Chapter 4
Chord-Scale Transformations

For jazz musicians, a chord symbol implies more than just the root, third, and seventh; its fifth, ninth, and potentially other chord members are implied as well. Instead of considering the extended harmonies common in jazz as stacks of thirds, musicians often describe harmony in a more linear fashion, using a scale to stand in for a chord symbol. What is often called "chord-scale theory" is a major part of jazz pedagogy, and cannot be ignored as we try to approach a general theory of jazz harmony. This chapter begins with an introduction to chord-scale theory, both in its original form and its later pedagogical adaptations, and then continues to incorporate it into the transformational system developed thus far; finally, we will see how the theory allows us to make analytical insights that can go beyond the chord-symbol based analysis of previous chapters.

4.1 George Russell's *Lydian Chromatic Concept*

The ultimate origin of chord-scale theory is George Russell's *Lydian Chromatic Concept of Tonal Organization*, first published in 1953 but revised several times throughout Russell's life.[1] Russell was a jazz pianist, drummer, and a well-known composer and arranger; he devised the majority of the *Lydian Chromatic Concept* while hospitalized for tuberculosis in 1945–46.[2] The influence of the *Concept* (as it is often called) is difficult to overstate. Joachim-Ernst Berendt and Günther Heusmann describe it as "the first work deriving a theory of jazz harmony from the immanent laws

1. George Russell, *The Lydian Chromatic Concept of Tonal Organization*, 4th ed., vol. 1, *The Art and Science of Tonal Gravity* (Brookline, MA: Concept, 2001); hereafter, simply *LCC*. References to the book in this dissertation will be to this final edition unless otherwise noted. Though a full reception history of the *Lydian Chromatic Concept* is beyond the scope of this project, it is worth noting that the later editions focus more heavily on the theory than the earlier editions, which were more practical in nature. In the original edition, the section on theoretical foundations appears after eight initial "lessons"; in the 2001 edition, this material has been moved front and center to Chapter 1. Furthermore, the last edition was reframed as the first volume in what was to be a multi-volume set; at the time of Russell's death in 2009, only the first volume had been published.

2. *Encyclopedia of Popular Music*, s.v. "George Russell," last modified July 4, 2006, http://www.oxfordmusiconline.com/subscriber/article/epm/48476.

of jazz, not from the laws of European music," and the blurbs on the back cover contain praises from musicians including Gil Evans, Ornette Coleman, Eric Dolphy, and Toru Takemitsu.[3]

Despite its importance to jazz theory, though, Russell's work has not received much attention in music-theoretical scholarship on jazz. Dmitri Tymoczko, for example, does not mention Russell at all in his survey on the pedagogical use of chord-scales in jazz, and the only mention of Russell in his book is in a footnote unrelated to Russell's contributions to chord-scale theory.[4] There may be many reasons for this—Russell's serpentine and hard-to-follow prose are probably not least among them—but regardless, an introduction to Russell's theories as he conceived them will be in order here. The *Lydian Chromatic Concept* can be divided into two main components, which we will treat separately in the following sections: Lydian tonal organization and chord/scale equivalence.

4.1.1 Lydian Tonal Organization

Russell's central insight—indeed, the Concept itself—is that the Lydian scale, rather than the major scale, serves a fundamental role in equal-tempered music. He offers many explanations, but this central idea is easiest to demonstrate, as he does, with an example. Figure 4.1a reproduces Russell's first example; he provides the following instructions and explanation:

> Sound both of the following chords separately. Try to detect the one which sounds a greater degree of unity and finality with its tonical [*sic*] C major triad. . . . In tests performed over the years in various parts of the world, the majority of people have repeatedly chosen the second chord—the C Lydian Scale in its tertian order. (*LCC* 1)

The lowest note of a stack of six perfect fifths is what Russell calls the "Lydian tonic"; the B–F tritone in the C major scale "disrupts the perfect symmetry of the fifths" (*LCC* 4; see Figure 4.1b).

3. Joachim-Ernst Berendt and Günther Huesmann, *The Jazz Book: From Ragtime to the 21st Century*, 7th ed., trans. H. and B. Bredigkeit et al. (Chicago: Lawrence Hill, 2009), 602. Takemitsu's fascination with the *Concept* is discussed at length in Peter Burt, "Takemitsu and the Lydian Chromatic Concept of George Russell," *Contemporary Music Review* 21, no. 4 (2002): 79–109.

4. Dmitri Tymoczko, "The Consecutive-Semitone Constraint on Scalar Structure: A Link Between Impressionism and Jazz," *Intégral* 11 (1997): 135–79; and *A Geometry of Music: Harmony and Counterpoint in the Extended Common Practice* (New York: Oxford University Press, 2011), 366n13. My intent here is not to single out Tymoczko, but only to note that modern theorists who engage directly with Russell's ideas do not always mention his work. The most complete treatments of the *Concept* in modern scholarship are Burt's previously-cited article on Takemitsu and Brett Clement's work on Frank Zappa (who, while influenced by jazz, is not part of the jazz mainstream that is the focus of this study); see "A New Lydian Theory for Frank Zappa's Modal Music," *Music Theory Spectrum* 36, no. 1 (Spring 2014).

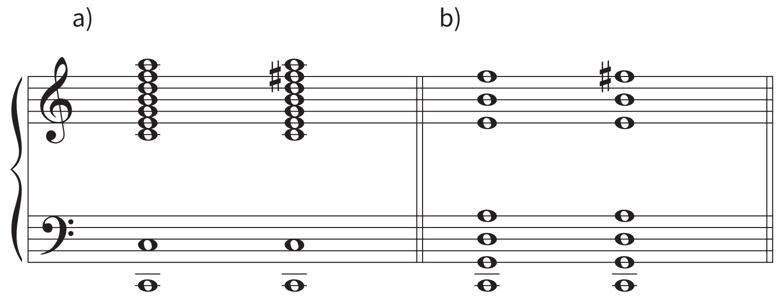


Figure 4.1. The major and Lydian scales, as stacks of thirds and fifths (Russell's Examples I:1, I:2a, and I:5a).

He does concede that C is also understood as tonic in the major scale arrangement, but that it does not sound resolved, since "the presence of the Lydian *do* on the major scale's fourth degree permanently denies [it] that possibility" (*LCC* 4). For Russell, the major scale is always in a state of tension, wanting to "resolve" to the Lydian.[5]

Closely allied with the Lydian tonic is the concept of tonal gravity, which Russell describes as the fundamental principle of the *Concept*. In a stack of fifths, tonal gravity flows downward: "the tone F♯ yields to B as its tonic—F♯ and B surrender 'tonical' authority to E, and so on down the ladder of fifths—the entire stack conferring ultimate tonical authority on its lowermost tone, C" (*LCC* 3). The concept of tonal gravity provides the justification for the primacy of the Lydian scale, since the major scale cannot be constructed by generating perfect fifths from its tonic.

Its theoretical justifications aside, the Lydian scale has an almost mystical quality to Russell, which can sometimes be off-putting. A somewhat longer passage from the *Concept* will help to illustrate Russell's fascination with the scale, as well as his usual circuitous mode of presentation (the emphasis and non-bracketed ellipses are original):

> The Lydian Tonic, as the musical "Star-Sun," is the seminal source of tonal gravity and organization of a Lydian Chromatic scale. [. . .] Unity is the state in which the Lydian Scale exists in relation to its I major and VI minor tonic station chords, as well as

5. I am using the term "scale" here as Russell does: he always refers to the Lydian as a scale rather than a mode. Dmitri Tymoczko has argued against this usage, saying that there is a "widespread tendency to elide the difference between scale and mode" (*A Geometry of Music*, 366n14). To call the Lydian a mode would imply that it is simply a reordering of a major scale, though, and for Russell the two are fundamentally different objects.

> those on other scale degrees. Unity *is* . . . instantaneous completeness and oneness in the *Absolute Here and Now* . . . above linear time.
>
> The Lydian Scale is the musical *passive* force. Its unified tonal gravity field, ordained by the ladder of fifths, serves as a theoretical basis for tonal organization within the Lydian Chromatic Scale and, ultimately, for the entire Lydian Chromatic Concept. There is no "goal pressure" within the tonal gravity field of a Lydian Scale. The Lydian Scale exists as a self-organized *Unity* in relations to its tonic tone and tonic major chord. The Lydian Scale implies an evolution to higher levels of tonal organization. The Lydian Scale is the true scale of tonal unity and the scale which clearly represents the phenomenon of tonal gravity itself. (*LCC* 8–9)

Russell's logic is, of course, circular: the Lydian tonic is by definition the note that is the bottom of a stack of six perfect fifths, and the principle of tonal gravity confers a special status on the bottom of a stack of six fifths (conveniently, the Lydian tonic). Partly for this reason, this part of Russell's theory has not really been taken seriously by modern scholars. He never gives a reason, for example, that the stack should not be extended further: would the lowest note of a stack of *seven* fifths not be imbued with even more tonal gravity? This complication reappears when Russell later presents the complete "Lydian Chromatic Order of Tonal Gravity," given here starting on F (*LCC* 12):

F C G D A E B C♯ A♭ E♭ B♭ G♭

What should be a perfect fifth from B to F♯ is replaced by a whole step (B–C♯), so that the minor ninth (F–G♭), does not appear until the last note. This sleight of hand also prevents there from being more than one succession of six perfect fifths in the series. If it had continued in perfect fifths, there would be by definition seven Lydian tonics!

Considering these inconsistencies, we might ask if there is anything worth saving in Russell's ideas. He is probably right that most people prefer the sound of the stack of thirds on the right of Figure 4.1a, with the F♯.[6] And the Lydian scale *does* have some practical advantages over the major scale. As Russell points out, $\sharp\hat{4}$ appears before $\natural\hat{4}$ in the harmonic series (he does not mention that $\flat\hat{7}$ appears before $\natural\hat{7}$). The Lydian scale is also unique in that it is possible to form all twelve

6. Though Russell attributes this preference to the Lydian scale, we could probably point to another reason: the second chord does not contain the dissonant minor ninth between F♮ and E, the third of the chord.

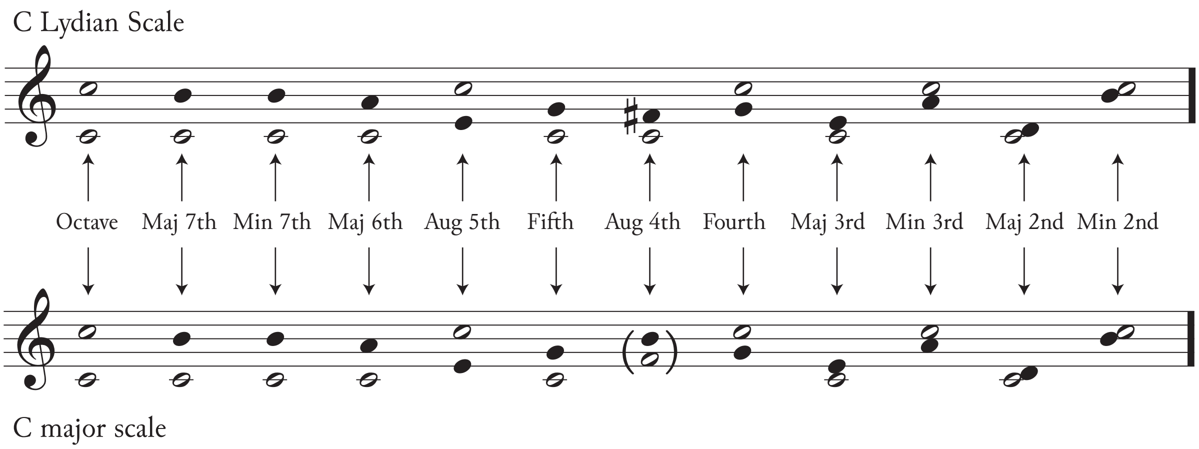


Figure 4.2. Russell's "Interval Tonic Justification" for the Lydian scale (his Example I:9).

interval types with the tonic; Russell's explanation of this fact is reproduced in Figure 4.2 (the F in the major scale is shown with a hollow note because it is the true Lydian tonic for the scale).

Though we may not share Russell's preoccupation with the Lydian scale, we should not let his idiosyncratic views distract us from the more important points of the theory. Theorists are, of course, used to adopting worthwhile theoretical ideas from authors without assuming their entire worldview. We regularly practice Schenkerian analysis without adopting Schenker's views on the superiority of German music, and even 18th-century authors like Johann Phillip Kirnberger accepted Jean-Phillipe Rameau's fundamental bass without necessarily espousing his more contentious thoughts on harmonic generation or *subposition*.[7] And yet, with the *Concept*, this does not seem to have taken place.[8] If we grant Russell these inconsistencies, though, his ideas prove to be remarkably useful, as we shall see.

Before moving on to chord-scales proper, we should first examine the scales themselves, as their initial presentation in the *Concept* is entangled with the discussion of the nature of the

7. Joel Lester, *Compositional Theory in the Eighteenth Century* (Cambridge, MA: Harvard University Press, 1992), 240–41.

8. My own suspicion is that Russell's work is too new to be considered historically, but not new enough to be taken seriously as modern scholarship. I discuss this idea at length in "Reconceptualizing the *Lydian Chromatic Concept*: George Russell as Historical Theorist" (paper presented at the annual meeting of the Society for Music Theory, St. Louis, MO, October 2015); see also Kyle Adams, "When Does the Present Become the Past? A Re-examination of 'Presentism' and 'Historicism'" (paper presented at the annual meeting of the Society for Music Theory, Charlotte, NC, November 2013).

Lydian scale. The scales are generated (more or less) from the chromatic order of tonal gravity, which is given again here in its generic form:

I V II VI III VII +IV +V ♭III ♭VII IV ♭II

When taken together, the entire series represents the Lydian Chromatic Scale, the foundation of the titular Concept.

The Lydian Chromatic (or LC) scale contains eleven "member scales," each of which is chosen, Russell says, for three reasons:

a. a scale's capacity to parent chords considered important in the development of Western harmony
b. a scale as being most representative of a tonal level of the Lydian Chromatic scale
c. the historical and/or sociological significance of a scale. (*LCC* 12)

These eleven scales are further divided into seven principal scales and four horizontal scales. The seven principal scales are derived from the Lydian Chromatic scale, and are shown in Figure 4.3. These scales are given what Russell calls their "ingoing-to-outgoing" order in regards to the F Lydian tonic; "ingoing" and "outgoing" may be read as "consonant" and "dissonant," respectively.[9] The principal scales are probably more familiar under different names, as shown in Table 4.1.[10]

The means by which the LC scale generates the seven principal scales is explained the diagram reproduced in Figure 4.4.[11] Russell's explanation of this diagram is somewhat confusing. The term "tone order" is never defined, except to say that the LC scale has five of them (it is unclear why there is no 8-tone order). The shaded "consonant nucleus" describes the fact that all of the standard chord types—major, minor, seventh, augmented, and diminished—are contained within it.[12] The consonant nucleus also provides a (tautological) explanation for the missing fifth in the order of tonal gravity: "the skipping of the interval of a fifth between the seventh and eighth tones

9. Russell defines "ingoing" only in passing, saying that "all music conceived within the equal tempered system maintains a closer (more INGOING) relationship to one tone than to all others, regardless of the music's style or genre" (*LCC* 9).

10. Russell's idiosyncratic names have mostly fallen out of use, since they are long and difficult to remember. It is easier for an improvising musician, for example, to recall the "half–whole diminished scale" than it is to remember the "auxiliary diminished blues scale" (named, incidentally, for the fact that it shares $\flat\hat{3}$, $\natural\hat{3}$, and $\flat\hat{7}$ with the blues scale).

11. The remainder of this paragraph is a gloss on the material in *LCC* 12–17.

12. Exactly what Russell means by "seventh" is unclear; he likely means the dominant seventh, though all four standard seventh chord types (major, minor, diminished, and half-diminished) appear in the consonant nucleus.

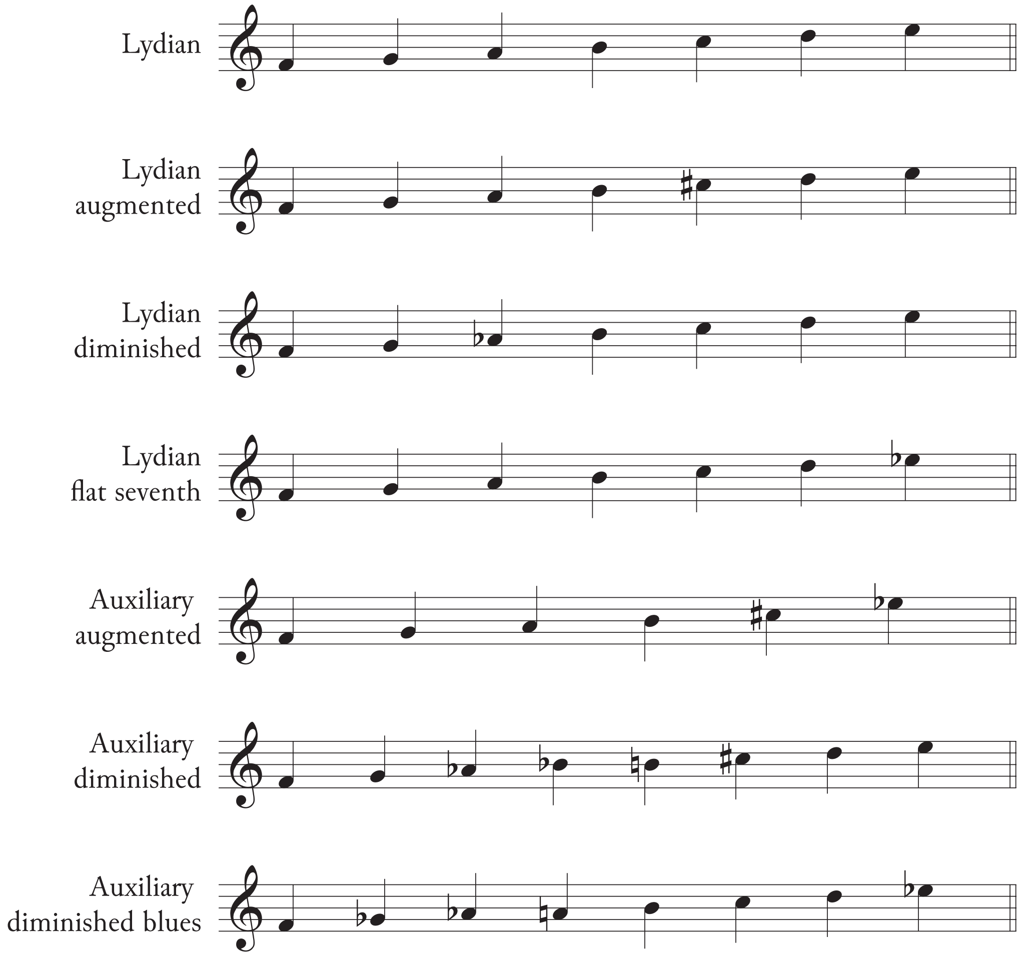


Figure 4.3. The seven principal scales of the F Lydian Chromatic scale.

Russell's name	Other common names
Lydian	–
Lydian augmented	3rd mode of melodic minor
Lydian diminished	4th mode of harmonic major
Lydian flat seventh	Lydian dominant, acoustic
Auxiliary augmented	whole-tone
Auxiliary diminished	octatonic, diminished (whole–half)
Auxiliary diminished blues	octatonic, diminished (half–whole)

Table 4.1. Russell's principal scale names and their other common names.

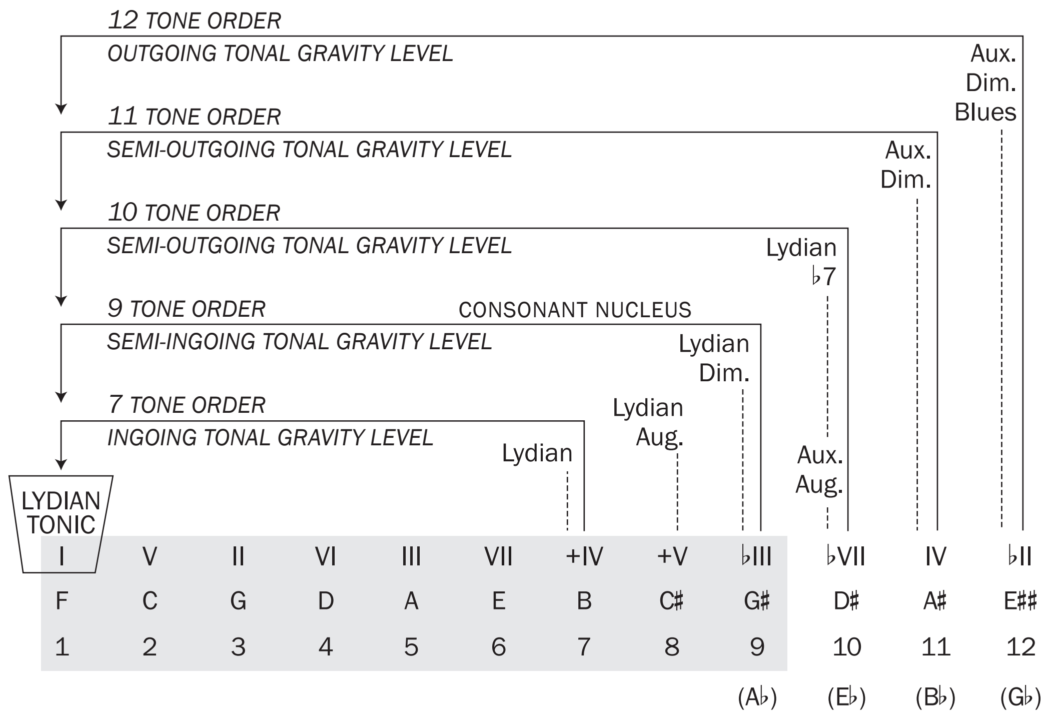


Figure 4.4. Russell's Lydian Chromatic Order of Tonal Gravity (his example II:3).

of the Lydian Chromatic Scale allows the five basic chord categories of Western Harmony to be assimilated by its Nine-Tone Order, Semi-Ingoing Level, in the logical order of their development in Western Harmony and the Lydian Chromatic Scale" (*LCC* 16).

The other four of the eleven member scales are known as the "horizontal scales," and are shown in Figure 4.5. For Russell, "horizontal" is used in opposition to the "vertical" generation of the Lydian scale. Because the major scale is not a stack of perfect fifths, he considers it to be generated in a different direction. All of the horizontal scales have ♮$\hat{4}$; Russell only includes them because of their "historical and/or sociological significance." The horizontal scales do not, as we shall see, generate chords in the same way as the vertical scales, and for Russell exist in a constant state of tension between the "false" tonic and the true Lydian tonic.

Given that most of Russell's ideas on Lydian tonal organization have disappeared from modern chord-scale theory, it is reasonable to ask why so much space has been devoted to them here. There are two reasons. First, much modern scholarship does not seriously engage with Russell's

Figure 4.5. The four horizontal scales of the F Lydian Chromatic scale.

ideas, and as a result most theorists are not familiar with its first incarnation. Because the original presentation of chord-scale theory is tied up with that of Lydian tonal organization, understanding the former is important in order to make sense of the latter. Second, and more importantly, one of the goals of this dissertation is to take jazz musicians' conceptions of harmony seriously: chord-scale theory is an integral part of the way jazz is taught, and therefore many practicing musicians understand harmony in terms of this theory. Later in this chapter, we will seek to revive some of Russell's initial formulation of the *Concept* as we develop a transformational system of chord-scales.[13]

4.1.2 Chord/Scale Equivalence

While Russell may have understood Lydian tonal organization to be the most important part of his new theory, the part that has survived—flourished, even—is his novel conception of chord/scale equivalence.[14] Russell's first mention of the concept explains its inception:

13. The counterargument is perhaps obvious: if the ideas about Lydian tonal organization have fallen by the wayside, why bother trying to resuscitate them? As I hope to show in the following sections, Russell's systematic approach is useful as a means of formalizing what has since become implicit knowledge.

14. Dmitri Tymoczko makes the argument that something like chord-scale theory existed in the music of the Impressionists, and suggests that jazz musicians may have discovered it by listening to Debussy and Ravel ("The

> In a conversation I had with Miles Davis in 1945, I asked, "Miles, what's your musical aim?" His answer, "to learn all the changes (chords)," was somewhat puzzling to me since I felt—and I was hardly alone in the feeling—that Miles played like he already knew all the chords. After dwelling on his statement for some months, I became mindful that Miles's answer may have implied the need to relate to chords in a new way. This motivated my quest to expand the tonal environment of the chord beyond the immediate tones of its basic structure, leading to the irrevocable conclusion that every traditionally definable chord of Western music theory has its origin in a PARENT SCALE. In this vertical sense, the term refers to that scale which is ordained—by the nature of tonal gravity—to be a chord's source of arising, and ultimate vertical completeness; the chord and its parent scale existing in a state of complete and indestructible chord/scale unity—a CHORDMODE. (*LCC* 10)

What Miles was looking for is essentially a way of determining what notes he could play over a given chord. Simply knowing the chord tones no longer seemed to be enough, since various extensions and alterations can change the sound of the chord. Chord-scale theory is ultimately, then, an improvisational expedient: a single scale stands in for a chord symbol. Chord symbols with alterations are represented by different scales, and thus musicians do not necessarily have to keep track of all of the individual chord tones.

Russell's later explanation of the concept is uncharacteristically clear:

> The chord and its parent scale are an inseparable entity—the reciprocal sound of one another. . . . In other words, the complete sound of a chord is its corresponding mode within its parent scale. Therefore, the broader term CHORDMODE is substituted for what is generally referred to as "the chord." (*LCC* 20–21)

It is important to understand that for Russell, the two terms—chord and scale—are truly equivalent: one does not substitute for the other, rather one *is* the other.[15] Here, we arrive at the reason for the inclusion of this material in a dissertation about jazz harmony. If we take Russell seriously (and I am arguing that we should), a harmony is a scale, and vice versa. The two ideas are

Consective-Semitone Constraint," 152 and 173). Given the initial reception of the *Concept* as the first real theory of jazz, I am skeptical of this claim, and treat Russell's ideas as their first appearance. Certainly, though, the tenets of chord-scale theory can be applied to other musics: Russell himself examines passages of Bach, Beethoven, and Ravel, among others.

15. In order to avoid confusion, we will generally respect the distinction between chord and scale from this point on. Where we have occasion to refer to the explicit chord/scale equivalence, we will use the term "chord-scale" rather than Russell's "chordmode." Russell's interchangeable use of "chord," "chordmode," and "mode" tends to confuse more than it helps, and "chord-scale" is the generally accepted term in modern scholarship and pedagogy.

inseparable, and a study of harmony in jazz would be incomplete without a commensurate discussion about scales.

At this point a brief overview of Russell's brand of chord-scale theory is appropriate. This material accounts for the majority of the length of the *Concept*, so we will be careful here to avoid going into all of its painstaking detail. Determining the scale that belongs with a particular chord is a multi-step process: first, identify the parent Lydian scale; then, determine the harmonic genre based on the characteristic modes of the Lydian scale.[16]

Russell goes through all seven modes of the Lydian scale, identifying the "principal chords" of each mode. These chords represent the purest form of the mode, and the basis for the chord/scale matching process. An overview of these is given in Table 4.2, which merits a bit of commentary.[17] First, the order of modes in the table follows Russell's order of presentation, which (though he does not explain it) roughly coincides with the frequency of each principal chordmode in jazz practice. Second, the "sub-principal chords" are those which are also representative of a given mode; they "do not contain all the tones of [the] relative Principal Chordmode," but they "still exist in a state of unity with [the] parent Principal scale" (*LCC* 23). Last, those modes with B in their names refer to bass notes: the III Major (IIIB) group refers to major chords with the third in the bass.

The treatment of Mode V here bears special mention. The fifth mode of the Lydian scale is of course the ordinary major scale, which Russell took great pains to show earlier was *not* a chord-generating scale.[18] Its role as the fifth mode of the Lydian scale is only to act as support for the consonant Lydian harmony. The principal chordmode for this scale is the same as that of the Lydian proper, with the fifth in the bass. This chord and its relatives are by nature unstable (cf. the cadential $^6_4$ chord), and this instability allows Russell to avoid a potential complication of his theory.

16. This process is simplified somewhat by the inclusion of a foldout chart in the book (in the first published edition, it was referred to as the "Lydian slide rule"). The chart is somewhat difficult to understand, though, and including it here would likely confuse matters.

17. This table summarizes the material in *LCC* 23–29.

18. His treatment of Mode II is similarly problematic, as Lydian Mode II (a vertical scale) is distinct from the Major flat seventh scale (a horizontal one).

Mode	Spelling	Principal chordmode	Sub-principal chords
I Major	C D E F♯ G A B	Cmaj13♯11	CM (triad), Cmaj6, Cmaj7, Cmaj7♭5
II Seventh	D E F♯ G A B C	D13	D7, D9, D11
VI Minor	A B C D E F♯ G	Am13	Am (triad), Am6, Am7,Am9, Am11
III Major (IIIB/Minor +5)	E F♯ G A B C D	Cmaj13♯11/E	C/E, Cmaj7/E, etc.
+IV Minor Seventh ♭5	F♯ G A B C D E	F♯m11 ♭5 ♭9 ♭13	F♯m7♭5, F♯m7♭5♭9, F♯m11♭5♭9
V Major (VB)	G A B C D E F♯	Cmaj13♯11/G	C/G, Cmaj7/G, etc.
VII Eleventh ♭9 (VIIB)	B C D E F♯ G A	Cmaj13♯11/B	B11♭9, C/B, Cmaj9/B, Cmaj9♯11/B

Table 4.2. Modes of the C Lydian scale.

After the explanation of the modes of the Lydian scale, Russell goes on to show how his seven vertical scales give rise to other kinds of chords. To do so, he introduces another bit of terminology, the Primary Modal Genre (PMG):

> A PMG is an assemblage of Principal Chord Families of similar type: a Principal Chord Family mansion housing the spectrum of variously colored Principal Chord Families of the same essential harmonic genre. (*LCC* 29)

All of the principal chordmodes in Table 4.2 are PMGs, and the six other vertical scales—Lyd. augmented, Lyd. diminished, Lyd. flat seventh, Aux. augmented, Aux. diminished, and Aux. dim. blues—generate similar assemblages of chordal types.

Figure 4.6 gives an example of how this works in practice. The left-hand side of the figure shows the second mode of the C auxiliary diminished scale, and the right-side gives its vertical expression as an altered dominant chord: D13♯9♭9♭5. Russell works through all of the modes of the six other vertical scales, and the chart included with the book lists almost all of these. The

Figure 4.6. The second mode of the C auxiliary diminished scale, in scalar and tertian formations.

Primary Modal Tonic	Primary Modal Genre
I	major and altered major chords
II	seventh and altered seventh chords
III	[I] major and altered [I] major 3B (minor +5) chords
+IV	minor seventh ♭5 / [I] major +4B chords
V	[I] major and altered [I]5B chords
VI	minor and altered minor chords
VII	eleventh ♭9 / [I] major 7B chords
+V	seventh +5 chords

Table 4.3. The eight principal modal tonics and their associated modal genres (Russell's example III:30).

eight PMGs fall into general categories, which are shown in Table 4.3 and will be sufficient for our purposes here.[19]

It is by now, I hope, apparent how the *Concept* can simplify matters somewhat for an improvising jazz musician. Once the process of matching chord symbols with scales is learned, it is a relatively simple matter to determine what notes will sound good over, for example, a D13♯9♭9♭5 chord. Russell seems to have taken Miles's wish to "learn all the changes" to heart; he takes care to note that indeed *all* of the harmonies of Western music can be found somewhere in the chart, and notes that many "non-traditional harmonic colors" can be found as well (*LCC* 29).

19. There are eight PMGs rather than seven because Russell needs to account for the sharp fifth in the Lydian augmented scale. Other altered scale degrees (♭II, ♭III) are seen simply as alterations and are not counted among the principal genres. Russell does not explain why, but the reason is probably related to the fact that the +V genre gives rise to an important class of chords (7+5), while the others do not.

At the same time, though, it is probably also apparent that Russell's system is somewhat more complicated than it needs to be. His ideas about Lydian tonal organization are in fact the source of much of this complication. To see the extent to which the two are entangled, take Russell's explanation of how to find the parent scale for an unadorned E♭7 chord (a relatively straightforward example):

> Over the roman numerals of the scales of Chart A are listed different chord families. For example, over roman numeral II of the Lydian Scale are listed 7th, 9th, 11th, and 13th chords. They belong to the same family: the (II) seventh chord family of a Lydian Chromatic Scale.
>
> The E♭7 chord is found in this family above roman numeral II of the Lydian Scale in the right column of Chart A. The Lydian Scale is therefore the parent scale of the E♭7 chord.
>
> Place the root of the E♭7 chord on roman numeral II, and E♭ becomes the second degree of that chord's parent scale.
>
> Think down a major 2nd interval; if E♭ is the second degree of the parent scale, D♭ is the first degree. Therefore D♭ is the tonic (root) of the E♭7 chord's parent scale. This tonic is called the Lydian tonic. For the E♭7 chord, D♭ is the Lydian Tonic and the parent scale is D♭ Lydian. (*LCC* 59)

This is quite a long process to determine that the most ingoing (consonant) scale for an E♭7 chord is the second mode of the D♭ Lydian scale. The equivalence of chords and scales is genuinely useful for improvising musicians, but the Lydian organization is more abstract. Faced with this situation, jazz musicians made the obvious simplification: over an E♭7 chord, play the E♭ Mixolydian scale.

Russell's theory becomes interesting, though, when we realize that any of the member scales of the Lydian tonic can stand in for the ordinary Lydian. Once you have determined that the parent scale of an E♭7 chord is D♭ Lydian, then it becomes easy to substitute more complicated scales built on the same Lydian tonic. If you wanted to create a more dissonant (outgoing) sound, you might instead play the second mode of the D♭ Lydian flat seventh scale; the second mode of the D♭ auxiliary augmented blues scale would be more dissonant still. Because the seven principal scales form a spectrum of consonance to dissonance—as Russell frames it, there is a progression of unity from ingoing to outgoing—the *Concept* provides a means of measuring how closely a particular progression or improvisation stays to a particular Lydian tonic. This idea is the core of what we might recover from Russell, and we will return to it when we begin to develop a transformational system in the next section.

4.1.3 Chord-Scale Theory after Russell

Russell's fundamental insight about the nature of chords and scales was revolutionary, and now forms the basis for much of modern jazz pedagogy. Most of the later sources for chord-scale theory, as it has come to be called, do not contain any mention of the Lydian generation of the tonal system, or go through the fuss of finding a parent Lydian scale and its associated PMG. Some of these texts do not mention Russell at all, which we might take as evidence that (not unlike Rameau's fundamental bass) chord/scale equivalence is such a natural way of thinking about music that it was taken for granted and no longer associated with its original author. Given the influence of this theory in jazz pedagogy, it will be worthwhile to sketch a brief outline of the literature here, if only to show how it differs from Russell's conception.

Each text uses slightly different variations on the theory, but Mark Levine's *Jazz Theory Book* will serve here as a surrogate for the theory in general.[20] Levine divides his chapter on chord-scale theory into four parts: major scale harmony, melodic minor scale harmony, diminished scale harmony, and whole-tone scale harmony. For each of these families, he describes the modes of the given scale and the harmonies (chord symbols) associated with them.

Many later chord-scale theorists describe "avoid notes" in scales; these are notes that are dissonant with the underlying harmony and should generally be avoided in improvisations except as non-harmonic tones. This is an idea that is not explicit in the *Concept*, but many of the notes that are described as "avoid" notes can be traced back to the fact that later theorists do not take the

20. Mark Levine, *The Jazz Theory Book* (Petaluma, CA: Sher Music, 1995), 31–94. Dmitri Tymoczko summarizes several textbooks' views on chord-scale theory in "The Consective-Semitone Constraint," 174–79. Other texts that discuss chord-scale theory at length include Andy Jaffe, *Jazz Harmony* (Tübingen: Advance Music, 1996); Joe Mulholland and Tom Hojnacki, *The Berklee Book of Jazz Harmony* (Boston: Berklee Press, 2013); Jamey Aebersold, *Jazz Handbook* (New Albany, IN: Jamey Aebersold Jazz, 2010), http://www.jazzbooks.com/mm5/download/FQBK-handbook.pdf; and Richard Graf and Barrie Nettles, *The Chord Scale Theory and Jazz Harmony* (Advance Music, 1997). I am eliding the minor differences in these discussions, since they will not affect the transformational system in the next section. John Bishop provides a good overview of the distinctions in "A Permutational Triadic Approach to Jazz Harmony and the Chord/Scale Relationship" (PhD diss., Louisiana State University, 2012), 77–81.

Mode	Chord symbol
Ionian	Cmaj7 (avoid $\hat{4}$)
Dorian	Dm7
Phrygian	Esus♭9
Lydian	Fmaj7♯4
Mixolydian	G7 (avoid $\hat{4}$); Gsus
Aeolian	Am♭6
Locrian	Bm7♭5

Table 4.4. Levine's chord-scale description of C major scale harmony (*Jazz Theory Book*, 34).

Mode	Chord symbol	Mode name
I	CmM7	minor-major
II	Dsus♭9	–
III	E♭maj7♯5	Lydian augmented
IV	F7♯11	Lydian dominant
V	CmM7/G	–
VI	Am7♭5	half-diminished, Locrian ♯2
VII	B7alt.	altered, diminished whole-tone

Table 4.5. Levine's chord-scale description of C melodic minor scale harmony (*Jazz Theory Book*, 56).

Lydian scale as their starting point ($\hat{4}$ is usually described as an avoid note on a major seventh chord). Levine's first-choice chord-scales for major scale harmony and melodic minor scale harmony are shown in Tables 4.4 and 4.5, respectively, with avoid notes listed as needed.[21] Levine does not give the modes of the diminished and whole-tone scales (for obvious reasons), and notes that the diminished scale represents 7♭9 and fully-diminished harmonies, while the whole-tone scale can be played over 7♯5 and 7alt. harmonies.

From this brief description, we can see how Russell's theory is more-or-less stripped of its philosophical underpinnings and used simply as a pedagogical and performance tool. Though there are vestiges of the Lydian conception of tonal space (Levine names the Lydian augmented and dominant scales), what remains is only the idea of chord/scale equivalence. On the one hand, this

21. Levine and others often describe only the first choice (Russell would say "most ingoing") for matching a scale with a chord; Russell's system of substituting other member scales sharing the same Lydian tonic is generally not present in the later texts. For jazz musicians the melodic minor scale refers only to its ascending form, which is played in both directions in jazz.

is certainly simpler: gone is the complicated derivation of Lydian parent scales, in its place a simple one-to-one matching of scales with chord symbols.

At the same time, though, something seems lost. For Russell, Lydian organization of tonal space was not incidental, but in fact the most important idea in the book (its title, after all, is *The Lydian Chromatic Concept of Tonal Organization*, and not *Chord/Scale Equivalence and Jazz Improvisation* or the like). Rather than simply writing off Russell's more unusual ideas as eccentric ramblings, we will aim in the next section to reincorporate some of them, in an effort to assimilate some of the "first jazz theory" back into modern scholarship.

4.2 A Chord-Scale Transformational System

Now that we have explored Russell's theory in some detail, we can take it as a basis on which to construct a transformational system. Focusing on chord-scales as first-class objects will allow us to take seriously the idea that scales *are* harmony, and will enable analytical observations about the way improvising musicians might understand harmonic structure.

4.2.1 Introduction: Scale Theory

First, though, it will be useful to take a brief tour through other analytical approaches that incorporate scales. Dmitri Tymoczko dedicates much of *A Geometry of Music* to the study of scales, and applies them analytically to both twentieth-century music and jazz.[22] He is interested primarily in voice-leading among scales, and constructs voice-leading spaces among the diatonic, acoustic, harmonic major and minor, hexatonic, octatonic, and whole-tone scales.[23] His conception of scales is somewhat different than Russell's, though; for Tymoczko, "a scale is a ruler," and provides a way of measuring musical distance.[24] The *Concept*'s view of scales, on the other hand, overlaps somewhat with Tymoczko's notion of "macroharmony": for Russell, a scale acts more like a set of

22. Tymoczko, *A Geometry of Music*, Chapter 4 and throughout. This work is a culmination of much of his earlier work that incorporates scales; see, for example, "The Consective-Semitone Constraint" and "Scale Networks and Debussy," *Journal of Music Theory* 48, no. 2 (October 2004): 219–94.

23. Tymoczko, *A Geometry of Music*, 135.

24. Ibid., 116.

notes that are all available for improvisation. In general, Russell is not interested in common-tone connections between chords or their abstract structure, and accordingly we will not have much occasion to draw on Tymoczko's work here.[25]

Other authors have applied chord-scale theory to jazz, though in somewhat different ways than we will do here. Garret Michaelsen, for example, draws on Tymoczko's work on scalar voice leading to construct networks for the music of Wayne Shorter.[26] Michaelsen does take seriously the notion that chords and scales are equivalent, but his work is more interested in determining how scalar structure can bring structure to harmony that is not obviously functional. Stefan Love's work on parsimonious connections is valuable for teaching students about chord-scales, but falls somewhat short for our purposes here, since it does not include all of the scales Russell identifies.[27]

The work that intersects most closely with our work here is John Bishop's dissertation, which incorporates chord-scales into a triadic transformational system.[28] Bishop is influenced by chord-scale theory as it is taught at the Berklee College of Music, which is different in some ways than Russell's theory outlined above.[29] He is also interested in triadic approaches to improvisation; in his theory, chord-scales exist as a means of generating these triads.[30] In this section we will not restrict our focus to triads, but will instead consider chord-scales as objects unto themselves.

One of the problems facing any scale theory is the need to account for scales of different cardinalities. Tymoczko's common-tone theory provides a means of connecting a means of relating the whole-tone (6 notes), diatonic, acoustic, harmonic major, (all 7), and octatonic (8) scales via

25. Nor will we have need of the extensive literature on the abstract structure of scales in general. For an introduction, see John Clough, Nora Engebretsen, and Jonathan Kochavi, "Scales, Sets, and Interval Cycles: A Taxonomy," *Music Theory Spectrum* 21, no. 1 (Spring 1999): 47–101.

26. Garrett Michaelsen, "Chord-Scale Networks in the Music of Wayne Shorter" (paper presented at the West Coast Conference of Music Theory and Analysis, Eugene, OR, March 2012).

27. Stefan Love, "A Model of Common-Tone Connections Among Jazz Scales," *Journal of Music Theory Pedagogy* 23 (2009): 155–69.

28. Bishop, "A Permutational Triadic Approach."

29. Bishop's primary source is Graf and Nettles's *Chord Scale Theory and Jazz Harmony*; Mulholland and Hojnacki's *Berklee Book of Jazz Harmony* covers much of the same material but in a more modern way (neither book mentions Russell at all). The Berklee method systematizes much of Russell's method in a way suitable for teaching undergraduate jazz musicians. Every tone in a scale, for example, is either a chord tone, an avoid note, or a "tension": an upper extension that colors the basic sound of a chord (*Berklee Book of Jazz Harmony*, xi).

30. These triadic approaches also tend towards music that is less clearly tonal, and were devised partly as a means of moving beyond the standard chord-scale approach we are examining here.

"split" and "merge" operations, and indeed these four scales account for Russell's six of seven vertical scales.[31] Tymoczko does mention the ascending melodic minor scale, but it does not merit a place in his diagram, since it is not a nearly even 7-note scale. His system does not, though, account for Russell's "African-American blues scale" (hereafter, simply the "blues scale"), which has either 8 or 10 notes, depending on whether $\hat{2}$ and $\natural\hat{7}$ are included. While we could incorporate this scale into the common-tone system—it is two splits and a semitone displacement from an octatonic collection—chord-scale theory as it is usually taught does not focus on common tones between chord-scales, but rather on determining what scale captures the sound of a particular chord.[32]

Russell's Lydian tonic system, despite all of its seemingly unnecessary complexity, provides a simple solution to the cardinality problem. Because all non-diatonic scales have a Lydian scale as their ultimate source (their parent scale), this means we can understand these other scales as alterations of some diatonic collection. All of the scales in Figure 4.3, for example, are derived from the F Lydian diatonic collection: the D melodic minor collection (Lyd. augmented), F harmonic major (Lyd. diminished), F acoustic (Lyd. flat seventh), whole-tone (WT_1, aux. augmented), and two octatonic scales (OCT_{02} and OCT_{12}, the auxiliary diminished scales). Russell's four horizontal scales, of which the blues scale is the most important, also have a Lydian tonic, and can be understood as still another variation on the Lydian collection.[33]

4.2.2 A GIS Proper

This reduction to a single diatonic collection will be the first step in devising a transformational system for chord-scales. Instead of referring to a scale's parent Lydian tonic as a Lydian scale, we will instead refer to it by a key signature: the D Lydian collection is 3♯, the E♭ Lydian collection 2♭, the F Lydian collection simply ♮, and so on. This notation is in common use and, helpfully,

31. Tymoczko, *A Geometry of Music*, 134–35.

32. Indeed, this lack of focus on common-tone connections in the pedagogical literature is the main impetus for Love's "Model of Common Tone Connections."

33. The shift in terminology from the Lydian "scale" to the Lydian "collection" here is deliberate, but not theoretically significant. In practice, Russell treats a scale as a collection: a group of notes from which to generate chord tones or improvisations. In this section we will be more interested in scales as collections, rather than (say) their function as "musical rulers."

0. Lydian (diatonic)
1. Lydian augmented
2. Lydian diminished
3. Lydian ♭7
4. Whole-tone
5. Whole-half diminished
6. Half-whole diminished
7. Blues scale

Table 4.6. A scale index inspired by Russell, listed from most consonant to most dissonant.

eliminates some of the awkwardness of having to refer constantly to the Lydian mode. The second mode of the F Lydian scale is of course the same as the G Mixolydian scale, and both refer to the collection ♮.

It is not yet clear, though, how Russell's other member scales might be incorporated into this system. To do so, we will first introduce the concept of a *scale index*, shown in Table 4.6 (they are numbered from 0 to 7 for reasons that will become clear shortly). Several things are worth noting about this table that differ from Russell's presentation. First, some of the scale names have been changed to reflect their common usage; we no longer need to remember, for example, which of the diminished (octatonic) scales is the "blues" variant.[34] I have maintained Russell's names when they clarify the relationship to the parent scale: scale 1 remains "Lydian augmented" rather than "melodic minor," since the D melodic minor scale has F Lydian, not D Lydian as its parent scale.

There are eight scales in the scale index, but Russell gives eleven member scales. The reason for this is a practical one: two of the horizontal scales are simply diatonic modes (the major scale and major flat seventh), and the third is a major scale with an additional ♯$\hat{5}$ (major augmented fifth), which we can usually understand as a chromatic passing tone.[35] The blues scale, though, does appear frequently in jazz, and merits its own place here.[36] This scale is given last in the order

34. These names have been chosen to reflect common jazz usage, so scale 3 is the Lydian dominant scale rather than the acoustic scale.

35. Admittedly, Russell himself would likely object to this characterization since, as noted in the first section of this chapter, the Lydian and major scales are fundamentally different objects. In practice, many jazz musicians do avoid $\hat{4}$ in major scales, and so whether a given passage is Lydian or major is often ambiguous.

36. In fact, the blues scale is probably more common than some of Russell's vertical scales.

because it is one of Russell's horizontal scales, which are inherently more outgoing than their vertical companions.

With some mathematical sleight of hand, we can define a chord-scale GIS using the scale index along with a diatonic collection as above. Elements of this GIS have the form ⟨*diatonic collection*, *scale name*⟩; the F Lydian collection is described by the pair ⟨♮, Lydian⟩, while ⟨2♭, Lyd. dominant⟩ describes the E♭ acoustic collection. Creating an ordered-pair GIS of course requires us to show that both elements are part of a mathematical group. Though this will not be its final form, we will define this chord-scale GIS formally here, with the knowledge that it will be relaxed in the next section. It is important to realize that this GIS is designed to reflect Russell's own conception of chord/scale equivalence. There are only three distinct octatonic collections, for example, but the GIS contains 24 distinct diminished scales: whole-half and half-whole diminished scales on all twelve Lydian tonics.

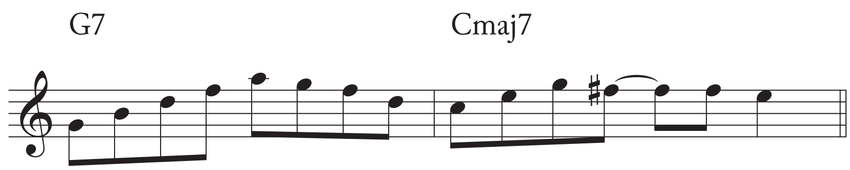
The first element of the pair is a key signature, which have been studied in a transformational context by Julian Hook.[37] Because we are interested in collections in jazz (often a non-notated music), we will consider enharmonically equivalent key signatures (like 6♯ and 6♭) to be identical. There are, then, only twelve key signatures (isomorphic to the group $\mathbb{Z}_{12}$, operated on by the sharpwise and flatwise transformations, s_n and f_n, which add n sharps or flats to a key signature, respectively; we might write $1\sharp \xrightarrow{s_1} 2\sharp$, $2\flat \xrightarrow{f_2} 4\flat$, or $1\flat \xrightarrow{s_3} 2\sharp$.[38]

The scales in the scale index do not obviously form a group, but we can (temporarily) define the eight scales to be isomorphic to $\mathbb{Z}_8$, the integers mod 8. The scales do form a progression from consonance to dissonance, and for Russell it is true that the whole-tone scale is in some sense further away from the Lydian tonic than the Lydian augmented scale.[39] They are not, however,

37. Julian Hook, "Signature Transformations," in *Music Theory and Mathematics: Chords, Collections, and Transformations*, ed. Jack Douthett, Martha M. Hyde, and Charles J. Smith (Rochester: University of Rochester Press, 2008), 137–60. In this section we will not apply the full power of Hook's transformations, since they operate not only on key signatures themselves but on pitches (what he calls "floating diatonic forms").

38. Ibid., 142. We could also write f_n as $s_n{}^{-1}$, and the entire set of signatures can be generated by s_1, adjusting for enharmonic equivalence as necessary.

39. This is apparent in his description of the tone orders of the Lydian Chromatic scale, as reproduced in Figure 4.4. We could also define a GIS using these tone orders, but such a GIS would lose some distinctions between scales (the Lydian flat seventh and auxiliary augmented are both representatives of the 10-tone order).



$\langle \natural, \text{Lyd.}\rangle \xrightarrow{R\langle s_1,\, 0\rangle} \langle \sharp, \text{Lyd.}\rangle$

Figure 4.7. A typical V–I jazz lick, along with its chord-scale GIS analysis.

cyclic in any meaningful way: it is not as though, for example, the blues scale is the most dissonant scale and if you take one more step you arrive back at the Lydian scale. Nor are the metaphorical distances of consonance between the scales really consistent: though Russell does not define them (and we will not attempt to do so here), the consonant distance between the two diminished scales seems much less than the distance between the whole-tone and whole-half diminished scales.[40] If we accept these limitations of the scales' group structure, though, we gain all the benefits of a GIS. Intervals between scales are calculated as integers mod 8, using the scale labels from Table 4.7: the interval from a Lydian augmented scale to a whole-tone scale is 3 ($= 4 - 1$), from a whole-tone scale to a half-whole diminished scale is 2, and so on.

We will call a transformation between chord-scales R, after Russell; these transformations have the form $R\langle$*signature transformation*, *scale index interval*$\rangle$. The transformation acts on elements of the GIS in a pairwise fashion in the usual way. A passage like the one in Figure 4.7, for example, expresses the $R\langle s_1, 0\rangle$ transformation: the collection changes but the scale does not. Figure 4.8 shows a passage which begins with the F blues scale and resolves to the F Lydian collection, representing the transformation $R\langle e, 1\rangle$, where e indicates the identity element.[41]

40. This limitation is not as significant, and in fact is the normal state of affairs for diatonic intervals, where, for example, intervals of both 3 and 4 semitones are called "thirds."

41. We might consider using -7 rather than 1 in the second place here, to reflect the intuition that the move from the blues scale to the parent Lydian is an ingoing motion. This seems to be a valid judgment, but affects the group structure of IVLS (-7 is not a member of $\mathbb{Z}_8$).

$$\langle \natural, \text{Blues}\rangle \xrightarrow{R\langle e,\, 1\rangle} \langle \natural, \text{Lyd.}\rangle$$

Figure 4.8. A resolution from the F blues scale to the F Lydian scale.

4.2.3 Relaxing the GIS

This initial pass at a chord-scale GIS is a useful first approximation, but there are some aspects of it that are somewhat unsatisfactory. How, for instance, should we determine what scales match with what diatonic collections? In some cases the answer is clear, but in others it is not. In Figure 4.7 above, for example, we labeled the G7 chord as ⟨♮, Lyd.⟩, rather than, say, ⟨1♯, Lyd.⟩; the $\hat{4}$ that would confirm either is absent. The problem seems to become even more intractable when we encounter the symmetrical scales: a diminished scale has eight possible parent diatonic collections.

Here again, George Russell provides a solution. Table 4.7 presents a portion of the foldout chart from the *Lydian Chromatic Concept* in somewhat simplified form (it may be useful to compare this table with Table 4.3 on p. 112). The top of this table gives the eight scales in the scale index of the previous section, while the left side lists the modal tonics. Only modes that give rise to common chords are shown in this table; notably absent are modes III and V, which are given by Russell as tonic chords with altered bass notes. The most common chords and scales (which are also the most ingoing) appear on the left side of the table, and rarer chords and scales appear nearer the right side. Alternate names for scales, when they exist, are given in italics in the appropriate box.

It is important to realize that for Russell the modal degrees (what he calls primary modal tonics) are roughly equivalent to functional categories. This is important to us here because it helps us to determine a scale's parent diatonic collection. All of the chords in the top row of the table are first-mode scales, and act like tonic chords. The F7 in the top row of the Lydian ♭7 column thus

	Diatonic	Lyd. augmented	Lyd. diminished	Lyd. ♭7	Whole-tone	WH diminished	HW diminished	Blues
	FGABCDE	FGABC♯DE	FGA♭BCDE	FGABCDE♭	FGABC♯E♭	FGA♭B♭BC♯DE	FG♭A♭ABCDE♭	FA♭AB♭BCDE♭
I	Fmaj7 *Lydian*	Fmaj7♯5 *Lyd. augmented*	– *Harmonic major*	F7 *Acoustic*	Faug (triad)	F°7		Fmaj7, Fm7, F7
II	G7 *Mixolydian*	G7♯11, G7♭5 *Lydian dominant*	G7♭9	G7♯5	G7♯5, G7♭5	G7♭9, G7♭5		
+IV	Bm7♭5 *Locrian*	Bm7♭5 *Locrian ♯2*		Bm7♭5 *Altered, dim.WT*			Bm7♭5	
+V					D♭7♯5, D♭7♭5	D♭7♯5, D♭7♯9		
VI	Dm7 *Dorian*	DmM7 *Melodic minor*	Dm7♭5	Dm7♭9			Dm7, Dm7♭5	
VII	E7♭9 *Phrygian*	E7♭9	E7alt.					

Alternate scale names are given in italics; less common chords are shown in gray.

Table 4.7. Common chords in the modes of the F Lydian Chromatic scale.

represents a major-minor seventh chord acting as tonic (Russell actually gives this chord symbol as "Maj ♭7" or "Maj 9th ♭7"). Likewise, dominant chords appear mostly in mode II, minor seventh chords appear in mode VI, and half-diminished sevenths in mode +IV.[42]

Of course, the pairing of modes and scales is still not unique, and is ultimately a question of analysis. Consider the scale in Figure 4.9a. This is an F acoustic scale, which can appear as an F Lydian ♭7 scale or as the second mode of an E♭ Lydian augmented scale.[43] The GIS allows us to show this, since "F acoustic as tonic" is a different GIS member than "F acoustic as dominant." Figure 4.9b places the ambiguous scale in the context of a ii–V–I progression in B♭ (the last four bars of an imaginary solo on George Gershwin's "I Got Rhythm"). Here, the acoustic scale clearly functions as a dominant, and would be labeled ⟨2♭, Lyd. aug.⟩: the parent collection is E♭ Lydian (2♭), and this is a mode of the Lydian augmented scale (number 2 in the scale index of Table 4.6). In contrast, Figure 4.9c places the fragment in an F blues ii–V–I progression (the end of Charlie Parker's "Now's the Time," perhaps). Because the collection now functions as a tonic chord, it represents the GIS member ⟨♮, Lyd. ♭7⟩.

The intuitions captured by the chord-scale GIS here are not quite like those represented by other theories of chord-scales. Indeed, the fact that both ⟨♮, Lyd. ♭7⟩ and ⟨2♭, Lyd. aug.⟩ refer to the same 7-element set of pitches is not immediately apparent in the GIS itself. Theories that prioritize voice-leading would likely include the F acoustic collection only once, since the voice leading from this scale to itself is maximally efficient (no voices move at all). Nor is it enough simply to label the scale as the F Lydian dominant scale, as this does not capture the difference in function between the passages in Figure 4.9b–c.

The GIS in fact is one of *functional* or *heard* chord-scales. In this way, it is more like Steven Rings's GIS for "heard scale degrees" than theories of scalar voice leading.[44] Rings argues that scale

42. The dominant chords that appear in mode +V are related by tritone to those in mode II. The fact that these tritone-related dominants appear along with the whole-tone and diminished scales is no accident: because these scales are symmetrical at the tritone, these scales are particularly effective when soloing over dominant seventh chords. Dmitri Tymoczko discusses this practice explicitly in *A Geometry of Music*, 365–68.

43. It is reasonable to wonder why we did not collapse the Lydian augmented and Lydian ♭7 scales into a single mode, as we did with the horizontal major scale and the vertical acoustic scale. The aim in this section is to show that the two scales do in fact function differently, which justifies their presence as separate vertical scales.

44. Steven Rings, *Tonality and Transformation* (New York: Oxford University Press, 2011), 44–50 and throughout.

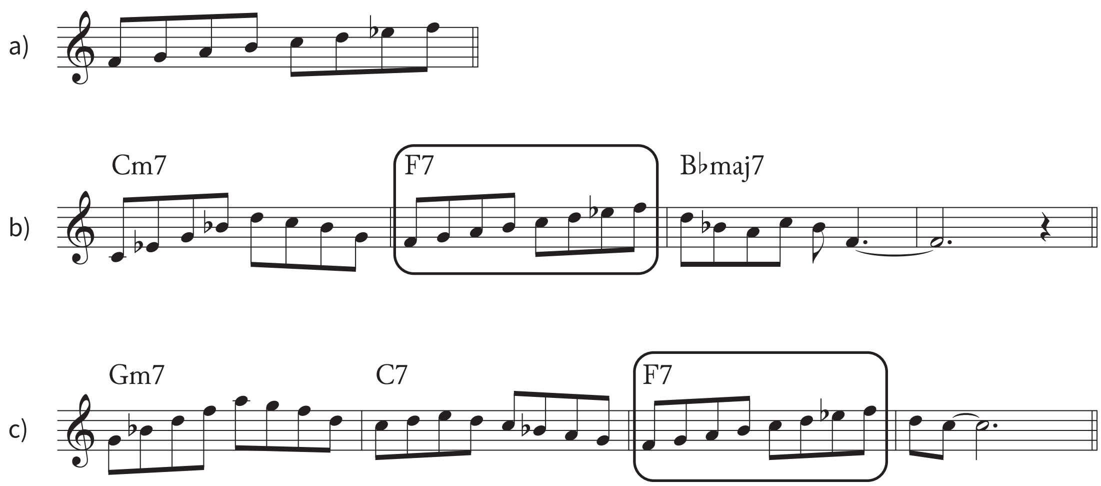


Figure 4.9. An ambiguous acoustic scale and two concrete presentations of it.

degrees are a perceived, rather than inherent, quality of music, and thus listeners have different experiences when hearing "A_4 as $\hat{1}$" and "A_4 as $\hat{7}$."[45] In many ways, this distinction is like the one at the heart of what Russell was trying to accomplish in the *Lydian Chromatic Concept*. For Russell, the F acoustic collection played over a tonic major-minor seventh chord really *is* a different entity than the same collection played over a dominant major-minor seventh chord. This is what Russell means when he writes of "a state of complete and indestructible chord/scale unity" (*LCC* 10): if an F7 chord can function in more than one way, so too can its corresponding scale.

Previous chapters have constructed various musical spaces in which to analyze passages, and this GIS can be turned into a space as well. Before doing that, though, we will relax its definition such that the scale indexes are no longer isomorphic to $\mathbb{Z}_8$. We noted above that this isomorphism was somewhat artificial, and the space becomes more intuitive if we simply use the non-modular integers 0–7 as elements of the space (which we will call S for now). The resulting space, though, runs afoul of the formal requirements for a GIS, which requires that IVLS form a mathematical group. The set S under addition does not form a group, since it is not closed ($6 + 5$ is not a member of S) and elements do not have inverses.

45. Rings, *Tonality and Transformation*, 42.

This is of course one of the well-known limitations of GISes: the musical spaces must be both continuous and infinite.[46] A GIS cannot account for musical spaces that are discontinuous or have "boundaries," which is the case here: it is not possible to conceive of a scale in the system which is more ingoing than the Lydian scale, or more outgoing than the blues scale.[47] Nevertheless, the transformations still seem to be reasonable reflections of intuitions about the nature of chord-scales. As Hook notes, "the narrative portions of Lewin's analyses [in *GMIT*] generally far transcend the logical consequences of the group structure," so the fact that a mathematical group does not underlie this no-longer-GIS should not dissuade us from exploring its analytical potential.[48]

Lewin does allow for semigroups of transformations, but the scale index transformations do not form a semigroup either, since a semigroup must still be closed under the group action. All possible intervals for the scale indexes (the integers 0–7) are contained in the set $\{-7, -6, \ldots, 6, 7\}$, which forms neither a group nor a semigroup. It does contain the additive identity (0), and every element has an inverse, so we can use this set under addition in practically the same way. Every interval is well-defined, but all intervals are not possible from every scale. For example: int(Lyd., Whole-tone) = 4, and int(Whole-tone, Lyd.) = -4, but there is no scale which satisfies x in the statement int(Blues, x) = 4, since there is no scale that is four levels more outgoing than the blues scale.

With these caveats, this space can be visualized using the diagram in Figure 4.10. In this figure, the diatonic (Lydian) scale is centrally located, with more outgoing scales located further toward the outside; these concentric circles combine with the ordinary circle of fifths to divide each

46. Many authors have commented on this limitation, which Lewin first observes in *GMIT*, 27. Dmitri Tymoczko is probably the most vocal in his opposition, and proposes incorporating a distance metric into the definition of what he calls a "Lewinian interval system" ("Generalizing Musical Intervals," *Journal of Music Theory* 53, no. 2 [Fall 2009]: 245–46); in other places, he has suggested that relaxing some of the restrictions on a GIS is "anti-Lewinian" ("Lewin, Intervals, and Transformations: a Comment on Hook," *Music Theory Spectrum* 30, no. 1 [Spring 2008]: 164–68). For more on this tension, see Rachel Wells Hall's review of *GMIT* (*Journal of the American Musicological Society* 62 no. 1 [Spring 2009]: 205–22); Julian Hook, "David Lewin and the Complexity of the Beautiful," *Intégral* 21 (2007): especially 185–86; and Rings, *Tonality and Transformation*, 19–20.

47. Admittedly, the outgoing boundary is more permeable than the ingoing: we could conceive of a scale that is more dissonant than the blues scale (the total chromatic, perhaps) and incorporate it into the system, while for Russell the Lydian boundary is absolute.

48. Hook, "David Lewin and the Complexity of the Beautiful," 185.

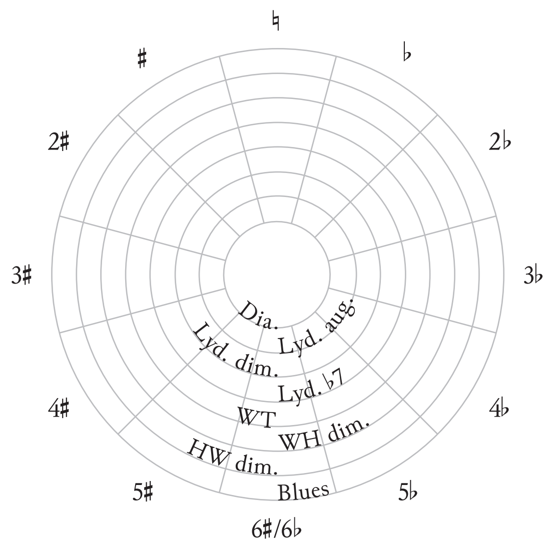


Figure 4.10. A "planetary" model of the chord-scale GIS.

scale into diatonic wedges.[49] The figure is inspired by Russell's description of the Lydian as a "musical 'Star-Sun'" (*LCC* 8) and the ultimate source of tonal gravity. More outgoing scales have more gravitational potential energy, as it were, and are more dissonant with the underlying diatonic collection. We can use this figure to map the two presentations of the F acoustic scale of Figure 4.9; such a mapping is given in Figure 4.11. This visualization makes clear that the second presentation (a tonic F7 chord) is more outgoing than the first (a dominant F7 chord), as well as the shift in underlying diatonic collection (E♭ Lydian vs. F Lydian).

Figure 4.11 also reveals that perhaps the objects in the system could be more informative. The right side of this figure represents a ii–V–I in F with the sequence

$$\langle \flat, \text{Dia.} \rangle \xrightarrow{R\langle e,\, 0\rangle} \langle \flat, \text{Dia.} \rangle \xrightarrow{R\langle s_1,\, 3\rangle} \langle \natural, \text{Lyd.}\ \flat 7 \rangle.$$

That is, the G Dorian scale and C Mixolydian scale are both represented by the pair $\langle \flat, \text{Dia.} \rangle$. On one level, this makes sense: both scales are modes of the B♭ Lydian (or F major) scale. Still, since a chord-scale is supposed to represent a "complete and indestructible unity," it seems appropriate to add some information about the chord into the notation itself. As it stands, information about

49. The diatonic collections are shown in flatwise order traveling clockwise. This corresponds to the way the circle of fifths (or fourths) is usually presented in jazz textbooks; see, for example, Jerry Coker, *Elements of the Jazz Language for the Developing Improvisor* (Miami: Belwin, 1991), v.

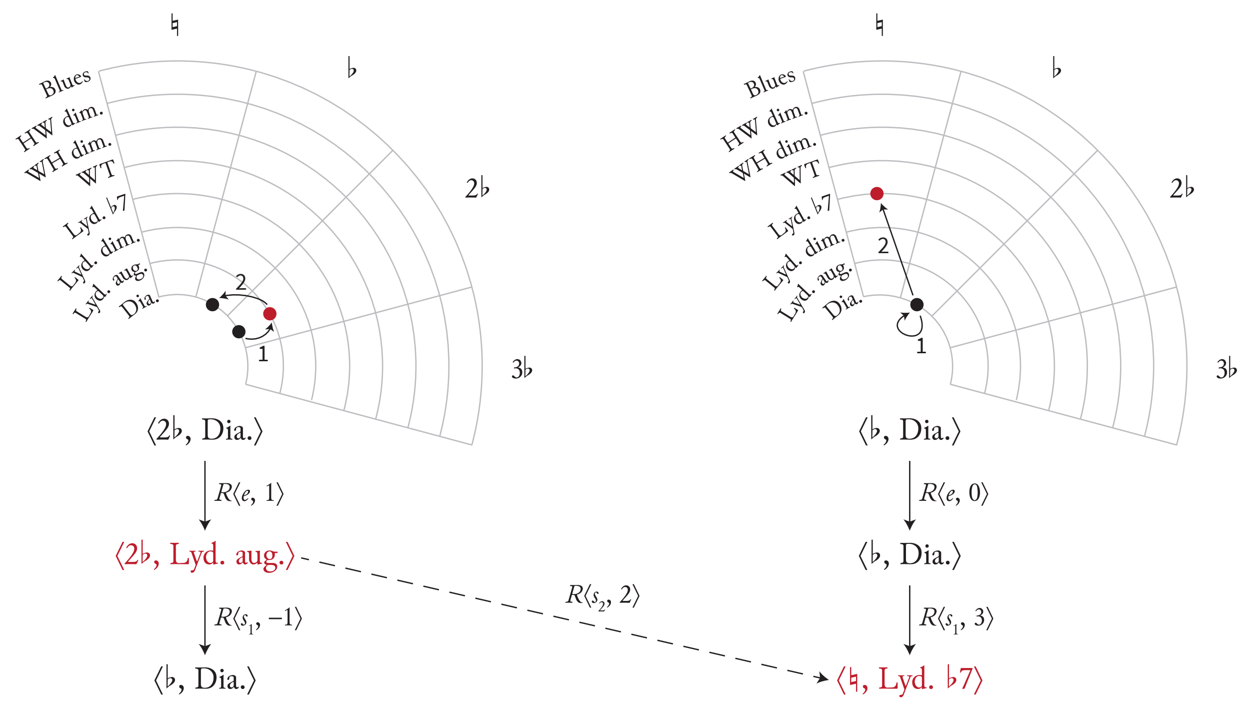


Figure 4.11. Two presentations of the F acoustic scale, shown in red, in the planetary model (compare Figure 4.9).

the chords themselves is separate from the transformations, and there is no way to distinguish the progression above (a ii–V–I in F) from, say, the nonsensical progression Em7♭5–Fmaj7–Bm7♭5.

We could solve this problem in several different ways, but the most obvious is to include the chord symbol itself in the chord-scale representation. This results in what we will call a chord-scale triple of the form ⟨*chord symbol*, *diatonic collection*, *scale name*⟩. This construction will allow us to draw on the work done in the previous chapters developing a system of transformations for chord symbols; we will still call the resulting transformations R, but the first element of the new triple will be a transformation between chord symbols.[50] The F-major ii–V–I of Figure 4.9c thus becomes

$$\langle \text{Gm7}, \flat, \text{Dia.}\rangle \xrightarrow{R\langle \text{TF},\, e,\, 0\rangle} \langle \text{C7}, \flat, \text{Dia.}\rangle \xrightarrow{R\langle \text{TF}_{\text{blues}},\, s_1,\, 3\rangle} \langle \text{F7}, \natural, \text{Lyd. }\flat 7\rangle.$$

Formally, the transformations of the last two chapters act on ordered triples of chord root, third, and seventh; the additional scale information in a chord-scale triple enriches this sparse three-not

50. We will generally use this new form of the R transformation, but in cases where there is a need to distinguish between this version and the version used just above, "2-element R" versus "3-element R" works nicely.

representation. Recall that the chord symbol transformations are cross-type transformations, and thus even if we had not already relaxed the GIS of the previous section (removing the cyclic group $\mathbb{Z}_8$), the new version with chord symbols cannot form a GIS.

While adding chord symbols to the system does clarify matters, it also complicates them. In particular, the planetary model of Figure 4.10 no longer represents the musical space accurately. The addition of chord symbols means that a copy of the planetary model exists at every location a chord symbol appears in the previous chapters.[51] Such a visual space would be forbiddingly complex—imagine the thirds spaces of Figures 3.2 or 3.15 redrawn with the additional chord-scale models. This is a sacrifice made consciously so that the chord-scale triples and R transformations are clear in the text. In practice, we can use either the planetary model or the chord spaces of the previous chapters as the situation demands, with the knowledge that both representations exist simultaneously as part of the single conceptual chord-scale space. With the final version of the chord-scale transformational system in place, the stage is now set to turn toward actual jazz performance.

4.3 Chord-Scales Transformations in Analysis

Analyzing jazz performance is inherently more complicated than the lead-sheet analysis done in previous chapters. Because jazz is primarily an improvised music, the analyses here will rely on transcriptions, which carry with them their own set of problems.[52] As Steve Larson notes, any transcription is also a kind of analysis: in many cases it is not at all clear how a particular recorded sound should be (or indeed, whether it can be) rendered in Western musical notation.[53] In the transcriptions in this dissertation, I focus primarily on pitches and rhythms, since they are most relevant to the discussion of harmony. As such, many of the most important aspects of a

51. In fact, the situation is even more complex, since a single chord symbol can support only a subset of the 96 chord-scales. Thus every chord symbol would contain a *different* partial copy of the planetary model. Only the chords listed in Table 4.7, for example, would be able to show the scales from the ♮ diatonic wedge.

52. Complete transcriptions for all solos analyzed in this chapter and the next can be found in Appendix B.

53. Steve Larson, *Analyzing Jazz: A Schenkerian Approach* (Hillsdale, NY: Pendragon Press, 2009), 1–2.

performance—dynamics, articulation, timbre, intonation, and so on—are absent from the notation.[54]

The three short analyses that follow will serve as preludes to the longer analyses we will pursue in the next chapter; each introduces certain issues of analysis to be explored in more detail later. All are solos on tunes analyzed in the first three chapters, allowing us the opportunity to discover how these abstract chord progressions are realized in improvised performance. They are also solos by tenor (and soprano) saxophonists: Rahsaan Roland Kirk, Gene Ammons, Sonny Stitt, and Joe Henderson. This selection reflects some of my own preference for saxophonists, but also permits a basis for comparison: different instruments have different idiomatic patterns. Notably absent from this list are Charlie Parker and John Coltrane, undoubtedly the two most well-known jazz saxophonists. As noted in Chapter 1, this dissertation is interested in jazz harmony in the general sense; by focusing on musicians who do not commonly appear in works of music theory, we gain insight into the lingua franca of jazz, rather than the particulars of Parker's or Coltrane's style.[55]

4.3.1 Rahsaan Roland Kirk, "Blues for Alice"

Multi-saxophonist Rahsaan Roland Kirk's recording of "Blues for Alice" from *We Free Kings* (1961) will act as an introduction to some of the issues of analyzing improvised performance. The complete transcription of the performance can be found on p. 157, and the analysis of the chord progression of this tune is in Section 2.2.2. Kirk often plays multiple saxophones simultaneously; each instrument is given its own staff in the transcription.

One of the main problems of analyzing chord-scales is determining exactly which notes should be taken as part of the scale, and which are simply embellishing. If one of the principal arguments of this chapter is that scales *are* harmony, then the question becomes one of determining what is non-harmonic. Sometimes it is obvious that notes are embellishing, but other

54. This is to say nothing of the fact that perhaps the most important aspect of a jazz solo is that it is improvised; transcriptions must necessarily only focus on a single recorded performance.

55. Thomas Owens (among others) refers to the bebop-inspired style as jazz's lingua franca (*Bebop: The Music and its Players* [New York: Oxford University Press, 1995], 4). To avoid focusing on Parker and Coltrane is not to say that the performers examined here are not also great musicians; all of them (but especially Stitt and Henderson) are highly regarded among jazz musicians.

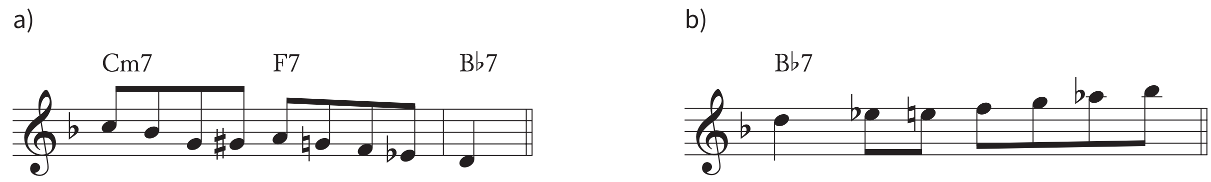


Figure 4.12. Two non-harmonic tones, from m. 112 (2:52) and m. 17 (1:00), respectively, of Kirk's solo on "Blues for Alice."

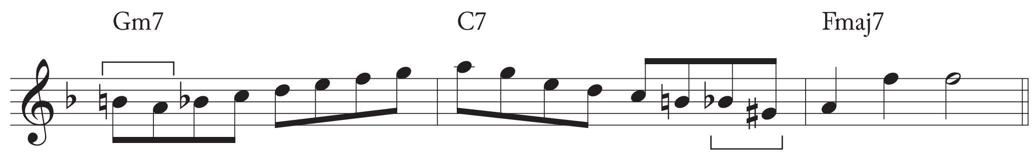


Figure 4.13. Two examples of enclosures (marked with brackets) in a ii–V–I progression, from mm. 33–35 (1:19) of Kirk's solo.

cases are not so clear. The G♯ in Figure 4.12a, for example, clearly functions as a chromatic passing tone between G (the fifth of the Cm7 chord) and A (the third of F7). Figure 4.12b presents a more complicated case: is the E♭ in the scale, with E♮ serving as a chromatic passing tone, or vice versa? If we choose E♭ as the main note, the scale implied is B♭ Mixolydian, while E♮ gives a B♭ Lydian dominant scale. The choice has analytical implications, as the two scales represent two different locations in chord-scale space. It is important to note that these kinds of non-harmonic tones are not quite like ordinary non-harmonic tones. Larson (and many others) would argue that *both* the E♭ and E♮ are non-harmonic, since at some deeper level they would reduce to either D or F (neither is part of a four-voice B♭7).[56] Because we have broadened the definition of "harmony" to include chord-scales, our idea of what is "non-harmonic" must also change accordingly.

One kind of embellishing figure merits special attention, which Jerry Coker calls the "enclosure," where a pitch is approached by semitone on either side.[57] Two examples of enclosures appear in the ii–V–I progression in Figure 4.13. The first appears before the B♭ on beat 2 of the

56. Larson, *Analyzing Jazz*, 5–10.

57. Coker, *Elements of the Jazz Language*, 50–54. Coker's manual is intended for student improvisers, but is analytically useful as something of an encyclopedia of idiomatic melodic devices in improvisations, since he provides many examples of each technique. He is one of the only authors I am aware of to discuss this aspect of performance; most others simply do not mention it at all, or hand-wave the problem away, saying that the knowledge will come by listening to and transcribing many recorded performances.

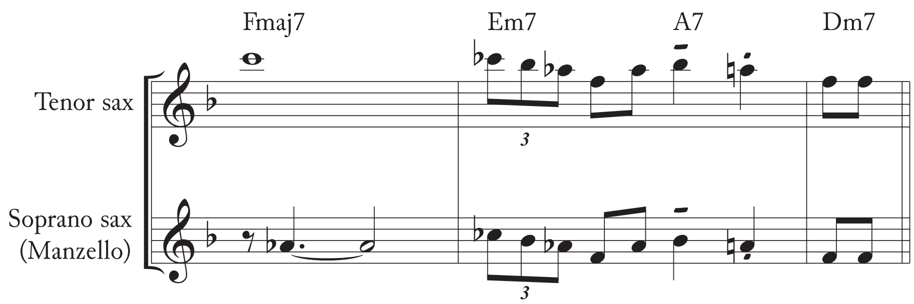


Figure 4.14. Harmonic generalization in Kirk's solo: the F blues scale appears over four different harmonies (mm. 25–27, 1:10).

first bar, and the second before the resolution to A at the end of the passage. What is interesting about enclosures from the chord-scale perspective is that usually only one of the neighbors is non-harmonic (i.e., not part of the scale). In the first example, only the B♮ is truly non-harmonic, since the A is a part of the (very clear) G Dorian scale. Likewise, the B♮ in the next measure is a chromatic passing tone in the C Mixolydian scale between C and B♭, while G♯ is a lower neighbor to the following A.

Another issue arises when an improviser chooses to play a single scale over several chord changes; Coker calls this "harmonic generalization."[58] This is a technique often used at faster tempos or with complex chord changes (or both), since it allows the performer to slow down the effective harmonic rhythm. Often the process results in notes that clash with the underlying harmonic progression, so Coker also notes that it is "less than ideal."[59] Kirk uses this technique at the beginning of his third chorus, where he plays the F blues scale over four chord changes (Figure 4.14).[60] B♭, A♭, and F♮ are all relatively dissonant over Em7, but here the coherence of the F blues scale allows us to focus on the figure as a single unit rather than hearing chord-to-chord. This phenomenon is easy to capture in the transformational system; all of the transformations have the form $R\langle\_\_, e, 0\rangle$, since the chord changes while the scale does not.

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58. Coker, *Elements of the Jazz Language*, 45–49.

59. Ibid., 46.

60. The tenor saxophone here (which sounds down an octave) is played with his left hand and the manzello—a modified soprano saxophone—is played with his right.

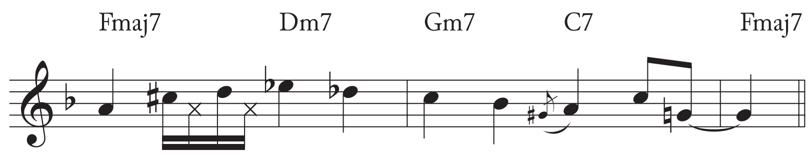

Figure 4.15. The turnaround at the end of Kirk's first chorus (mm. 11–13, 0:52).

The final issue Kirk's solo brings to light is that of chord substitution. Previous chapters have discussed harmonic substitution at length, but only in the context of tunes. The process of substitution that happens during solos is more complicated: different substitutions can happen in different choruses, a soloist might use a substitution while the rhythm section does not (or vice versa), and so on. This is an aspect of performance that is *not* so easy to capture in chord-scale space—or at least, in any single transformational label. In general, transformational labels show only a single interpretation: a passage is either represented by one chord-scale triple or another, not both simultaneously. We can, however, examine a single passage in multiple different ways, first exploring one interpretation then another. Steven Rings calls this process of analysis *prismatic*, where "phenomenologically rich passages are refracted and explored from multiple perspectives."[61]

As an example of this prismatic approach, take the turnaround from Kirk's first chorus, shown in Figure 4.15. Over the nominal Dm7 chord, Kirk plays the notes E♭ and D♭. These two notes seem incompatible with Dm7; none of Russell's scales contain a chromatic trichord (necessary if the scale is to include the chord root). One possibility is that Kirk is drawing on the total chromatic gamut, or perhaps some other scale Russell did not recognize (like the enneatonic scale). This analytical possibility seems unlikely, though; drawing on a high-cardinality scale seems excessive to explain a mere two pitches. Another, more likely, possibility is that Kirk takes the tritone substitution here, playing the notes E♭ and D♭ over an implied A♭m7 chord (or perhaps A♭7, as a tritone-substituted dominant of the following Gm7). Still another possibility is that Kirk uses a harmonic generalization, playing a diminished scale fragment (E♭–D♭–C–B♭–A–G) over a C7 harmony that is implied over the full one-and-a-half bars of the turnaround.

61. Rings, *Tonality and Transformation*, 38.

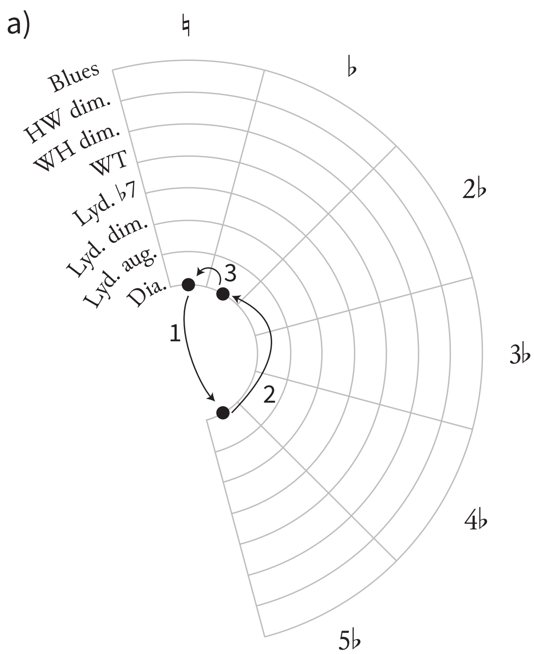

Figure 4.16. Two analytical possibilities for Kirk's turnaround, in mm. 11–13:
a) As a tritone substitution for Dm7.
b) As a harmonic generalization for C7.

Figure 4.16 shows these last two analytical possibilities in the planetary model of the previous section. The first involves hearing the E♭–D♭ succession as a diatonic tritone substitution for Dm7.[62] In this hearing, all of the chord-scales are diatonic, but the diatonic collection shifts greatly from the first chord to the second. (There are only three objects in this model because moving diatonically from Gm7 to C7 does not involve a scalar shift.) Figure 4.16b, on the other hand, combines a small diatonic shift with a large leap in the scalar dimension, moving from the diatonic collection to the whole–half diminished scale.[63]

We might also construct different transformation networks for this passage, as shown in Figure 4.17.[64] Letter *a* is a strictly chronological network (time flows from left to right), which

62. The diagram here assumes A♭7, since it is more common to substitute dominant sevenths than minor sevenths. An analysis with A♭m7 would be similar, except that the second chord would be in the 6♭ collection.

63. Recall from Table 4.7 that a diminished scale played over a dominant chord is always the whole–half diminished scale. Conceptually, the parent scale of C7 is B♭ Lydian, so the scale in question is the second mode of the B♭ whole–half diminished scale (which is of course the same as the C half–whole diminished scale).

64. All of the networks here are what Lewin calls "figural" networks (*Musical Form and Transformation: Four Analytic Essays* [New York: Oxford University Press, (1993) 2007], 45–53); since the *R* transformations do not form a semigroup, a "formal" network (showing all possible transformations) is not possible. Hall suggests in a footnote

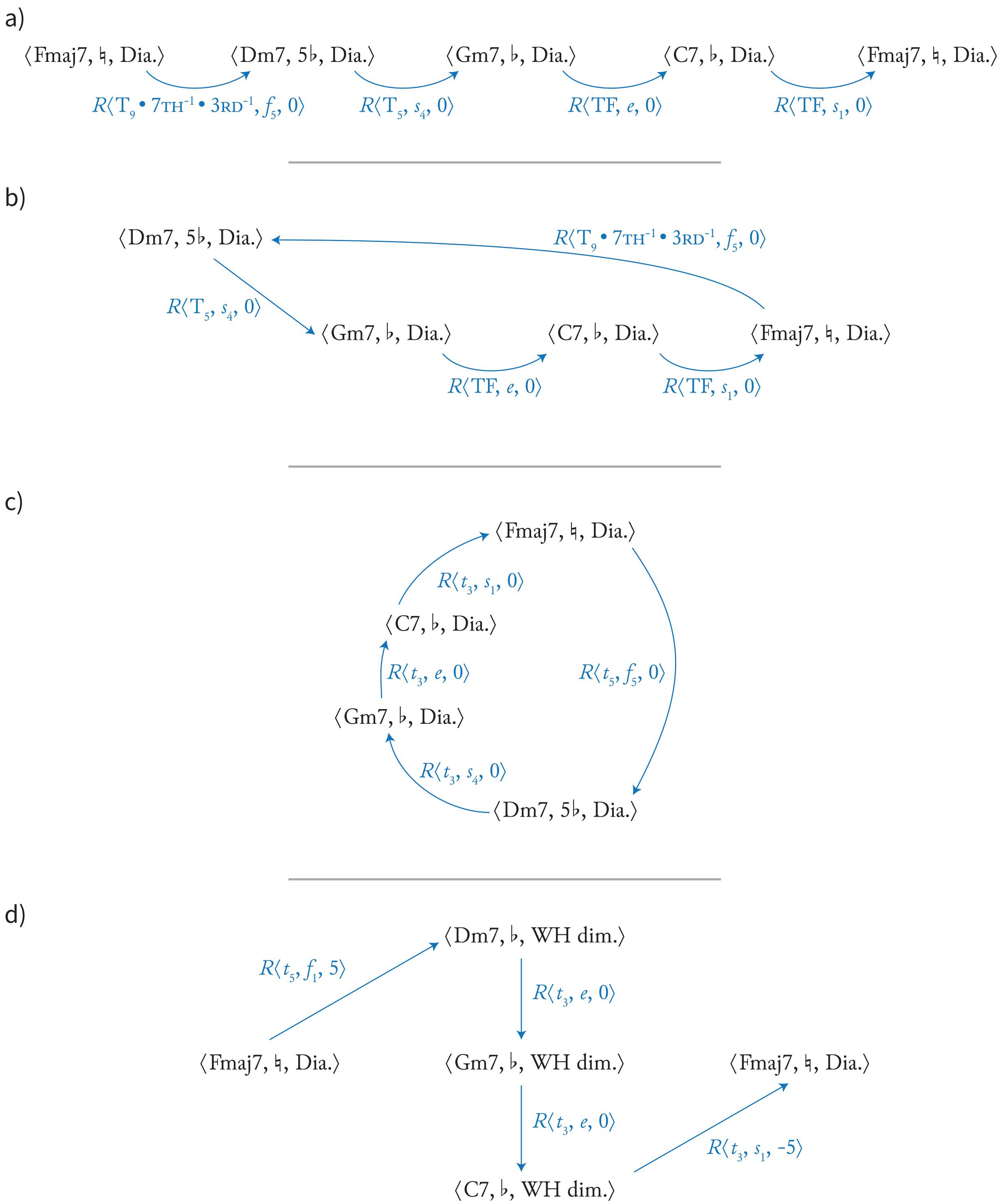

Figure 4.17. Four different transformation networks of the turnaround in mm. 11–13.

shows the basic transformations involved in the tritone-substitute hearing. Letter *b* redraws this network to reflect the organization of ii–V space: the ii–V–I is in a single horizontal line, while Dm7 is a level higher, representing its position as a ii^7 chord in C. This network also clarifies that the starting and ending Fmaj7 chord is the same point in the space. Letter *c*, on the other hand, reimagines the chord transformations as taking place in a F major diatonic space (similar to that of Section 1.5), while still hearing the tritone substitute. Finally, letter *d* represents the diminished-scale hearing: both transformations in the middle column contain $\langle e, 0\rangle$ as their second and third elements, since the scale does not change.

It may seem as though the preceding pages have reached for the pile-driver to kill the gnat, so to speak; the entire discussion was brought about by the two notes E♭–D♭.[65] These notes are not of any particular significance in Kirk's solo, and indeed the entire turnaround is relatively ordinary. As listeners and analysts, though, we can conceive of multiple ways of hearing this particular passage, and chord-scale transformations offer a way to explore these interpretations. None of the networks of Figure 4.17 is more correct than the other, and none proposes to be *the* structure of this particular passage. As Rings observes, "to the extent that [transformational] analyses reveal 'structures' at all, they are *esthesic structures* rather than immanent structures."[66] Throughout his book, he emphasizes that a particular analysis is more a record of an analytical encounter with the music than the music itself. Though we will not often focus so intently on such a small fragment of music, adopting Ring's attitude means that we *can*: the lens of transformational theory can zoom in and out as needed.

Before leaving Kirk's solo, it will be instructive to look at his improvisations on a few ii–V–I progressions, if only because they are so ubiquitous in jazz. Figure 4.18 gives three of these, each

(Review of *GMIT* and *MFT*, 213n16) that the logical structure of the group is unnecessary in figural networks; the networks of this figure support this claim.

65. The pile-driver/gnat metaphor comes from Richard G. Swift's response to Lewin's first published article (Letter to the editor, *Journal of Music Theory* 4, no. 1 [April 1960]: 128; quoted in Hook, "David Lewin and the Complexity of the Beautiful," 162).

66. Rings, *Tonality and Transformation*, 37, emphasis original.

Figure 4.18. Three ii–V–I progressions from Kirk's solo on "Blues for Alice."

taken from the last four bars of a chorus of "Blues for Alice." [67] Letter *a* reproduces Figure 4.13, and uses the most typical ii–V–I chord-scale pattern:

$$\langle \text{Gm7}, \flat, \text{Dia.} \rangle \xrightarrow{R\langle \text{TF}, e, 0 \rangle} \langle \text{C7}, \flat, \text{Dia.} \rangle \xrightarrow{R\langle \text{TF}, s_1, 0 \rangle} \langle \text{Fmaj7}, \natural, \text{Dia.} \rangle.$$

The G Dorian and C Mixolydian scales are both in the ♭ collection, while the parent scale for Fmaj7 is the ♮ collection; this results in the typical s_1 V–I resolution.[68] Figure 4.18b is likewise all diatonic, and has an identical transformational structure. Its interest comes in the "double enclosure" figure that appears over Gm7: the downbeat B♭ in m. 22 is approached by two chromatic neighbors on each side. The A and C are both in the G Dorian scale, while G♯ and B♮ are simply embellishing, and do not take part in the chord-scale transformations. Figure 4.18c uses a diminished scale over Gm7 and includes D♭ over C7, giving a different transformation network:

$$\langle \text{Gm7}, \flat, \text{HW dim.} \rangle \xrightarrow{R\langle \text{TF}, e, -4 \rangle} \langle \text{C7}, \flat, \text{Lyd. dim.} \rangle \xrightarrow{R\langle \text{TF}, s_1, -2 \rangle} \langle \text{Fmaj7}, \natural, \text{Dia.} \rangle.$$

Here, the scales get more ingoing over the course of the progression from the half–whole diminished scale (implying ♭13 and ♭5) to the Lydian diminished scale (♭9) before reaching the diatonic Fmaj7.

67. Figure 4.18c is missing beats 2–4 of the third bar because this ii–V–I leads into the turnaround in Figure 4.15, which is discussed at length above and would distract from the topic at hand.

68. Absent any additional information we will assume Russell's most ingoing scale for chords. Since there is no B (flat or natural) in any of the third bars of Figure 4.18, we thus assume F Lydian.

It should be apparent that these analytical fragments of excerpts from Kirk's solo do not constitute an analysis of the solo as a whole. Nothing has been said about the overall shape of the solo, the role of register, how playing multiple saxophones limits Kirk's available pitches, or any of the countless other analytically interesting aspects. It is in many ways a typical jazz solo, and as such has served primarily as an introduction to the fundamentals of analyzing jazz improvisation, while at the same time offering a glimpse of how chord-scale transformations might be used in analysis.

4.3.2 Gene Ammons and Sonny Stitt, "Autumn Leaves"

Tenor saxophone duo Gene Ammons and Sonny Stitt recorded "Autumn Leaves" on the album *Boss Tenors* in 1961 (the complete transcription is on p. 153). "Autumn Leaves" was first analyzed in Section 1.5, in connection with diatonic chord spaces. We will return to this subject shortly, but only after a brief diversion into meter in improvisation (an aspect emphasized in this recording that did not appear in Kirk's solo on "Blues for Alice").

Both Ammons and Stitt shift barlines frequently in their solos, while Kirk almost never did. Meter is not the primary focus here, but it can affect the chord-scale analysis of a passage.[69] The most common kind of metrical shift is a slight anticipation of the following harmony; Stefan Love notes that these are "so common as to be a cliché," and they are usually obvious in analysis.[70] Figure 4.19 gives two straightforward examples from the beginning of Ammons's solo. The F♯ in m. 2 clearly belongs to the following Bm7 and not to F7, and the F♮ in the following bar functions in the same way.

Sometimes the metric shift is more dramatic; take the passage in Figure 4.20, for example. Here, Ammons seems to arrive at D7 too late, continuing the E♭7 harmony two beats into the next bar. Jerry Coker refers to these as "barline shifts," and says that while they are "not intentional,

69. The kind of metrical shifts discussed here are much simpler than those usually discussed in the jazz literature. The classic work on metrical dissonance in jazz is Cynthia Folio, "An Analysis of Polyrhythm in Selected Improvised Jazz Solos," in *Concert Music, Rock, and Jazz since 1945: Essays and Analytical Studies*, ed. Elizabeth West Marvin and Richard Hermann (Rochester, NY: University of Rochester Press, 1995), 103–35; Stefan Love provides an overview of other literature in this area in "Subliminal Dissonance or 'Consonance': Two Views of Jazz Meter," *Music Theory Spectrum* 35, no. 1 (Spring 2013): 48–61.

70. Ibid., 51.

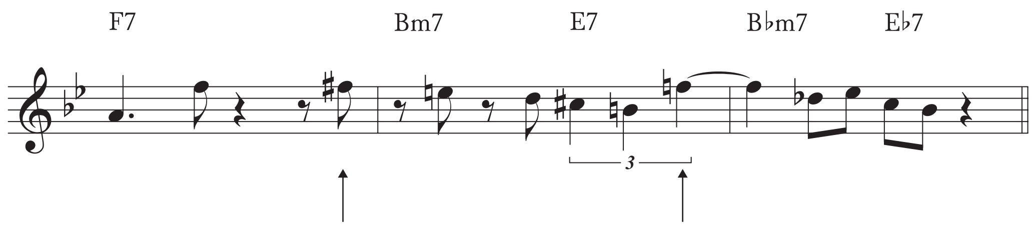

Figure 4.19. Two examples of anticipations, from Gene Ammons's solo on "Autumn Leaves" (mm. 2–4, 1:04).

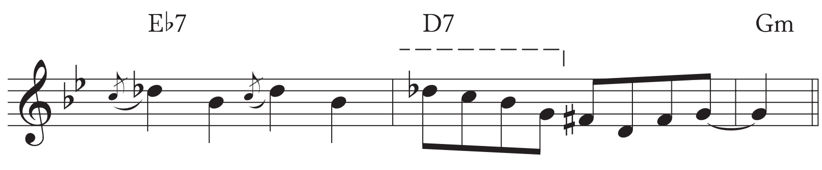

Figure 4.20. A barline shift in Ammons's solo (mm. 29–30, 1:47).

necessarily, they are not errors, either, as they might be in the case of the novice who momentarily loses his/her place in the progression."[71] In this case it is relatively clear that the arrival of D7 is delayed, and that the pattern D♭–C–B♭–G should not be taken as some outgoing scale choice for D7.

In his solo, Sonny Stitt often uses barline shifts in double-time passages to increase the effective harmonic rhythm; Figure 4.21 gives one of these passages over a ii–V progression.[72] In the second half of m. 73, Stitt plays a descending F bebop scale, implying the F7 chord a half-bar early.[73] Instead of continuing to play F7 in the next bar, though, Stitt seems to return to Cm7: he uses only F♯ as a lower neighbor until the last beat, when the (strongly C-minor) figure

71. Coker, *Elements of the Jazz Language*, 83.

72. In "double-time" passages, the soloist plays twice the speed of the prevailing note value, though the underlying tempo remains constant. Here there is a quarter-note pulse, and the soloists play predominantly eighth notes; the double-time passages use sixteenth notes instead. Matthew Voglewede has discussed the practice of double-time from a metrical standpoint in "Metrically Dissonant Layers of Swing: Double Time in Two of Louis Armstrong's Performances of 'Lazy River'" (paper presented at the annual meeting of the Music Theory Society of the Mid-Atlantic, Philadelphia, PA, March 2013).

73. The dominant bebop scale is a Mixolydian scale with a chromatic note added between the chordal seventh and the root, so that when played in eighth notes the chord tones fall on the beat. David Baker (who played with George Russell early in his career) is usually credited with inventing the term; see *How to Play Bebop, Vol. 1: The Bebop Scales and Other Scales in Common Use* (Van Nuys, CA: Alfred, 1985).

Figure 4.21. A barline shift from Sonny Stitt's solo on "Autumn Leaves" (mm. 73–74, 2:59).

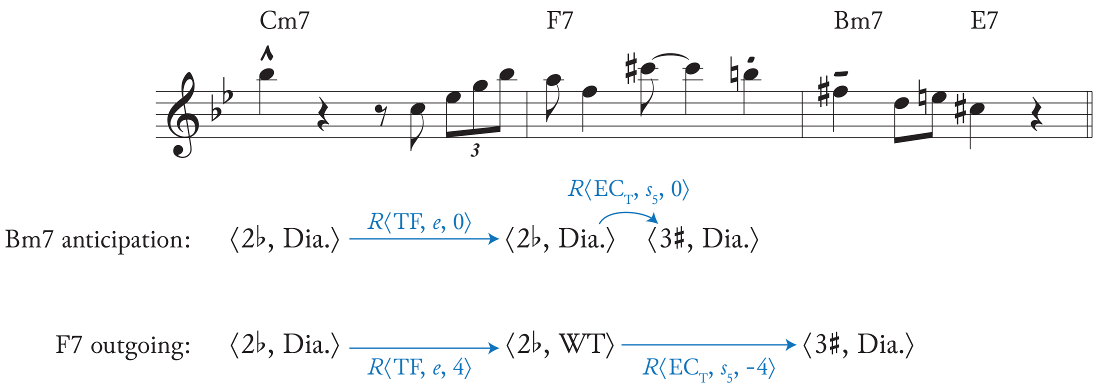

Figure 4.22. An ambiguous barline shift in Ammons's solo (mm. 41–43, 2:06), with two possible transformation networks.

G–E♭–D–C figure resolves to F♮. Stitt exploits the fact that there is no diatonic shift between ii^7 and V^7 chords, and alternates between the two freely in a 2♭ diatonic wash.

Finally, there are some cases when it is unclear whether to read a passage as a barline shift or as an outgoing scale choice; Figure 4.22 gives a representative example.[74] The C♯ and B♮ in m. 42 could be heard as anticipating the Bm7 by two beats, or as part of a whole-tone scale over F7, as shown in the transformation networks. Ammons anticipates the Bm7 in the A sections of the first chorus (mm. 3 and 11, the second with the pitches C♯ and B♮), giving some credence to the anticipatory hearing. On the other hand, the first A section of the second chorus features increased chromaticism—the D7 in m. 38 uses a diminished scale—and perhaps the second A section continues the trend. Again, the prismatic approach says that it is less important to decide on a single interpretation than to realize that both are available for our perception.

74. In this figure and others following, I have omitted the chord symbol from the chord-scale triples to save space, since it is obvious from the transcription itself.

Original:	C-^{7}	F^{7}	B♭^{maj7}	E♭^{maj7}	A-$^{7\flat5}$
Ammons/Stitt:	C-^{7}	F^{7}	B-^{7} E^{7}	B♭-^{7} E♭^{7}	A-$^{7\flat5}$

Figure 4.23. "Autumn Leaves," mm. 1–5, showing substitutions in mm. 3–4.

Over the course of an improvised solo, a performer's choice of scale for a particular chord can change. Usually, though, some chords are more flexible in their chord-scale identity than others.[75] In the Ammons/Stitt recording, the progression Bm7–E7–B♭m7–E♭7 in the third and fourth bars of the A sections is almost always accompanied with the ⟨3♯, Dia.⟩–⟨4♭, Dia.⟩ succession.[76] The home-key dominant D7, on the other hand, enjoys a wider range of scalar options, appearing at various times with the whole–half diminished scale (see mm. 6, 18, 38), the Lydian diminished scale (mm. 14, 26, 78), the diatonic collection (m. 82), and the Lydian ♭7 scale (mm. 102, 110). As first noted in Chapter 1 (p. 22n67), the scale choice for the tonic G minor is somewhat flexible: it is always played with E♮, but sometimes with an upper-neighbor F♮ implying a Dorian scale (mm. 19, 39) and other times with an F♯ implying a melodic minor scale (or ⟨Gm, ♭, Lyd. aug.⟩, as in m. 83).

The analysis of "Autumn Leaves" in Chapter 1 focused on its underlying diatonic nature, but this diatonicism is attenuated somewhat in the Ammons/Stitt recording. Figure 4.23 gives the first five bars of "Autumn Leaves" as analyzed in Chapter 1 (top) and as played on *Boss Tenors* (bottom). Both major seventh chords in the original diatonic succession F7–B♭maj7–E♭maj7–Am7♭5 are here substituted with chromatically descending ii–V progressions; Figure 4.24 shows this set of substitutions in ii–V space. This set of substitutions is relatively easy to understand: first, the major seventh chords are turned into dominants (B♭7–E♭7); each is preceded by its ii^{7} chord (Fm7–B♭7–B♭m7–E♭7); finally, the first ii–V progression is transposed by a tritone. While these

75. By tallying up all of the appearances of a given chord/scale pairing, it would be possible to develop something like a snapshot of a performer's chord-scale choices. Doing so could perhaps bring some clarity to discussions of jazz style (as in, for example, David Baker's *Giant of Jazz* series) by incorporating the chord-scale transformations developed here. While this is an interesting possibility, we will pursue it no further here.

76. The only time it is not occurs in Stitt's first chorus (3A$_{1}$, mm. 67–68), where he plays a sustained D♮ through all four chords.

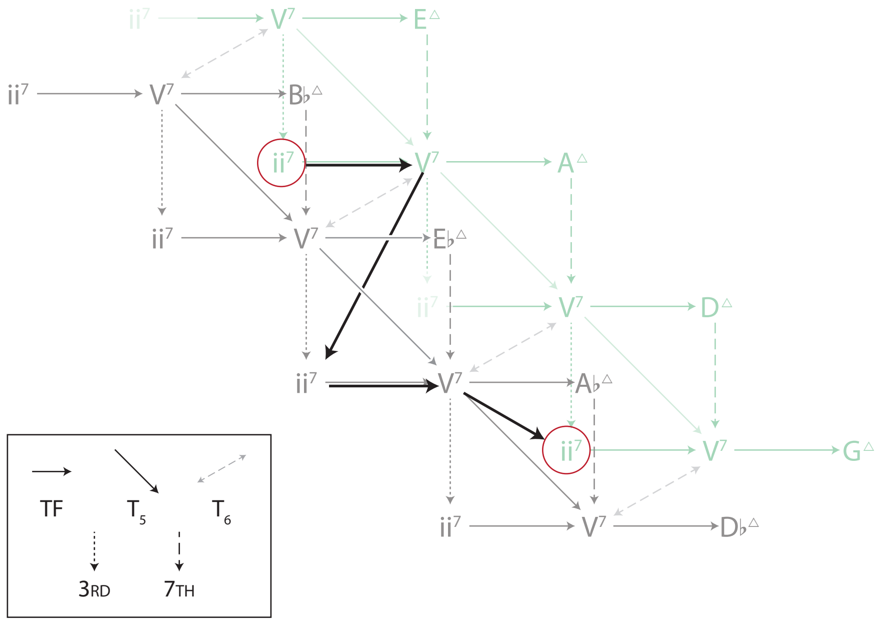

Figure 4.24. The substitutions in mm. 3–4 of "Autumn Leaves" in ii–V space.

chords are close together in ii–V space, they are far apart in chord-scale space, as noted above; Bm7–E7 is played as ⟨3♯, Dia.⟩ in this recording, while B♭m7–E♭7 is played as ⟨4♭, Dia.⟩—a difference of five sharps/seven flats.

The ensemble likely decided to make the substitutions in the solos to prevent the piece from becoming boring: since almost all of the original chords are diatonic in G minor, playing in the 2♭ diatonic collection will work for almost every harmony.[77] The substitutions in mm. 3–4 of the A sections provide some variety in the chord-scale options, leaving the diatonic nature of the tune to manifest in other ways. In both of his choruses, Stitt uses a harmonic generalization from the last four bars of the bridge through the first four of the C section, playing the 2♭ diatonic collection throughout (Figure 4.25 reproduces this passage from his last chorus). Because of the substitutions in the A section, this implicit diatonic cycle (first discussed in connection with Figure 1.8) is the only one remaining in the solo changes; Stitt's choice to use a harmonic generalization highlights

77. The dominant, D7, is not in the 2♭ collection, since it is not diatonic in G minor. This collection also results in the major scale (not the Lydian) for the B♭maj7 chords, which is borne out by the E♭s in the recording (see mm. 23–24, 55, and 88). The Gm chord itself is usually played with E♮, placing it in the 1♭ collection.

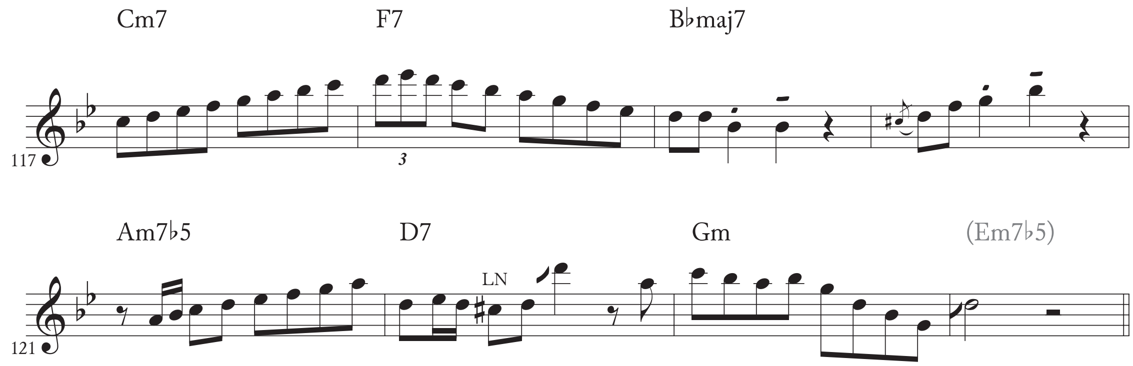

Figure 4.25. Stitt's 2♭ harmonic generalization, highlighting the implicit diatonic cycle (mm. 117–24, 4:11).

this implicit diatonicism.[78] Because the scale stays the same while the chords move through a diatonic cycle, every transformation in this passage is the same: $R\langle t_3, e, 0\rangle$.

4.3.3 Joe Henderson, "Isotope"

Joe Henderson's composition "Isotope" was the subject of Section 3.1.2, and this section will return to Henderson's solo on the tune from *Inner Urge* (1965). Since he is also the composer of the tune, Henderson's fifteen improvised choruses (Appendix B, p. 160) can provide some insight into how he understands its harmony.

As we observed in Section 2.3.2, major-minor seventh chords can function as tonic chords in the blues. This fact presents something of a problem for an improviser: the C7 at the beginning of "Isotope" acts as tonic at the beginning of its four-bar span, but as a dominant of the following F7 at the end.[79] At some point during this four bars must be a pivot fifth: a motion from "C7 as tonic" to "C7 as dominant." This is harmonic information that is not readily available in the chord symbols, but can be seen in a soloist's scale choices.

78. In fact, Stitt's note choices here would also work well if the rhythm section were to play E♭maj7 in the fourth bar, which is suggested in Figure 1.8.

79. Other blues tunes negotiate this problem by inserting another chord in the first four bars. Thelonious Monk's "Misterioso," to take a typical example, is a blues in B♭: the first four bars contain the progression B♭7–E♭7–B♭7–B♭7. In a case like this, the first B♭7 functions as tonic, while the last two bars function as dominant of the following IV chord.

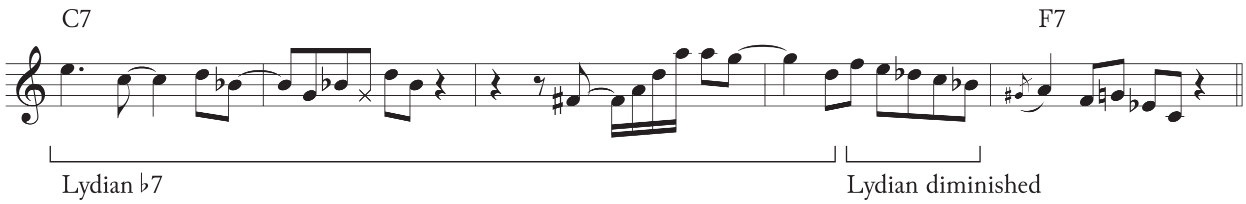

Figure 4.26. A scalar shift highlights a change in function in Joe Henderson's solo on "Isotope" (mm. 13–17, 0:47).

Figure 4.26 gives a representative example from Henderson's second chorus; here, he uses the Lydian ♭7 scale in the first three bars of the chorus before shifting to the Lydian diminished scale in the final bar. The addition of ♭9 (D♭) intensifies the motion toward F7, since tonic chords do not usually have this extension. This is a harmonic move that is easily captured using a chord-scale transformation; we can represent the passage as

$$\langle \mathrm{C7}, \sharp, \mathrm{Lyd.}\ \flat 7\rangle \xrightarrow{R\langle \text{pivot 5th}, f_2, -1\rangle} \langle \mathrm{C7}, \flat, \mathrm{Lyd.\ dim.}\rangle.$$

Henderson does not do this in every chorus (he often plays diatonic or blues scales through the entire four bars), but similar effects can be observed in choruses 1, 7, 9, 14, and 15.

In the two analyses above we saw that substitutions can affect chord-scale choices, but not all of them do. One of the most common substitutions is actually an interpolation, in which a performer plays a ii–V progression when only a V^7 chord is given. Because the motion from ii^7 to V^7 does not involve a diatonic shift, these interpolations often do not affect the chord-scale analysis.[80] Two examples from Henderson's first chorus are given in Figure 4.27; in each, the arpeggiation in the first half of the bar could be seen as diatonic (each involving the ninth of the V^7 chord), but they can also be heard as arpeggiations of the ii triad.

The blues offers many opportunities for harmonic generalization, and here I want to focus on two passages in particular.[81] The first is in Henderson's fifth chorus, the opening of which is shown in Figure 4.28. In the third bar of the chorus, Henderson begins playing a lower-neighbor figure

80. If a performer chooses non-diatonic scales for the ii^7 and V^7 chords, the analysis would be affected; in the diatonic case, it is not.

81. Harmonic generalization is part and parcel of the blues; the blues scale derives its name in part from the fact that the tonic blues scale can be (and often is) played over an entire blues chorus. As Mark Levine has it, "playing the blues scale over the I–IV–V chords of a basic blues yields dissonances hardly acceptable in traditional theory. But these dissonances have been present in jazz since its inception" (*The Jazz Theory Book*, 233).

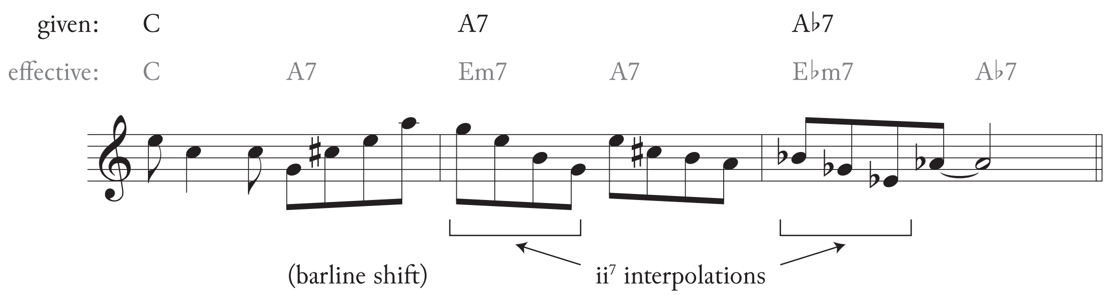

Figure 4.27. Two interpolated ii⁷ chords from Henderson's first chorus (mm. 7–9, 0:39).

that continues in sequence through the next four bars. Because this passage is so uniform, we can draw on the full power of Hook's signature transformations, including the diatonic transposition operator *t*.[82] Each pattern moves down a diatonic step (t_6); the final arrow is dotted to indicate that the pattern breaks down at this point, and the lower-neighbor is distorted into a descending minor third. In mm. 54–55, the lower-neighbor pattern is constant, while the underlying collection shifts from the 2♭ to the 2♯ collection, an s_4 transformation.[83] Henderson ignores the C chord in m. 55, anticipating the A7 by a full bar, and also deemphasizes the B♭7 (there is no A♭ present).

Henderson plays a similar passage in the middle of chorus 14, shown in Figure 4.29. Like the first, it begins with a diatonic sequence, this time in a stepwise rising motion (a series of t_1s). Here the sequence breaks down much earlier in the passage, but the constant eighth notes and general rising contour here link the two together; both sound like a single line with a shifting diatonic foundation rather than a series of loosely connected gestures. This passage traverses the same s_4 transformation as the first from the 2♭ to 2♯ diatonic collections, though the route here is more scenic. Henderson does not anticipate the A7 and instead plays the C harmony, splitting the s_4 transformation into two s_2s. The first of these is further subdivided into an f_1/s_3 pair; because the

82. This operator should be read here as Hook's t_k, which operates on "floating diatonic forms," *not* as the t_k operator defined in Section 1.5. See Hook, "Signature Transformations," 139–41.

83. Incidentally, the diatonic collection of the C7 chord itself is ambiguous. We might hear it as the 1♯ collection (as part of a Lydian ♭7 scale), the 1♭ collection (hearing C7 as a dominant, as the second mode of of B♭ Lydian), or perhaps even the 2♭ collection (as a harmonic generalization of B♭7 in the first six bars of the chorus). Exactly which diatonic collection we choose is not important to the analysis here.

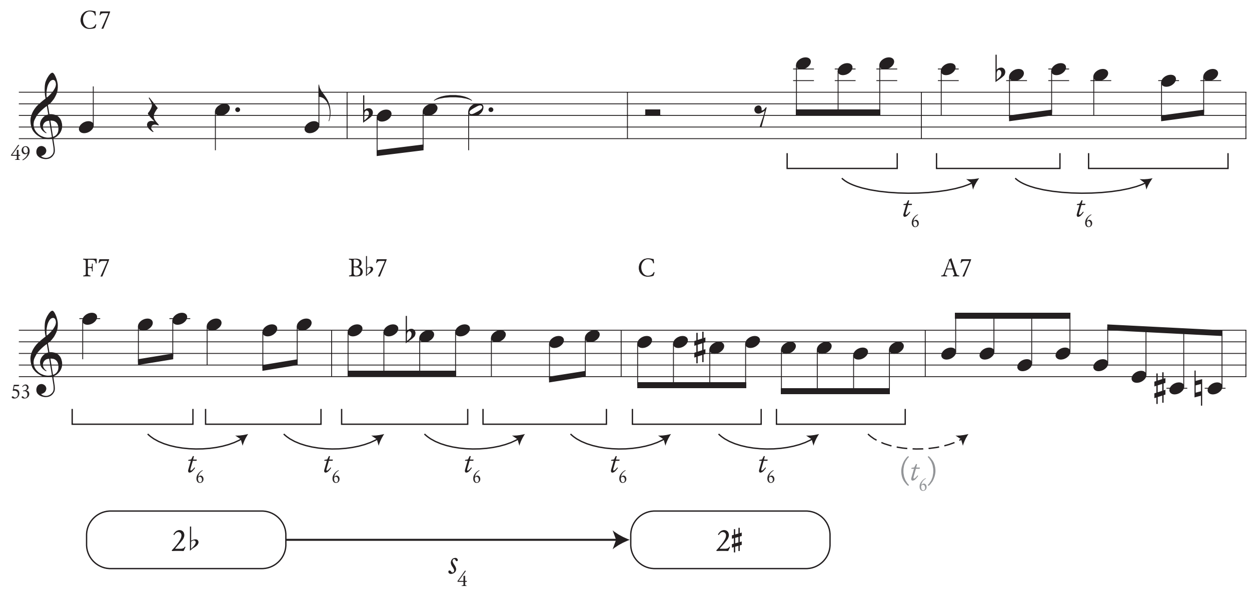

Figure 4.28. Signature transformations in the opening of Henderson's fifth chorus (mm. 49–56, 1:33).

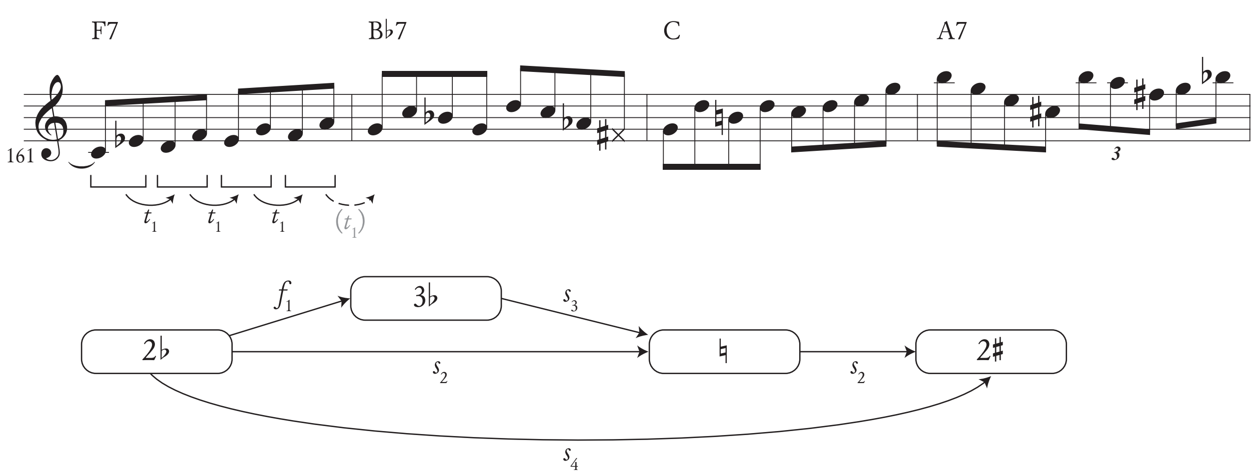

Figure 4.29. A similar passage in chorus 14, with signature transformations (mm. 161–64, 3:52).

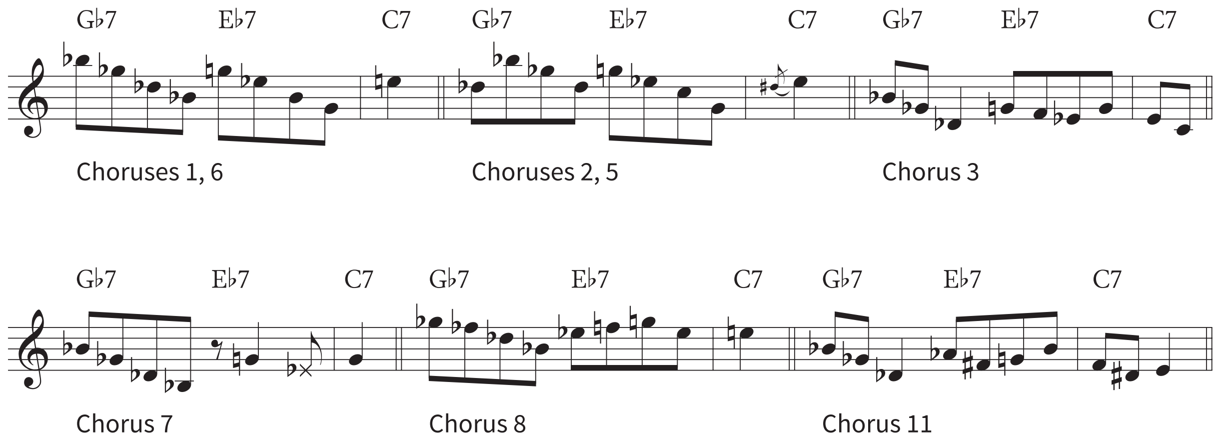

Figure 4.30. Henderson's solos on G♭7–E♭7–C7 in several choruses of "Isotope."

A♭ comes at the very end of m. 162 as part of an enclosure figure, it is not as strong as the larger motion from the 2♭ to the ♮ collection.

In the final pages of this chapter, I want to take a step back to show that there are aspects of Henderson's solo that are not easily expressed with chord-scale transformations. In the analysis of "Isotope" in Chapter 3, we noted that the turnaround, in which dominant sevenths descend by minor thirds, was one of the most interesting parts of the tune. The fact that these chords can be related by smooth voice leading was downplayed there, but Henderson often plays these chords (especially G♭7–E♭7) as arpeggiations that emphasize this voice leading. Figure 4.30 gives several examples of Henderson's solos on the final bar of the chorus, along with their resolutions. In all of these, he emphasizes the G♭–G♮ voice leading from G♭7 to E♭7, and usually brings out the E♭–E♮ over E♭–C7 as well. The importance of these voice leadings disappear in the chord-scale transformations, and would be better shown in, for example, one of Tymoczko's voice-leading spaces.[84]

There are two choruses of Henderson's solo where contrapuntal concerns seem to take precedence over making the changes; Figure 4.31 reproduces chorus 6 in its entirety, but the same principle is at work in chorus 12. The particular scale Henderson plays in the first four bars is

84. The four-voice tesseract in Tymoczko, *A Geometry of Music*, 106 is his way of describing these motions; Cohn's Four-Cube Trio in Figure 3.13 describes the same voice-leading space.

Figure 4.31. Henderson's sixth chorus (mm. 61–72, 1:48), featuring contrapuntal motion.

clearly not as important as the chromatic line from E to G and back, taking place over the lower G pedal point.[85] This chromatic polyphonic melody continues throughout the chorus, culminating in the arrival at the high C in m. 70. This chorus is one that a Schenkerian voice-leading sketch would describe particularly well (the first four bars unfold the tonic interval E_5–G_5, and so on), but that chord-scale transformations do not. Indeed, it is not at all clear which scales are being used, nor do they even seem particularly important to understanding this chorus.

To the extent that chord-scale transformations describe *harmony*, though, they are quite useful, as these three analytical vignettes have shown. Both of the limitations just discussed involve voice leading, and for jazz musicians, harmony and voice leading do seem to be separate entities.[86] While for Schenker harmony and voice leading are two aspects of the same phenomenon, George Russell instead pairs harmony (or chord) and scale. The two theories seem to be quite similar in their goals; compare Schenker's unification of harmony and voice-leading with Russell's repeated declarations that the Lydian Chromatic Concept unites both the vertical and horizontal aspects of

85. Jerry Coker calls this kind of line CESH, which is short for "contrapuntal elaboration of static harmony" (*Elements of the Jazz Language*, 61–67).

86. None of the passages discussing CESH or "linear chromaticism" in Coker's book, for example, say anything about harmony, nor do any of the passages that feature discussions of voice-leading (what other authors refer to as "guide tones") mention it as a harmonic phenomenon. In his discussion of the "7–3 resolution", he says that he is "simply concerned with the smooth connection (voice-leading) of two chords, especially with respect to melodic, rather than harmonic, implications" (*Elements of the Jazz Language*, 19).

music. Furthermore, Russell's theory of jazz was no less aspirational than Schenker's in its goal to describe all tonal music; Russell says explicitly that the concept of tonal gravity is "the underlying force of equal tempered music" (*LCC* 223).

Toward the end of the *Concept*, addressing the claim that his theory can describe all music, Russell asks why "such a theoretical work [should] come from the jazz experience" (*LCC* 223). This chapter has asked the related question of why Russell's theory of "the jazz experience" seems not to have been applied in any rigorous theoretical way to jazz itself. If we take seriously the idea that chords and scales are manifestations of a single phenomenon, then we must look at scales if we are to fully understand jazz harmony. Transformational theory provides a means of examining these chord-scales in a systematic way, and the chord-scale transformations developed here have expanded our musical universe beyond the lead sheet and into jazz performance itself.