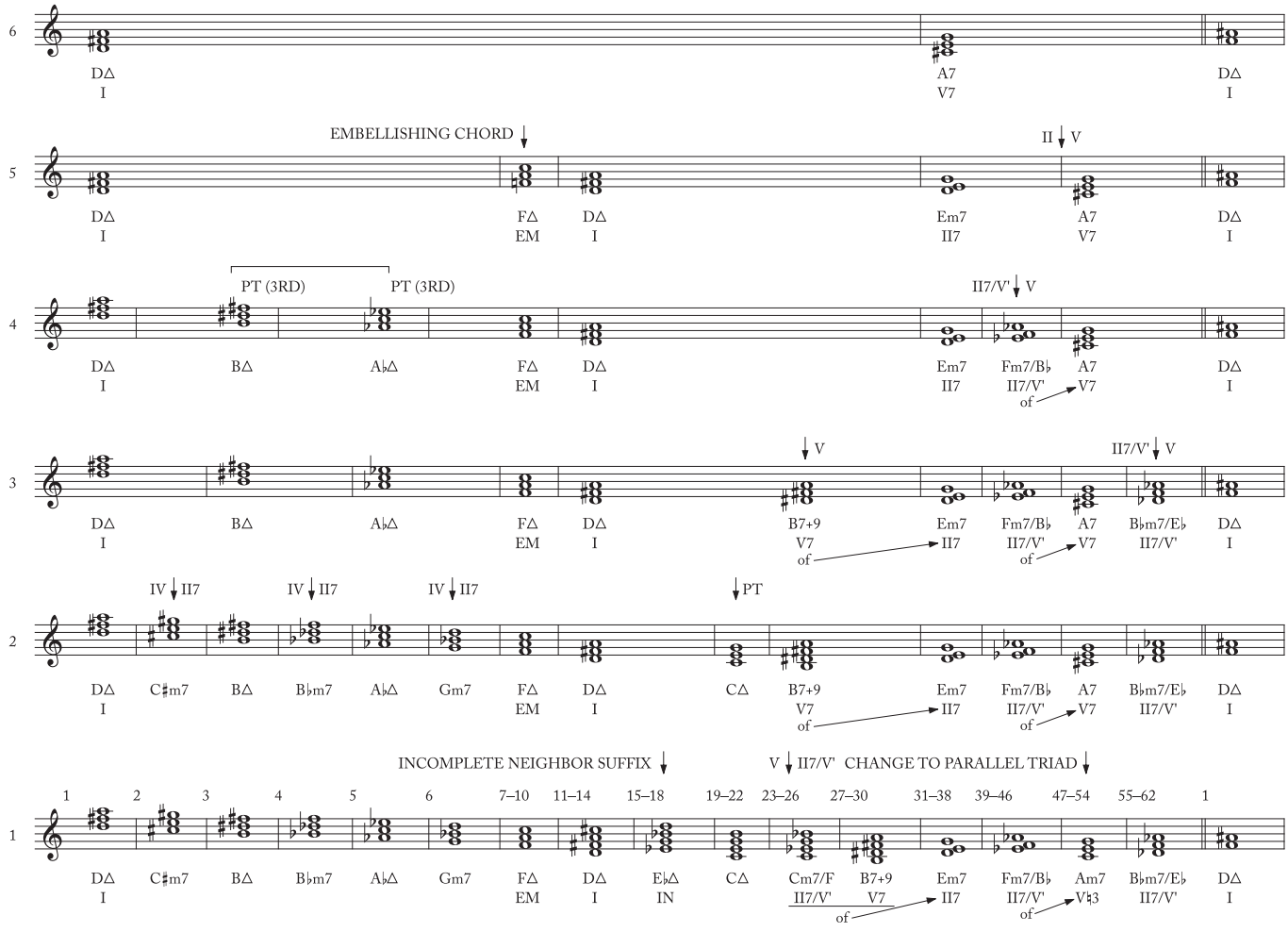


EXAMPLE 6(B). *"Litha" middleground graph*

numerous arpeggiations and transfers of register and has no resemblance to a standard *Urlinie*. The tonal structure appears most clearly in the middleground graph, Example 6(b).[21]

After the tonally ambiguous passage from D to D in mm. 1–14, the bass initiates stepwise motion to a minor-dominant chord at m. 47. Only the Bbm7/EbF (indicated as bII on the graph) in mm. 52–62 exhibits has strong directionality toward the D tonic. There seems to be minimal functional harmony here: most of the piece is devoted to harmonically ambiguous

21 I have treated the Fmaj7 at m. 7 as an embellishing chord because of the gap in the bass.



EXAMPLE 7. *"Litha": A Layered Approach*

passing motion. Would the layered approach tell us more about "Litha"?

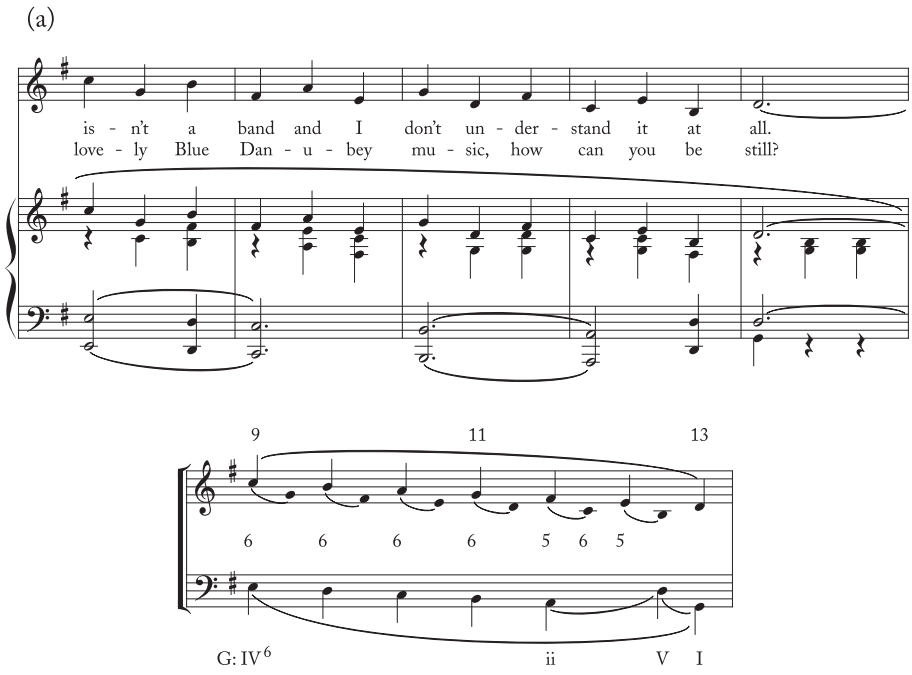
"LITHA": A LAYERED APPROACH

Example 7 gives a layered analysis of "Litha." What it tells us is that, unlike "Windows," "Litha" cannot be described as consisting entirely of circle-of-fifths or subdominant-dominant-tonic paradigms. Because most of the harmonic progressions are not rooted in orthodox tonal syntax, the required alterations stretch the system of layered analysis to its limits.

In order to generate the progressions of "Litha," the operations designed for bebop harmony must be modified and supplemented by quite a few new operations. In Level 5, a new operation, the "embellishing chord" prefix, generates the Fmaj7 above mm. 7–10.[22] Level 4 uses the previously defined passing-tone (third) operation to fill the gap between the Dmaj7 and the Fmaj7 above mm. 1–6. As an alternative, the whole series between the two tonic chords could have been generated by the passing-tone (third) operation. Also in Level 4, the chord II^7/V', meaning a sus4 dominant seventh on the root of the substitute dominant, is used as a new variant of the V prefix above mm. 39–46.[23] This operation is used again in Level 3 above mm. 55–62 and in Level 1 at mm. 23–26. In Level 2, above mm. 2, 4, and 6, subdominant prefixes take the form of ii^7 chords mildly tonicizing each of the major-seventh chords

22 Here is a possible definition for the embellishing chord prefix: this operation in general places before the object chord a chord the root of which is not related by step or by perfect fifth to that of the object chord. The structure of the embellishing chord varies: in this example, it is the same as that of the object chord (a major seventh), but it can be any other structure, diatonic or chromatic, in the context. In the latter respect, it resembles the passing-tone operation.

23 The compositions analyzed in Strunk (1979) did not use any "slash chords," i.e., chord symbols of the form A/B, where A is an ordinary chord symbol and B is the requested bass note. Slash chords, especially the dominant-seventh sus4 indicated as a supertonic minor seventh over a dominant bass (e.g., Dm7/G), began to be used widely in the 1960s (Strunk 1988). In "Litha" the bass of the chord is ♭II, as it is a substitute dominant.



EXAMPLE 8(A). *"Do I Hear a Waltz?"*

above mm. 3, 5, and 7. Two more new operations appear at Level 1: the "incomplete neighbor suffix" (which formerly had been only a prefix) in mm. 15–18 and the "change to parallel triad," which produces the minor dominant at mm. 47–54.[24]

The layered analysis is probably not the best approach to "Litha." This piece, like many others Corea composed during the 1960s, is less tonally oriented than "Windows." It therefore leads to a preliminary discussion of principles of organization for passages of music that are tonally nonfunctional but which use traditional chord structures in a chromatic context.

LINEAR INTERVALLIC PATTERNS, EQUAL DIVISIONS, THE TRANSPOSITION OPERATION, AND OTHER NONFUNCTIONAL SEQUENTIAL PRINCIPLES

Within standard tonal structures, there exist passages that connect, generally in a sequential manner, two temporally distant structural and functional harmonic events. Most often, these are the linear intervallic patterns that are harmonically nonfunctional. They can be entirely diatonic, as in Example 8(a),[25] "Do I Hear a Waltz?" or they may be chromaticized without losing their basic diatonic nature, as in Example 8(b), "You Do Something to Me." This concept can be extended to include progressions of chords that produce equal divisions of some important structural interval, similar to twelve-tone techniques. These patterns tend to attenuate the sense of tonality much more than the simpler types. Example 8(c), "Molten Glass," divides a minor sixth into four descending whole steps harmonized with parallel major-seventh chords. Although this example has been described as a 7–6 pattern resolving above a single root-position triad,[26] in a case like this, one could also invoke the "transposition operation," as described by Gregory Proctor: "The concept of transposition will be reserved for those cases in which the chords, taken as a whole, reflect no single underlying scale, or, when taken as pairs, the scale they create has no relevance to the environment."[27]

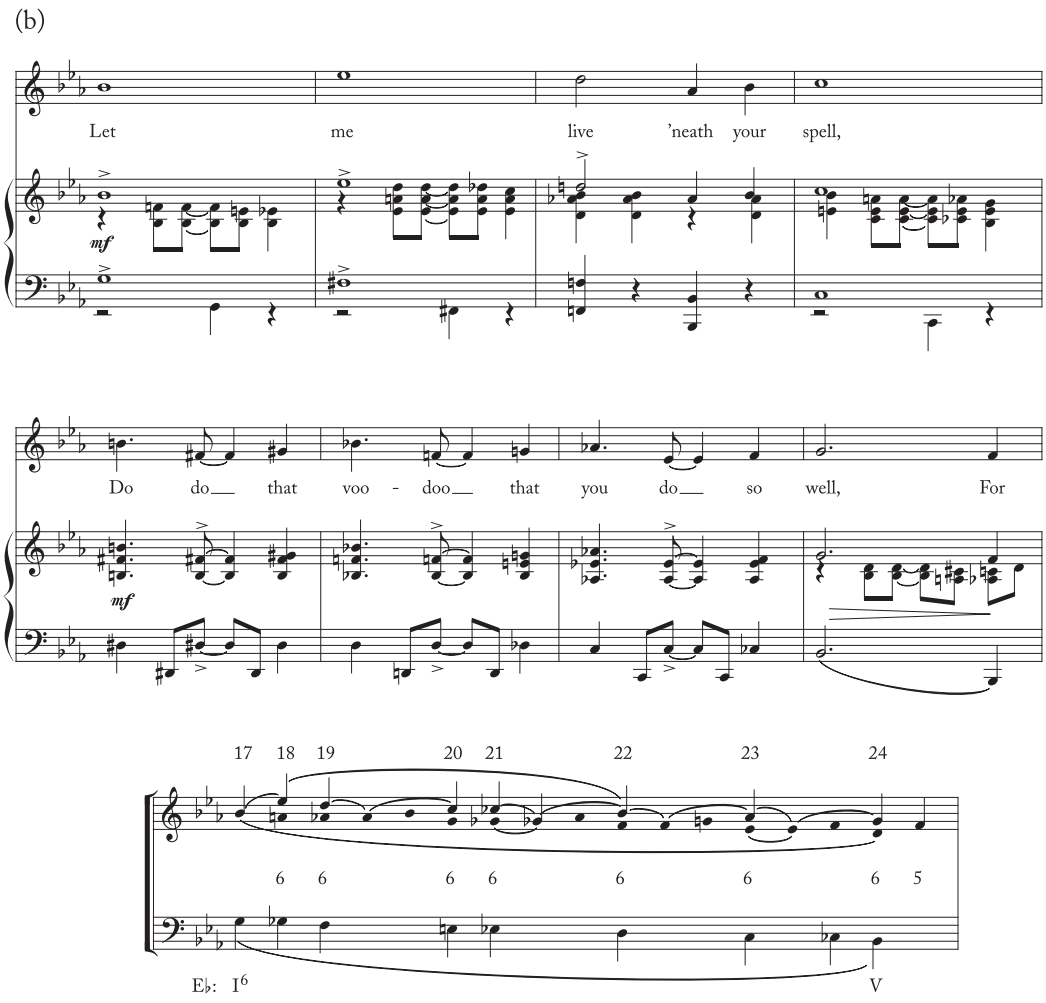
One version of transposition as equal division of the octave appears in Example 8(d), part of the verse of "Spring Can Really Hang You Up the Most," wherein major-seventh chords four semitones apart descend through an octave from tonic to

24 The definition of the incomplete neighbor suffix would resemble that of the incomplete neighbor prefix. In the case of the suffix, the root of the resultant chord leaves that of the object chord by step and has no stepwise relationship to the root of the chord immediately following it. The operation "change to parallel triad" switches the third of the triadic portion of the chord from major to minor or vice versa. (Subdominant modal intensification, discussed earlier, involves changing the third of only the IV chord from major to minor, and not vice versa: hence the need for a new operation.) Neither of these operations were needed; nor would they have been useful in analyzing the music discussed in Strunk (1979).

25 Examples 8a–d are drawn from Strunk (1996, 80, 82, 106, and 107).

26 Ibid. (105–106).

27 Proctor (1978, 162). Proctor also states: "What transposition requires is: 1) the failure of the operations of traditional counterpoint to be less than remote and cumbersome as an explanation, or 2) the nonconjointness of scales produced by the chords under examination, or 3) the irrelevance of the passage to the produced scale. . . . It is possible for the principle of transposition, then, to refer to just one voice of each chord of the pattern or to all of them" (166).



EXAMPLE 8(B). *"You Do Something to Me"*

tonic. Each of the passing major-seventh chords is given a ii^7 subdominant prefix, so that the combined roots move through the whole-tone scale. This progression, as triads without the ii^7, among others, was taken up by Richard Cohn.[28] He showed that the major triads of this series form a T_2 co-cycle of one of four hexatonic cycles labeled after the four directions, in this case, the "Northern" hexatonic cycle (Example 9).[29] On the relationship between hexatonic analysis and tonal analysis, Cohn, has written that:

> A . . . way to constrain the domain of hexatonic analysis would be to acknowledge that hexatonic elements might infiltrate compositions that otherwise operate according to the principles of diatonic tonality, but to limit the application to elements of those compositions that fail the standard test of diatonic coherence. . . . the hexatonic model is likely to achieve the broadest scope and deepest insight . . . if used not in isolation from standard diatonic models, but rather in conjunction with them. Relations well modelled by acoustic theory—tonal centricity, diatonic determinacy, *Auskomponierung*, and all that they entail—latently coexist with relations well modelled by group-theoretic models of chromatic space, such as the transposition operation, smooth voice leading, and the hexatonic constituency of triads.[30]

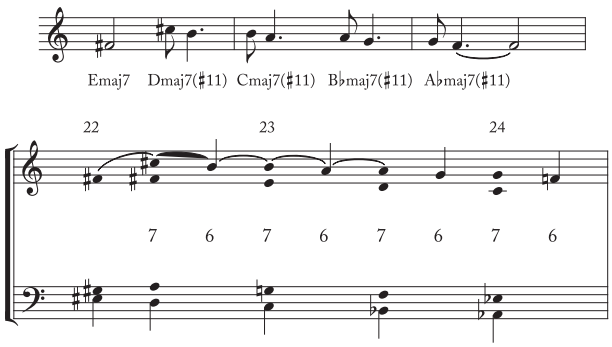
These and other nonfunctional sequential progressions occur frequently in jazz compositions of the 1960s and 70s, including those of Corea. By bringing together Examples 8 and 9, I intend to suggest that there is a continuum between the simple diatonic nonfunctional linear intervallic patterns and the tonally ambiguous twelve-tone chromatic progressions involving the transposition operation and other operations to be discussed: they all have the role of connecting tonally functional moments, and they all operate under their own nonfunctional logic.

28 Cohn (1996).

29 Cohn's use of "T_2" means moving two steps clockwise around the circle. Major triads are indicated with a + sign, minor triads with a -.

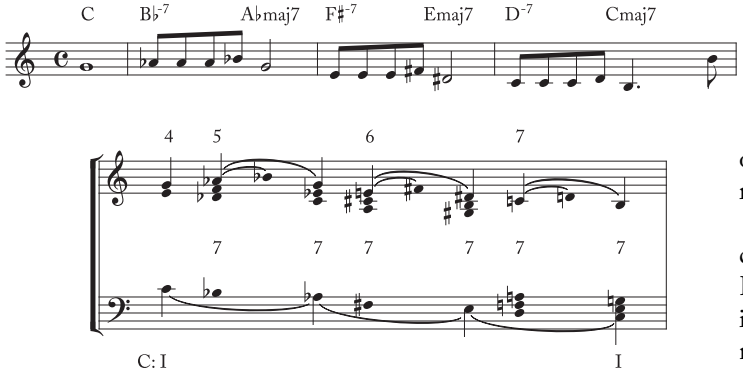
30 Cohn (1996, 33).

(c)

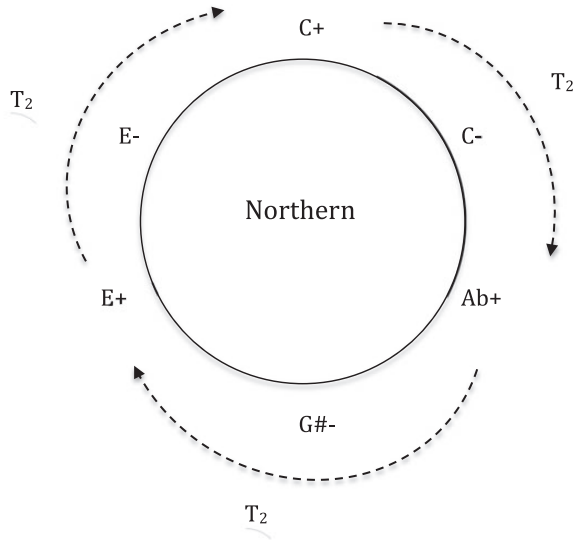


EXAMPLE 8(C). *"Molten Glass"*

(d)



EXAMPLE 8(D). *"Spring Can Really Hang You Up the Most"*



EXAMPLE 9. *Cohn's four hexatonic systems ("Maximally Smooth Cycles, Hexatonic Systems," Figure 1)*

"LITHA" AND NEO-RIEMANNIAN THEORY

Considerable work, initiated by Lewin in the 1980s, has been done in Neo-Riemannian theory, of which Cohn's hexatonic systems form a part. Scholars have generally agreed on definitions and English names for operations originated by Hugo Riemann. Cohn reports that "work along Neo-Riemannian lines has focused on three operations that maximize pitch-class intersection between pairs of distinct triads: P (for Parallel), which relates triads that share a common [perfect] fifth; L (for Leading-tone exchange), which relates triads that share a common minor third; and R (for Relative), which relates triads that share a common major third."[31] These are "contextual inversions," as they amount to an inversion of the triad transposed to hold the requisite triadic pitch classes invariant. Scholars have also adopted the *Tonnetz*, a diagrammatic way of illustrating relations among triads that originated in the late eighteenth century, but was developed primarily by Arthur von Oettingen and Riemann in the nineteenth century.[32] The three operations on the *Tonnetz* (P, L, and R) appear on it as geometric reflections around a common edge.[33]

The parallel triads of the opening progression of "Litha" can be generated by repeated application of the binary chain Relative-Parallel (RP). This chain is illustrated on the *Tonnetz* in Example 10, which indicates pitch-classes by 0–11 integer notation. The progression from "Litha" is shown in bold and reads from right to left. Successive chords are related by geometric translation, here equivalent to pitch-class transposition at T_9. Similarly, the triadic progression from "Spring Can Really Hang You Up the Most" can be generated by repeated application of the binary chain Parallel-Leading-tone exchange (PL).

This progression is represented on the *Tonnetz* in Example 11. It reads from top to bottom. Again, successive chords are related by geometric translation, in this case equivalent to T_8. According to Brian Hyer, such progressions obtain their tonal coherence through the participation of the generating operations in an algebraic group:

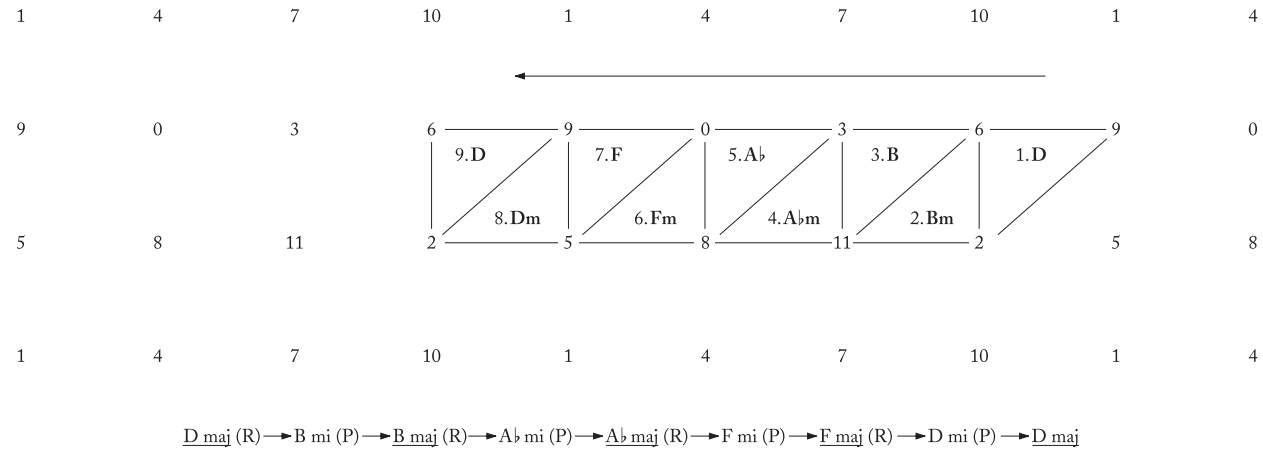
> The combinatorial properties of Riemann's transformations enable us to construct an algebraic group from the moment-to-moment mosaic of tonal relations. . . . It is the algebraic group—not the presence of a tonic—that ensures the tonal coherence of its constituent relations: the algebraic group imparts an immediate intelligibility to transformational relations between harmonies, however remote from each other those harmonies might appear to be.[34]

31 Cohn (1997, 1).

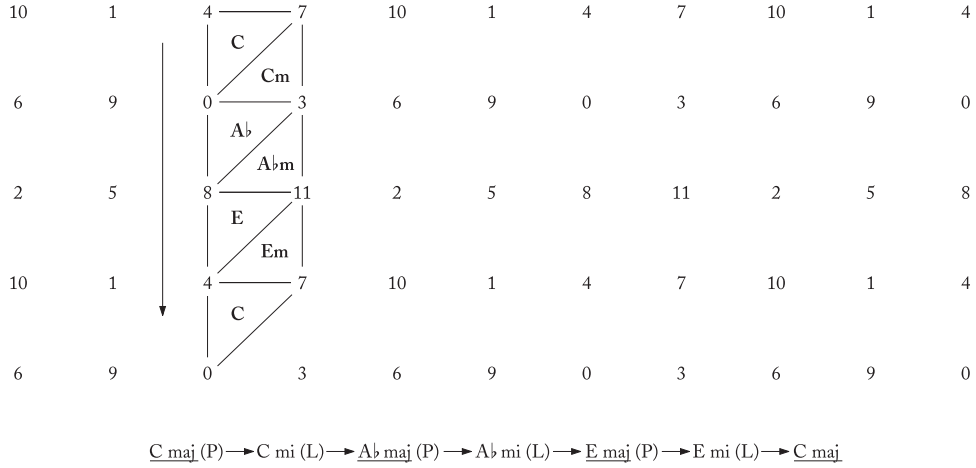
32 For a brief history of the *Tonnetz*, see ibid. (7–10).

33 See Gollin (1998, 197).

34 Hyer (1995, 129–30).



EXAMPLE 10. Tonnetz *representation of "Litha" major triad series, mm. 1–14, as RP transformations*



EXAMPLE 11. Tonnetz *representation of "Spring Can Really Hang You Up the Most" major triad series, mm. 4–7, as PL transformations*

The Neo-Riemannian operations, of course, form a group as do the equivalent geometric transformations visible on the *Tonnetz*.

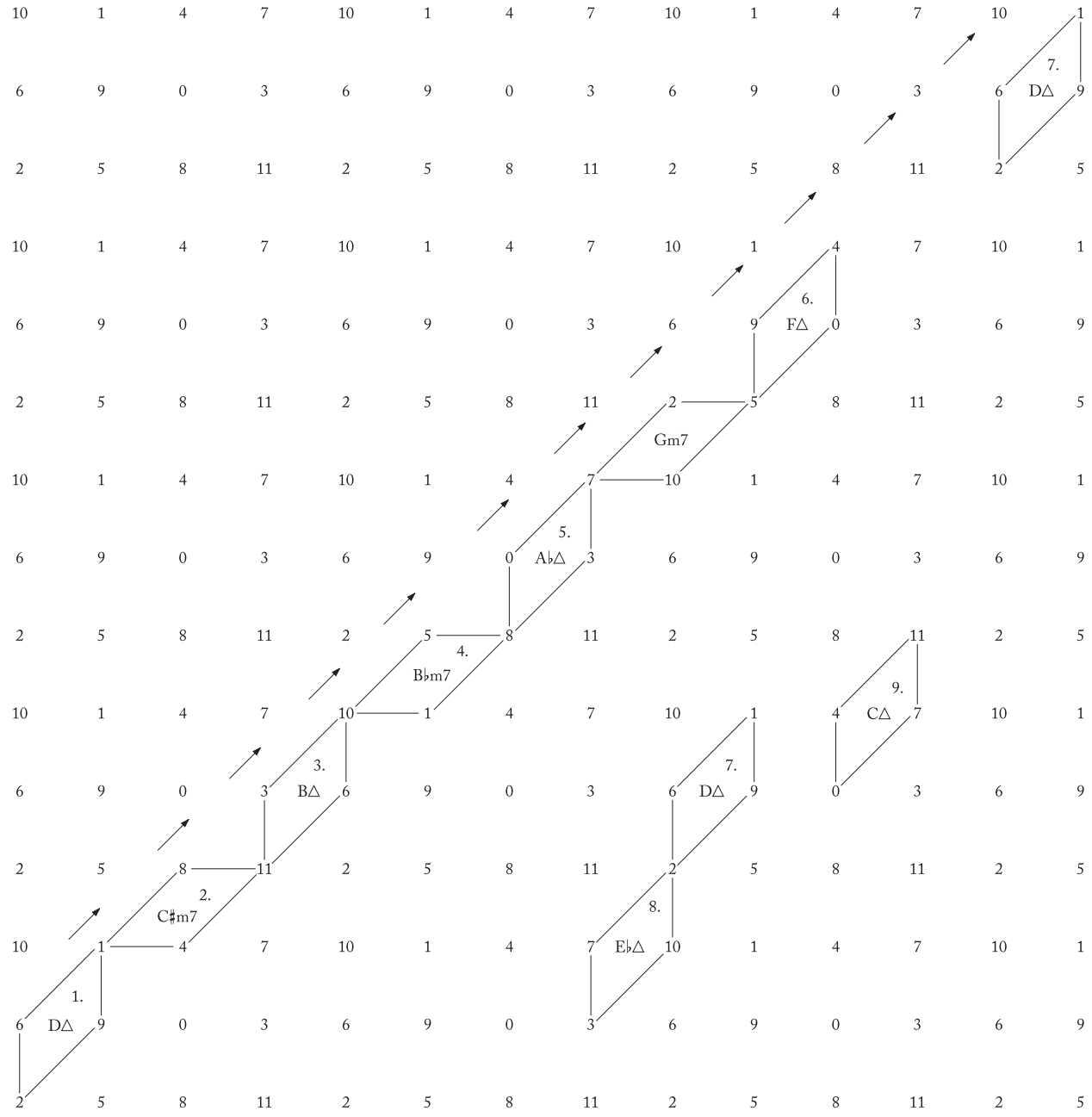
Jazz usually makes use of four-note chords at a minimum, not triads. What would progressions of seventh chords look like plotted on the *Tonnetz*?[35] Example 12 shows those of "Litha," mm. 1–22. The chords are numbered in the order of their appearance. Motion from each major-seventh chord to the following minor-seventh chord results from the compound operation LRL,[36] which is equivalent to the geometric reflection around one of the diagonals of the parallelogram followed by translation. The inverse motion back to the major-seventh chord results from the compound operation RLR, which is also equivalent to reflection followed by translation. In each instance the chordal seventh forms a common-tone relationship with the root of the following chord. The motion from chord 5–7 and from chord 8–9 could be explained as a translation, but based on the pattern established earlier, the compound operation LRLRLR might be more appropriate. Chord 7 moves to chord 8 by means of either RLPL or PLRL, which geometrically can be either a rotation around the common pitch class or a translation. These operations, unlike the others in this example, are also equivalent to pitch-class transposition and inversion (T_1 and T_4I).

I will return to the *Tonnetz*, but now let us consider the remaining chords of "Litha," from m. 23 to m. 62. These also form a sequence, illustrated in Example 13.

At (a) the pitch-class content of the chords is given on a bass staff. Each of the three pairs of chords is a form of 9–11 [01235679T], and the pairs are related by T_5—it is a circle-of-fifths progression of that nine-note set. The first pair is out of

35 See Childs (1998).

36 Neo-Riemannian operations on major- and minor-seventh chords are here based on application of the operations to the triad forming the root, third, and fifth of the seventh chord.

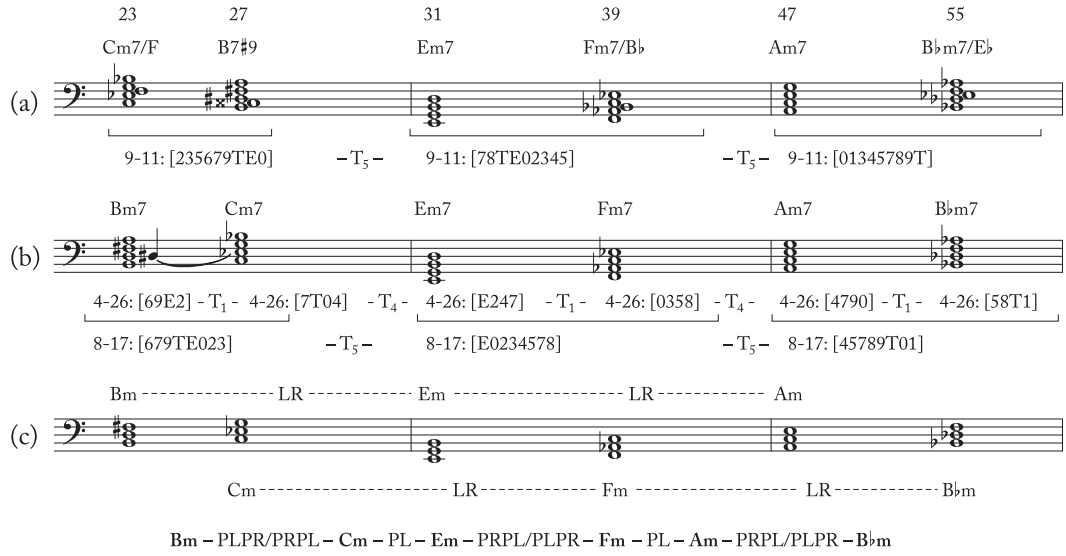


EXAMPLE 12. Tonnetz *representation of seventh chords, "Litha," mm. 1–22*

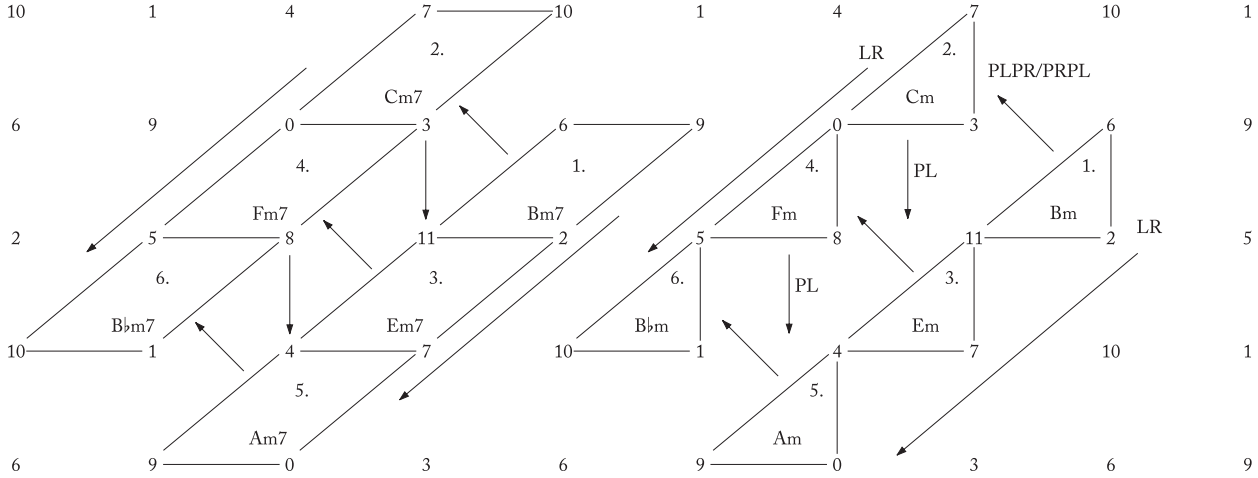
order in relation to the other pairs, but as unordered sets, they are transpositions of each other.

At (b) the progression is given as four-note chords and the order of the first two chords is rearranged to match that of the other pairs.[37] In this arrangement, each of the vertical structures built on those roots is a minor-seventh chord, 4–26[0358], and the series of roots (B–C–E–F–A–B♭) forms a symmetrical statement of the inversionally symmetrical set-class 6-Z38[012378], representing repeated applications of T_1 followed by T_4 (detailed below the staff). The pairs of chords, now 8–17[01345689], are also related by T_5. Thus, the construction of mm. 23–62 parallels that of mm. 1–14: a single type of seventh chord (major seventh in 1–14,

37 The B7(♯9) at m. 27 is reinterpreted at (b): the C$^{\sharp\sharp}$ is spelled as D, and the D♯ is considered to belong with the Cm^7 as enharmonically equivalent to E♭. Also, note that at (b) and at (c) the bass notes are omitted from the slash chords. Both these changes enable the isolation of the minor-seventh structures that are present in each of the chords of mm. 23–62. These minor-seventh chords form the basic structure of the progression from the point of view of the analytical technique being employed here.



EXAMPLE 13. *"Litha" mm. 23–62: (a) as in score; (b) as seventh chords; (c) as triads*



EXAMPLE 14. Tonnetz *representation of "Litha" triads and seventh chords, mm. 23–62*

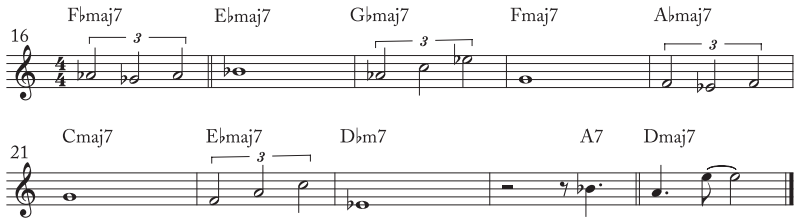
minor seventh in 23–62) is moved through a transposition cycle (T_9 in 1–14, T_1-T_4 in 23–62). Both transposition cycles have the potential to make a closed progression that returns to the initial chord, but this potential is realized only in the former.

At (c), the series of chords is given as triads. These may be generated by two interlocking repeated applications of the binary chain Leading-tone exchange-Relative (LR), as shown around the staff at (c). Alternatively, the series may be generated by alternating between two compound operations: (1) PLPR or its equivalent, PRPL; and (2) PL, as indicated below the staff. All these operations are equivalent to geometric translations. This progression is presented on the *Tonnetz* in Example 14, both as triads and as seventh chords.

"TONES FOR JOAN'S BONES" AND "STEPS"

Measures 16–25 of Corea's "Tones for Joan's Bones" (1966) appears in Example 15.[38] An Ebmaj7 chord (m. 17) is

38 Corea (1994, 70–71).



EXAMPLE 15. *"Tones for Joan's Bones," mm. 16–25, taken from Corea (1994)*

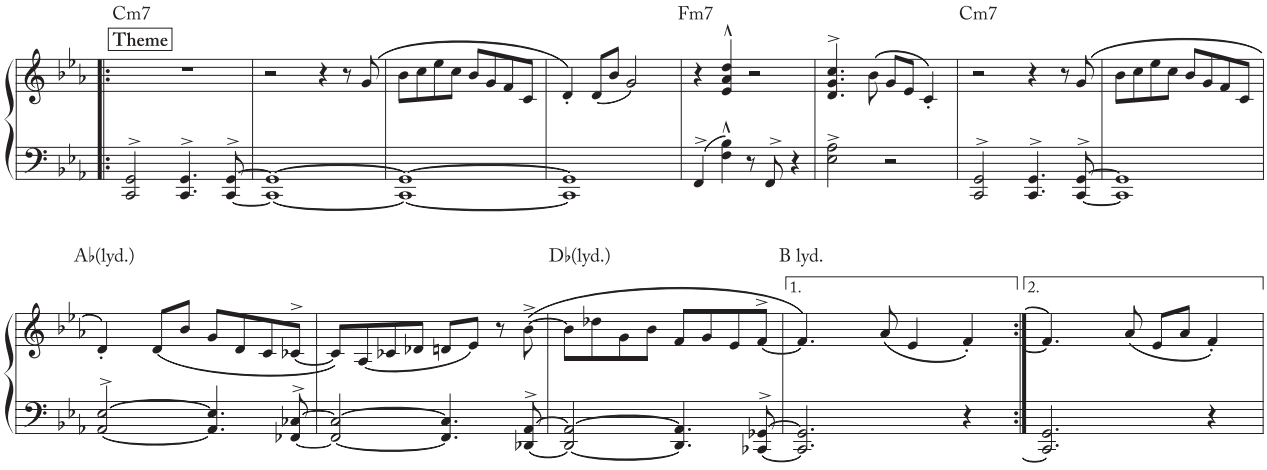
(a) Score version:

m.	16	17	18	19	20	21	22	23
	F♭△	E♭△	G♭△	F△	A♭△	C△	E♭△	D♭ m7 (9th in melody)

(b) Reduction to major seventh chords:

m.	16	17	18	19	20	21	22	23
	F♭△	E♭△	G♭△	F△	A♭△	C△	E♭△	F♭△
	T_{11}	T_3	T_{11}	T_3	T_4	T_3	T_1	

EXAMPLE 16. *"Tones for Joan's Bones," mm. 16–23*

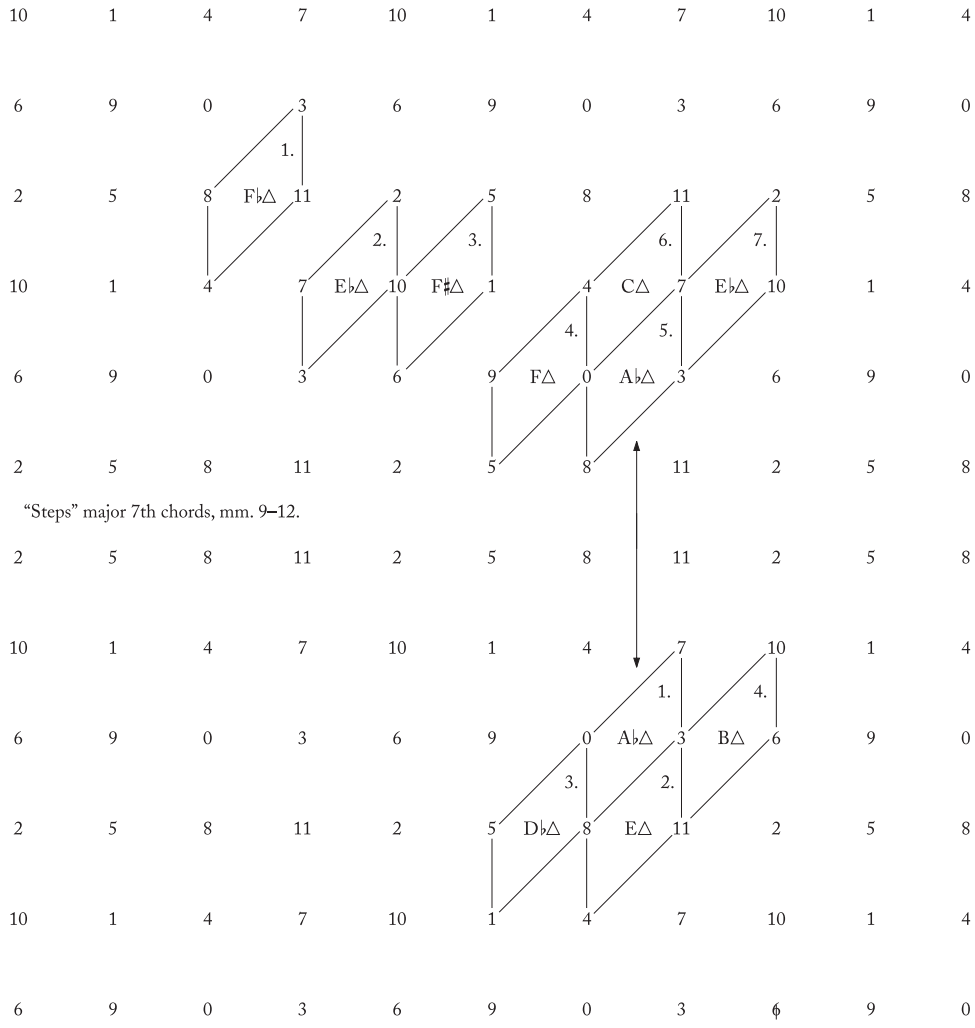


EXAMPLE 17. *Theme of "Steps" (Dobbins transcription) By Chick Corea Copyright © 1968 UNIVERSAL MUSIC CORP. Copyright Renewed. This arrangement Copyright © 2014 UNIVERSAL MUSIC CORP. All Rights Reserved. Used by Permission. Reprinted by permission of Hal Leonard Corporation.*

immediately preceded by an F♭maj7. This begins a tonally ambiguous passage, consisting almost entirely of major-seventh chords, and to the dominant A7 at m. 24, which then returns to tonic D at the repeat of the opening theme. Example 16, at (a), lists the chords of the ambiguous passage as indicated on the score, which agrees with the sound

m.	8	9	10	11	12	‖ 1
	Cm7	A♭△	F♭△	D♭△	B△	Cm7
roots:	4	4	3	2	1	
major 7th chords:		T_8	T_9	T_{10}		

EXAMPLE 18. *"Steps," mm. 8–12–1*



EXAMPLE 19. Tonnetz *representation of "Tones for Joan's Bones" major seventh chords, mm. 16–23 and "Steps" major seventh chords, mm. 9–12*

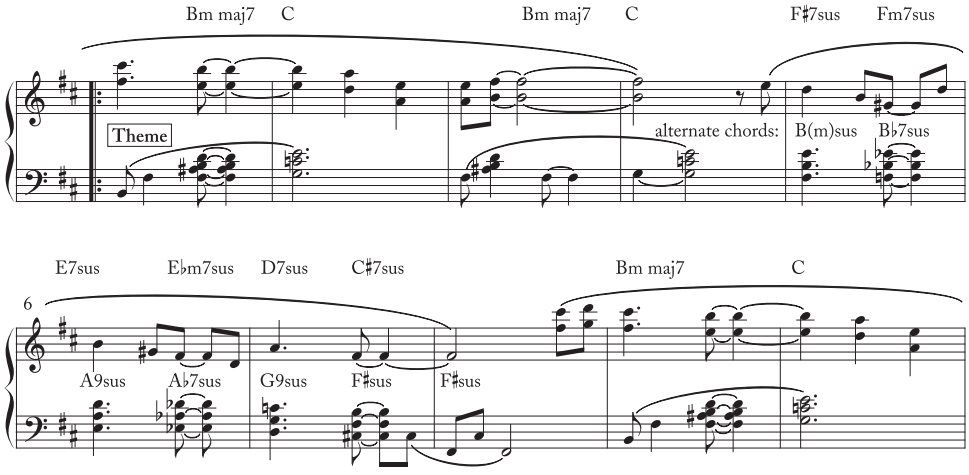
of the recording.[39] At (b), the last chord (D♭m7, ninth in melody) is replaced by a subset of it (F♭maj7) in order to compare transposition levels of the major-seventh chords. The logic of this progression may lie in its symmetrical aspects. Curved brackets below the progression indicate symmetrically paired elements. Among the chords, the outer elements, the F♭maj7s and E♭maj7s, are paired. Among the transposition levels, if one matches T_{11} and T_1 because of their interval-class correspondence, then the outer elements, T_{11}, T_1, and T_3, are paired. The placement of T_3 as the second, penultimate, and central elements also supports the symmetrical interpretation. Before graphing this progression on the *Tonnetz*, we will consider a similar progression from "Steps" (1968).

Bill Dobbins's transcription of the theme of "Steps" is given in Example 17.[40] "Steps" is a minor blues, which presents the usual tonic and subdominant harmonies in mm. 1–8 but replaces the last four measures with a nonfunctional progression. Example 18 shows that progression as a series of major-seventh chords connecting the tonic Cm7 of mm. 7–8 to the same chord in mm. 1–4.[41] The series seems to be based on decreasing intervals between the chordal roots, as the interval-classes between the successive roots decrease from

39 Blue Mitchell, *Boss Horn,* Blue Note BST84257 (1966); reissued on *The Best of Chick Corea,* Blue Note CDP 0777 7 89282 2 5 (1993).

40 Corea (1988, 10–11).

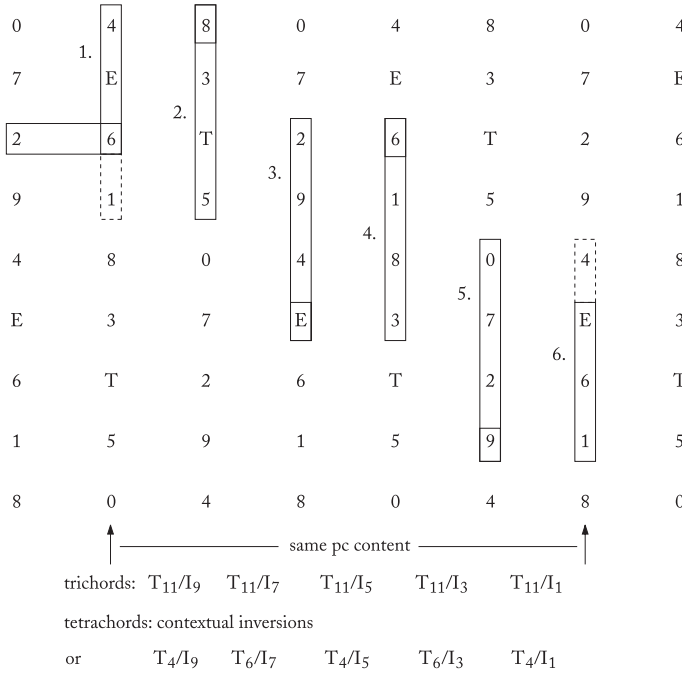
41 I interpret Dobbins's "A♭ Lydian" as a major-seventh chord due to the G in the melody and the treatment of the chord in the subsequent choruses. Although on the "E(maj7)," the melody has D♭, not D♯, the later choruses confirm that it is a major-seventh chord.



EXAMPLE 20. *Theme of "Now He Sings, Now He Sobs," mm. 1–10 (Dobbins transcription)*

4 to 1. The pitch-class transposition levels of the major-seventh chords also progress from T_8 to T_9 to T_{10}.

Example 19 plots these two progressions on the *Tonnetz*. The graph of mm. 16–23 of "Tones for Joan's Bones" reflects the sequential relationships between chords 1–2 and chords 3–4, chords 2–3 and chords 4–5, and chords 4–5 and chords 6–7. Chords 4–7 form a cluster: each of those chords shares two pitch classes with one or more of the other chords. On the other hand, the *Tonnetz* graph of mm. 9–12 of "Steps" shows that the potential sequential relationships within its cluster of four chords were avoided, evidently in favor of the decreasing interval-classes between roots. Note, however, the isomorphism of the two four-chord clusters in the two pieces: they are mutually related by T_4/T_8. Although the chords as a cluster have the same structure, each set of chords moves through them in a different order. The four-chord cluster, then, acts as a compositional space, as described by Robert Morris: "compositional spaces are out-of-time structures from which the more specific and temporally oriented compositional design can be composed."[42] One of Morris's examples of a compositional design is "jazz chords from a lead sheet,"[43] which corresponds to the progression in Example 19. These are two temporal realizations of the same nontemporal compositional space.

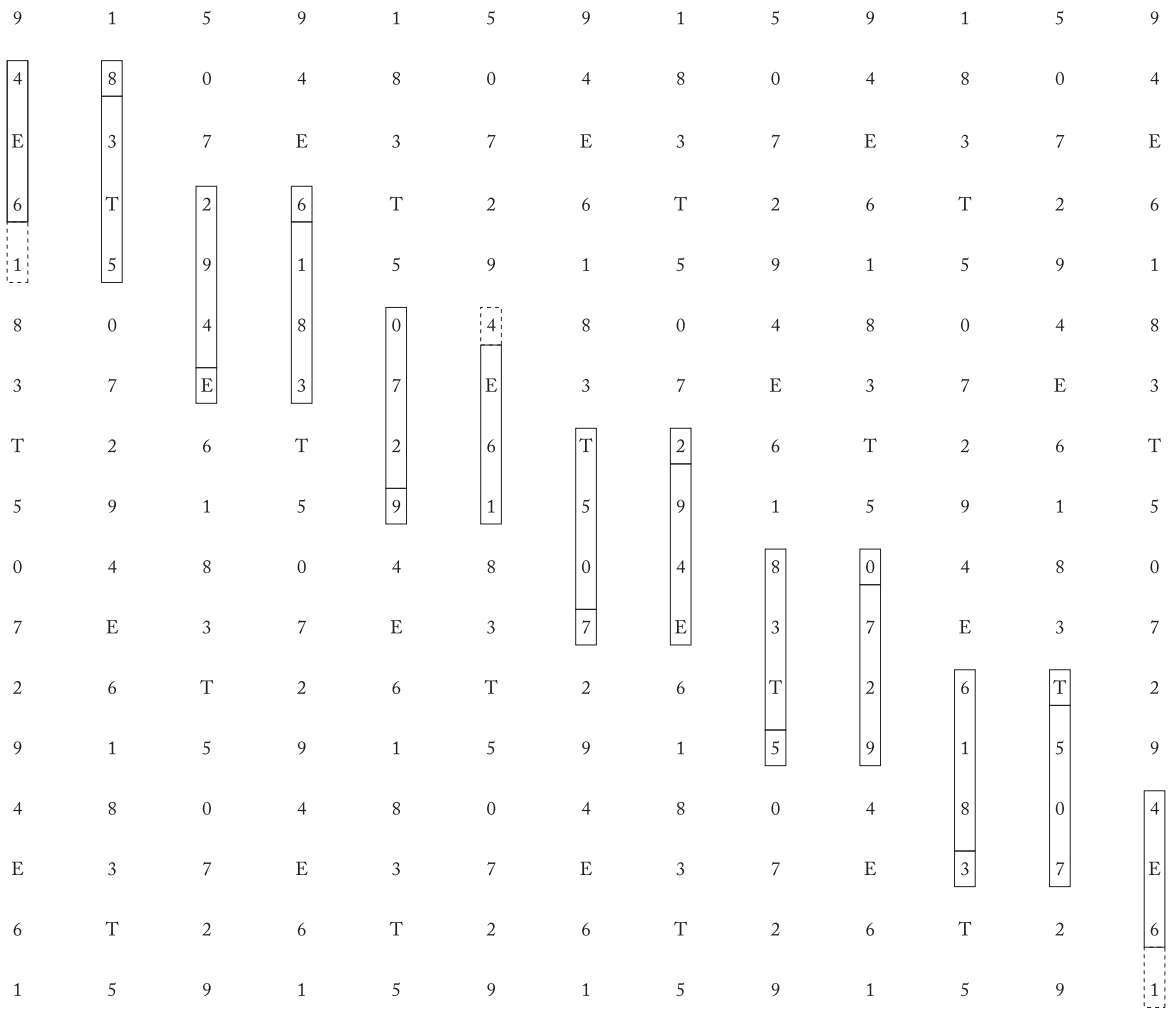


EXAMPLE 21. Tonnetz *representation of "Now He Sings, Now He Sobs," mm. 5–7 of theme*

"NOW HE SINGS, NOW HE SOBS"

In studying Bill Dobbins's transcriptions of Corea's 1968 album "Now He Sings, Now He Sobs," I was struck by the nearly constant presence of chords voiced in fourths in the left hand. Perhaps it was misleading to represent chord symbols as triads and seventh chords, when Corea almost never voiced them in thirds. At times the quartal voicings were difficult to interpret in terms of triadic harmony, leading Dobbins to posit alternate versions of chord symbols for some passages. It seemed reasonable, then, to graph these progressions on a version of the *Tonnetz* that was constructed with fourths in place of the usual thirds. To allow for such unusual *Tonnetze*, Robert Morris has generalized a "*Tonnetz* space descriptor": "A *Tonnetz* space whose upward verticals are of T_x cycles, whose left-to-right horizontals are of T_Y cycles, whose southeast to

42 Morris (1995, 330).
43 Ibid.



EXAMPLE 22. *Larger pattern of "Now He Sings, Now He Sobs," mm. 5–7 of theme*

northwest diagonals are of T_z cycles, and whose southwest to northeast diagonals are of T_w cycles, is given the *Tonnetz space descriptor* [x, y, z, w]. The descriptor for our basic *Tonnetz* is [4, 3, 1, 7]."[44] The latter is the *Tonnetz* I have used in the examples up to this point. For the quartal chords, I use a [5, 4, 1, 9] *Tonnetz*.

Measures 5–7 of "Now He Sings, Now He Sobs" contain one of the ambiguous progressions of fourth chords. Example 20 shows Dobbins's transcription of mm. 1–10 with the alternate chords for mm. 5–7 indicated,[45] and Example 21 shows the series from mm. 5–7 graphed on a [5, 4, 1, 9] *Tonnetz*. Each chord, with the exception of the first, appears as a vertical stack of fourths. The trichords are played by the left hand. For chords 2–5, the single pitch class in a box is played by the right hand. The structure of the system implies pitch-class 1 for the first chord (shown in a dotted box), where Corea in fact plays pitch-class 2. He also foreshortens the right-hand melodic sequence at chord 6 (compare mm. 6 and 7 from the transcription): the completion of that sequence would result in pitch-class 4 (rather than 6 as played by Corea): the implied pitch-class 4 is also included, shown by a dotted box. Using the implied pitch classes, the progression is closed, beginning and ending with the same pitch-class content. The series is produced by a rotation of 180 degrees followed by a translation. That is, the first chord is turned upside down and moved one column to the right, which sends 1 to 8 (the right hand), and {6, 11, 4} to {3, 10, 5} (the left hand). This combination maintains the two chords side-by-side on the graph. The second move of the series turns the second chord upside down, then translates the result one column to the right and down two rows, sending 8 to 11 (the right hand) and {5, 10, 3} to {2, 9, 4} (the left hand). Thus the tetrachord moves down two units on the graph. In the model (with the implied pitch classes), the series continues until the original pitch-class content is regained. The left-hand part, of course, can also be said to be moving down in

44 Morris (1998, 188).
45 Corea (1988, 48).

semitones, T_{11}, through the transposition series T_4, T_6, T_4, T_6, T_4, or through the inversion series T_9I, T_7I, T_5I,T_3I, T_1I, but these descriptions do not seem to show the relationship between the hands as well as the geometric operations on the graph.

Although the six-chord progression regains the same pitch-class content, the first and sixth chords are not distributed between the hands in the same way. The six chords are part of a larger pattern: Example 22 continues the inversions until the two hands regain the same pitch classes they each had in the first chord. Reading from left to right, the first six chords are those we have seen; the last six continue the process, returning to the beginning of the series.

SUMMARY

As a summary, I list the analytic approaches taken in this article. All have contributed in a unique way to an understanding of the compositions studied.

1. The rudimentary experiential approach of the performer or listener shows how harmonic ambiguity maintains functional uncertainty through most of "Windows" until the key is confirmed toward the end in the piece.

2. Schenkerian voice-leading graphs demonstrate the connection of these compositions to tonal music in general, as well as their departures from the norms of tonal music through their variations on *Urlinie* and *Ursatz*. It is also possible through these graphs to propose two interpretations of the tonal structure of "Windows": one with a tonic-subdominant axis and one with a tonic-dominant axis.

3. The "layered" analysis originally developed for bebop harmony is useful in demonstrating how far, and in what ways, Corea's tunes have strayed from the bebop harmonic style of earlier decades. The harmonic features in Corea's music call for new operations (the embellishing chord prefix, incomplete neighbor suffix, and change to parallel triad) as well as the stress on the sus4 dominant seventh, which distinguish it from those of earlier bebop.

4. Application of the transposition operation, Neo-Riemannian operations, and other contextual operations on the *Tonnetz* are among the methods employed in analyses of nonfunctional harmony. These operations were first connected to the linear intervallic patterns and equal divisions of tonal space (usually the octave). Then the Neo-Riemannian operations were used to generate a passage in "Litha." Passages from "Tones for Joan's Bones" and "Steps" were graphed on the *Tonnetz* and were seen to share a compositional space. A special *Tonnetz* was used to graph the passage from "Now He Sings, Now He Sobs" to illustrate a pattern of rotation and translation.

Analysis of these compositions and other related music of this period is challenging. There is much more to be learned, but I hope that these various analytic approaches, each suggested by the nature of the music itself, may have begun the process of understanding a style worthy of further study.

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