HARMONIC VOCABULARY IN THE MUSIC OF JOHN ADAMS: A HIERARCHICAL APPROACH

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Overview

Following the minimalist tradition, much of John Adams's[1] music consists of long passages employing a single set of pitch classes (pcs) usually encompassed by one diatonic set.[2] In many of these passages the pcs form a single diatonic triad or seventh chord with no additional pcs. In other passages textural and registral formations imply a single triad or seventh chord, but additional pcs obscure this chord to some degree. These phenomena suggest a hierarchical approach to the harmonic analysis of Adams's music that relates passages containing only a triad or seventh chord to passages incorporating additional pcs.

For each individual passage I recognize three distinct pc levels arranged in an ordered triple of pc sets called a *complex*. A complex consists of (1) a *chord*—a strongly projected triad or seventh chord; (2) a *sonority*—all strongly presented pcs in the passage, encompassing the chord plus other strongly presented pcs, if any; and (3) a *field*—a complete diatonic collection plus strongly presented non-

chord $\subseteq$ sonority $\subseteq$ field

Figure 1. Inclusion relations in the complex.

diatonic pcs, if any, encompassing both the chord and the sonority. Thus, I have placed constraints on the complex that (1) limit the allowable set types for chord, sonority, and field, and (2) specify inclusion relations among the three components.

The inclusion relations are shown in figure 1. The constraints on the set type of the chord specify that the chord must be a diatonic triad or seventh chord. Two premises underlie the constraints on allowable set types for chords. The premise that *chords are formed by thirds superimposed above a root* is well-understood from traditional harmony and accords with Adams's conception of his chords as having roots (Adams 1989). The premise that *each chord is either a triad or seventh chord and any other contextual pcs are considered as non-chord tones* implies interaction between chord tones and non-chord tones. Such interaction characterizes Adams's music, both melodically and rhythmically.[3] In addition, this premise corresponds to the prevailing view of traditional western music according to which ninths, elevenths, and thirteenths are usually considered as "frozen" non-chord tones, or non-chord tones that do not resolve before the next change in harmony.[4]

The constraints on the set type of the field specify that the field must consist of (1) a complete diatonic collection of pcs—called a *diatonic field;* or (2) a complete diatonic collection of pcs plus any strongly presented non-diatonic pcs—called a *superdiatonic field.* Thus the field, a set of pcs that provides a context for the chord and sonority, always includes a diatonic set among its pcs. I call a complex containing a diatonic field a *diatonic complex* and a complex containing a superdiatonic field a *superdiatonic complex;* however, I retain the terms *complex* and *field* as generic labels for both types since the superdiatonic case is simply an expansion of the diatonic case.

The inclusion relations between the three components imply constraints on the set type of the sonority: (1) the sonority necessarily includes *all* pcs of the chord; and (2) the sonority includes nothing but diatonic pcs in a diatonic complex and includes *all* non-diatonic pcs of the field in a superdiatonic complex. Consequently, the sonority and field must be either both diatonic or both superdiatonic with respect to the diatonic portion of the field.

Figures 2 and 3 graphically display the diatonic complex and the superdiatonic complex, respectively. The three trapezoids in each figure enclose the components of the complex and display the inclusion

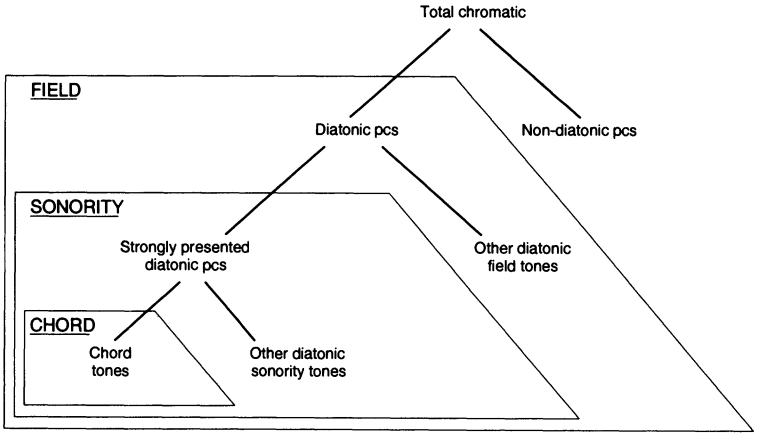

Figure 2. Diagram of diatonic complex.

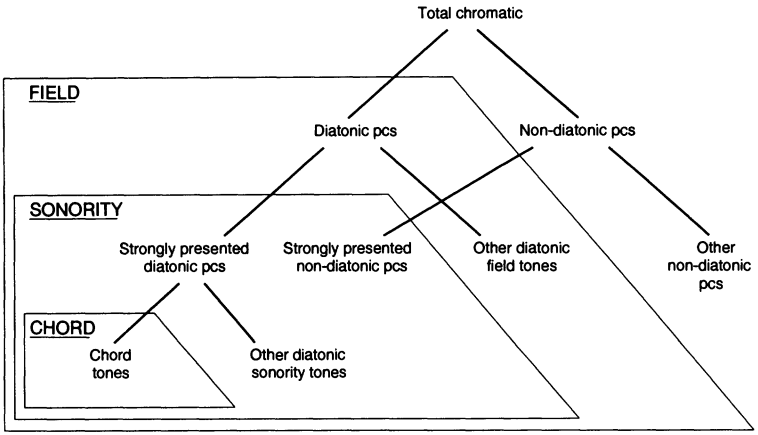

Figure 3. Diagram of superdiatonic complex.

relationships among them. Branching lines show the hierarchical partitioning of pc sets stemming from the total chromatic. Each pc set (for example, "diatonic pcs") branches into two disjunct subsets (for example, "strongly presented diatonic pcs" and "other diatonic field tones") at the next lower level, and the union of these smaller sets yields *all* of the pcs of their "parent" set. In the diatonic complex this branching, beginning from the "total chromatic", reaches one

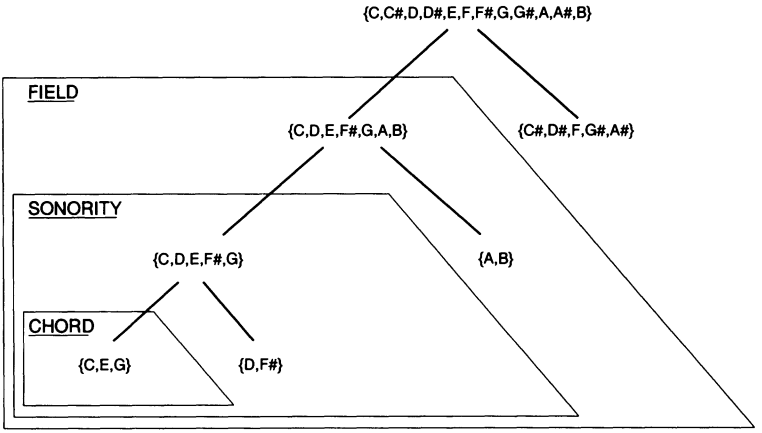

Figure 4. Diagram of diatonic complex with pcs.

component of the complex at a time. On the other hand, in the superdiatonic complex the "strongly presented non-diatonic pcs" branch from the "non-diatonic pcs" directly into the trapezoid enclosing the sonority since these strongly presented pcs always appear in both the sonority and the field, as noted above. In addition the branch from the "non-diatonic pcs" terminates at the trapezoid enclosing the sonority rather than continuing to the trapezoid enclosing the chord, since the chord includes only pcs from the diatonic field.

Figures 4 and 5 graphically display a diatonic complex and a superdiatonic complex, respectively, using pcs rather than abstract sets. The two complexes have the same diatonic portions: both use a C major triad as the chord; both include the same diatonic collection of pcs from C up to G in the sonority; and both include the diatonic collection of pcs corresponding to the G-major scale in the field. However, the superdiatonic complex adds two strongly presented non-diatonic pcs, C♯ and G♯, to both the sonority and the field.

In previous work Diana Deutsch and John Feroe have presented a formal model, developed in reference to traditional tonal music, that effectively generalizes the hierarchy described by my complex (Deutsch and Feroe 1981). Pcs appear in hierarchical networks of "alphabets," and the elements of each alphabet maintain the Gestalt laws of proximity and good continuation (giving preference to motions beginning and ending on the next higher hierarchical level). Thus, pcs appearing at higher hierarchical levels are more stable than pcs

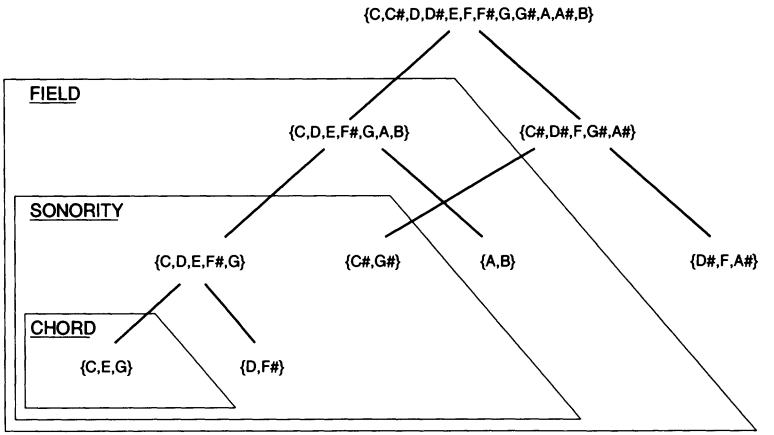

Figure 5. Diagram of superdiatonic complex with pcs.

appearing at lower levels, and melodic lines generally begin and end with pcs appearing at relatively higher levels. Fred Lerdahl adopts this model and its representation of the tonal realm as an ideal approach to the organization of pc space suitable for a compositional system that "utilizes the full potential of our cognitive resources" (Lerdahl 1988, 249–250, 255–257). In addition, Lerdahl claims that "there are innumerable and radically new ways to extend" this system, some of which, I hope to show, Adams has achieved (Lerdahl 1988, 256).

My complex also corresponds to the format of David Lewin's "sandwich number" (Lewin 1987, 121). The function, SNDW (X, Y,Z), indicates the number of forms of Y that can be sandwiched between X and Z—in other words, the number of forms of Y (a set class) that are included in Z (a specific set) and that include X (a specific set). The sandwich number for complexes indicates the number of sonorities with a particular set type that can be sandwiched between a chord and a field. Thus, each complex displays a single instance of this relationship: a particular sonority (Y) sandwiched between a chord (X) and a field (Z).

In this article I introduce a method for the recognition and description of complexes. First, I explore possible symbologies for chords and diatonic fields, settling on a particular one; I then expand this symbology to describe superdiatonic fields. Next, using examples from Adams's works, I provide guidelines for choosing between two or more possible complexes in a passage and develop criteria for

segmentation between complexes. Finally, I present some analytical observations about complexes in Adams's *Phrygian Gates,* employing the symbology and identification strategies developed in this article.

Symbologies for Chords and Diatonic Fields

For the present I ignore sonorities and superdiatonic fields and address the matter of symbology for chords in diatonic fields. The problem is first to determine, given a diatonic set, the included tertian structures of three or four pcs and their intervallic contexts. The *intervallic context* of a chord indicates the intervals between the pcs of the chord and the diatonic pcs that surround the chord. This notion must be clearly differentiated from the *interval content* of a chord, or the intervals between the different pcs of the chord; unlike the intervallic context, this set of intervals is unique for each chord type.[5] A small number of different chord types can be formed from a diatonic set, and some of these chord types can be found in more than one diatonic context.

Richmond Browne has devised a chart to display the intervallic context of each diatonic scale degree, taking the major scale as the frame of reference (Browne 1981, 10–14). He arranges scale degrees in a circle of fifths, symmetrically positioned around scale degree 2, and sets these scale degrees against intervals arranged symmetrically around the perfect fourth and fifth. I have altered Browne's chart to indicate the intervals *above* each scale degree, instead of the interval class above or below the starting scale degree (see figure 6). Each generic interval (second, third, fourth, etc.) is uniquely represented above each scale degree; only the qualities of the intervals change from scale degree to scale degree. For example, comparing the intervals above adjacent scale degrees in the chart, the augmented fourth above scale degree 4 is replaced by a perfect fourth above scale degree 1, and the major seventh above scale degree 1 is replaced by a minor seventh above scale degree 5. This pattern continues, replacing each interval in turn by another of the same genus but of different quality, as indicated by the block of X's migrating through the chart.

Examining the third, fifth, and seventh above each scale degree (the bold Xs in figure 6) reveals the well-known repertory of diatonic chords. The fact that triads have three pcs implies that three distinct types of triads can be formed diatonically: cardinality equals variety (Clough and Myerson 1985). Since only one tritone appears in the diatonic set, as indicated by its interval vector [254361],[6] clearly only one diminished triad is possible in a diatonic set, and the fact that there are three each of the other two types can be inferred from Clough and

	4̂	1̂	5̂	2̂	6̂	3̂	7̂
A4	X						
M7	**X**	**X**					
M3	**X**	**X**	**X**				
M6	X	X	X	X			
M2	X	X	X	X	X		
P5	**X**	**X**	**X**	**X**	**X**	**X**	
P4		X	X	X	X	X	X
m7			**X**	**X**	**X**	**X**	**X**
m3				**X**	**X**	**X**	**X**
m6					X	X	X
m2						X	X
d5							X

Figure 6. Intervallic context chart by scale degrees of the major scale [after Browne (1981)].

Myerson's principle that "structure [measured in perfect fifths] implies multiplicity" (Clough and Myerson 1985). Similarly, since seventh chords have four pcs, four distinct seventh chords can be formed, and their structure implies the multiplicities of each type.

When seventh chords are formed by expansion, adding a note to each triad, the multiplicities for the resulting seventh-chord types remain the same as for the triad types except that the three major triads "split" into two major seventh chords and one major-minor seventh chord (see figure 7, a tree diagram presenting triads and seventh chords over corresponding scale degrees). The three minor triads correspond to the three minor seventh chords, and the diminished triad corresponds to the half-diminished seventh chord. Each of the two uniquely represented seventh-chord types in the diatonic set contains a tritone, the only unique ic in the diatonic set: the major-minor seventh chord contains a tritone between the third and the seventh of the chord, and the half-diminished seventh chord contains a tritone between the root and the fifth.

Although most of the triad and seventh-chord types of the diatonic set, as displayed in figures 6 and 7, are not uniquely represented, the diatonic context of each individual chord *is* unique. Within each group of identical chord types, the intervals from the chords to the other diatonic notes differentiate the contexts of the individual chords. For example, whereas scale degrees 4 and 1 support the same seventh-chord type (major), the diatonic contexts of these two chords differ since all intervals above the two scale degrees are identical except the fourth

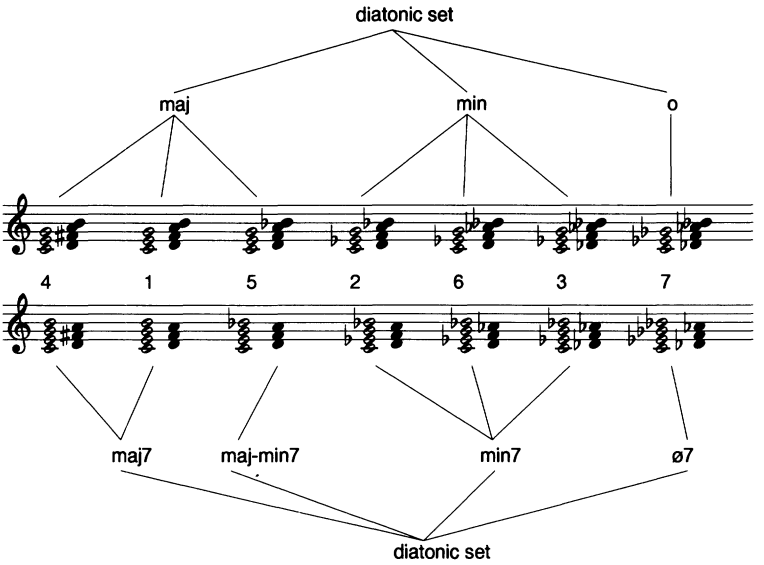

Figure 7. Diatonic chords and intervallic contexts with C as root.

above: scale degree 4 has an augmented fourth above whereas scale degree 1 has a perfect fourth above. Similarly, every scale degree supports a triad and a seventh chord, differentiated from other chords of the same type by context.

A number of possible symbologies can be employed to describe chords and fields of diatonic complexes unambiguously. The familiar system of roman numerals corresponding to scale degree, referenced to a specific underlying scale, is one such possibility. For example, an F major seventh chord in a diatonic context of all the white notes of the piano is labeled

C: IV7.

The symbol implies the chord type and its unique intervallic context; however, it singles out two pcs: C, a tonic arbitrarily based on the priority of the major scale, and F, the root of the chord.

A second possible symbology involves identifying chord root and type as well as the intervals, invariably whole and half steps, between the lower three members of a seventh chord and their upper neighbors. These upper neighbors are labeled according to their generic interval above the root of the triad or seventh chord—2 for the upper neighbor to the root, 4 for the upper neighbor to the third, and 6 for the upper neighbor to the fifth. These upper-neighbor designations

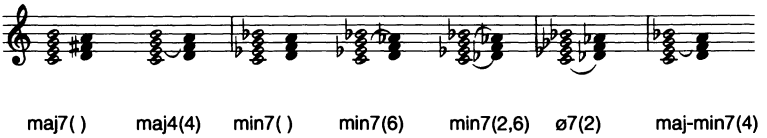

Figure 8. Half-step neighbor symbology.

are convenient abstract descriptions of diatonic contexts of chords and should not be considered analytically descriptive. As indicated by the interval vector for the diatonic set [254361], half steps are the next most distinguishing ic after the tritone since only two of them occur in the diatonic set. Thus, a list of the generic intervals (if any) between the root of a triad or seventh chord and the pcs that lie a half step above its chord tones contains at most two items. This list is sufficient to imply the diatonic field for any given type of seventh chord; however, ambiguity results in the case of the major triads whose contexts are fully differentiated only when the sevenths above their respective basses are taken into account (major seventh and major-minor seventh).

Using this half-step neighbor approach to symbology, the seventh chords and their diatonic fields are labeled as in figure 8. The parenthetical scale degree indicating the half step for the last two seventh chords, half-diminished and major-minor, could be omitted, since these two chord types are unique in the diatonic set, but it is retained for the sake of consistency. The addition of the root name to these symbols uniquely identifies any particular seventh chord and its context. For example, the F major seventh chord in the context of all the white notes is labeled

F major 7( ).

The empty parentheses indicate the absence of half-step upper neighbors.

A third approach is to adopt the names of the seven authentic modes as labels for the seven scalar orderings of the diatonic pcs. This terminology is suggested by Adams's title for his piano work *Phrygian Gates*.[7] Triads and seventh chords built on the modal center or "final" (the lowest note of the scalar ordering) of each of the modes are unique in their combination of chord type and intervallic context (see figure 9). The seven modes map onto the chord types built on each modal center, which, taken as a root, can support only one triad and one seventh chord. Thus, identification of the mode also identifies the chord built on its center, but the reverse relationship, from the chord

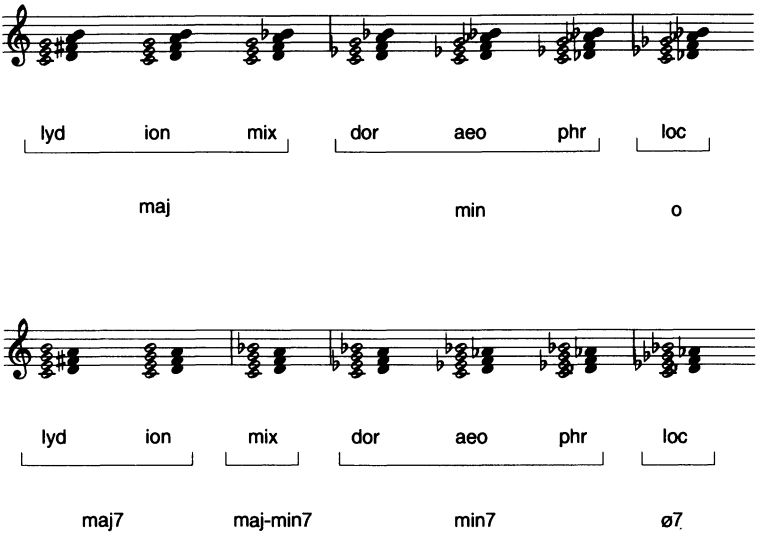

Figure 9. Modal symbology.

to the mode, is generally ambiguous. The designation of a different mode for each individual chord, rather than the customary designation of a single mode with multiple chords occurring on different notes of the mode, seems appropriate for Adams's music since chord changes occur relatively infrequently and usually correspond to changes in field.[8]

Using root names with modal designations uniquely identifies every possible chord-field pair. These root-plus-mode symbols emphasize only the root of the chord rather than an additional, hypothetical tonic as in the roman-numeral approach. For example, the same F major seventh chord over all white notes discussed above is now labeled

F lydian 7.

Although this symbology uniquely implies the chord type and its diatonic context, it fails to express the close relationship between chords of the same type. Thus,

F lydian 7, F ionian 7

do not appear to be any more related than

F lydian 7, F dorian 7

even though the members of the first pair, unlike the second, are of the same chord type.

Each of the three symbologies discussed above is a distinct and sufficient solution to the problem of unambiguous symbology for triads and seventh chords contained in diatonic sets (except for the neighbor-note approach as applied to triads). However, none of them seems particularly well-suited to Adams's music. The roman-numeral method arbitrarily assigns preferred status to a pc, the neighbor-note method assigns too powerful a role to upper-neighbor-note relationships, and the modal method fails to identify identical chord types.

A fourth approach to symbology, which I adopt here, combines chord root and quality with modal designation. Although the quality identification is redundant since the root and mode together uniquely define both chord type and field, this symbology provides an immediate reading of chord types without assigning a tonic status to any pc (except the root) while at the same time retaining the suggestive modal designation. The symbols clarify relationships between chords according to their root and quality, even if their diatonic contexts differ. The F major seventh chord over the "white notes" discussed above is labeled

F major 7 lydian,

or abbreviated

Fmaj7 lyd.

I indicate the triad quality by a capital letter showing the root name alone for major, with a lower case *m* for minor, or with a small raised circle (°) for diminished. Similarly, I indicate the seventh-chord quality by a capital letter with *maj7* for major, *m7* for minor, *7* for major-minor, and *ø7* for half-diminished.[9] The complete set of symbols using F as the root appears in figure 10.

Symbology for Superdiatonic Fields

Although Adams's earlier pieces generally remain diatonic throughout, pcs outside the diatonic field are frequently introduced in his later pieces beginning with *Harmonielehre* (1984–1985).[10] Nevertheless, a diatonic basis for the "chromatic" passages of these later pieces is evident from (1) association with surrounding diatonic passages and (2) the apparent secondary role of the non-diatonic pcs.[11] Since the strongly presented non-diatonic pcs are treated as pcs added to a diatonic field, the modal designations for diatonic fields can be

TRIADS	
F lyd	F major lydian
F ion	F major ionian
F mix	F major mixolydian
Fm dor	F minor dorian
Fm aeo	F minor aeolian
Fm phr	F minor phrygian
F° loc	F diminished locrian
SEVENTH CHORDS	
Fmaj7 lyd	F major 7 lydian
Fmaj7 ion	F major 7 ionian
F7 mix	F major-minor 7 mixolydian
Fm7 dor	F minor 7 dorian
Fm7 aeo	F minor 7 aeolian
Fm7 phr	F minor 7 phrygian
F°7 loc	F half-diminished 7 locrian

Figure 10. Symbology using the root and quality for the chord and the modal designation for the diatonic field.

employed for superdiatonic fields, and the non-diatonic pcs can be indicated in parentheses as intervals above the root of the chord appended to the modal designation, in order of increasing size. For example, an F major seventh chord in a field consisting of all the white notes plus a strongly presented G♯ and D♭ is labeled:

Fmaj7 lyd(A2,m6).

Thus, the chord and diatonic portion of the field remain the same as in diatonic complexes; the additional non-diatonic pcs appear in parentheses.

Although this symbology may seem rather cumbersome, it uniquely identifies the field, and at most five intervals need be indicated in parentheses (the addition of five non-diatonic pcs completes the total chromatic). The use of intervals above the root of the chord rather than pc names permits easy comparison, relative to the root, from complex to complex.

Preference Rules for Complexes

To identify complexes in Adam's music, I have devised a set of analytical preference rules illustrated with examples from several works.[12] I use the following abbreviations for these rules:

C-PR	Chord Preference Rule
S-PR	Sonority Preference Rule
F-PR	Field Preference Rule

Each component of the complex must be examined in order—chord, sonority, and field. I first make a provisional analysis of the complex by examining a relatively homogeneous portion of the beginning of its *time span* (a musical segment containing a single complex). Next I determine the identity of the three components according to the preference rules. I then determine the exact boundaries of the time span, according to the criteria for segmentation presented in the following section of this article. Finally, I revise the analysis of the complex in light of the content of the entire time span, if necessary.

In the analytical sketches, I show chord tones as white note heads and additional sonority tones as black note heads placed to the right of the chord tones (for instance, see figure 21). I generally place the notes in registers where they appear in the score, but I eliminate most octave doublings. A measure number marks the beginning of each time span. Bar lines separate complexes with *different* fields; thus, a series of complexes whose fields contain the same collection of pcs are not separated by bar lines (for instance, see figure 29: mm. 1–113). The chord and field of the complexes are labeled below the staves using the method described above, and all of the pcs listed (both white and black note heads) comprise the sonority. Accidentals affect only the notes they immediately precede, but cautionary accidentals are employed as appropriate.

CHORD PREFERENCE RULES

C-PR1 (Completeness):

> Complete seventh chords or triads are preferred; however, if no complete chord can be found, the fifth or (if no other reading is possible) the third may be omitted. A seventh may be added to a previously established triad; a seventh appearing relatively briefly may be considered as a non-chord tone rather than part of the chord.

Example (fifth omitted; seventh added):

In the first movement of *Harmonielehre,* the first time span contains pcs E, G, and D (mm. 1–30). E and G sound throughout; D is introduced about halfway through the time span (m. 19; see figure 11). The added pc does not form a new chord; it merely enlarges the chord from triad to seventh chord without changing the quality. Thus, although the fifth of the chord, B, is missing and the seventh enters later in the time span, the chord for the entire time span still is identified as **Em7.**

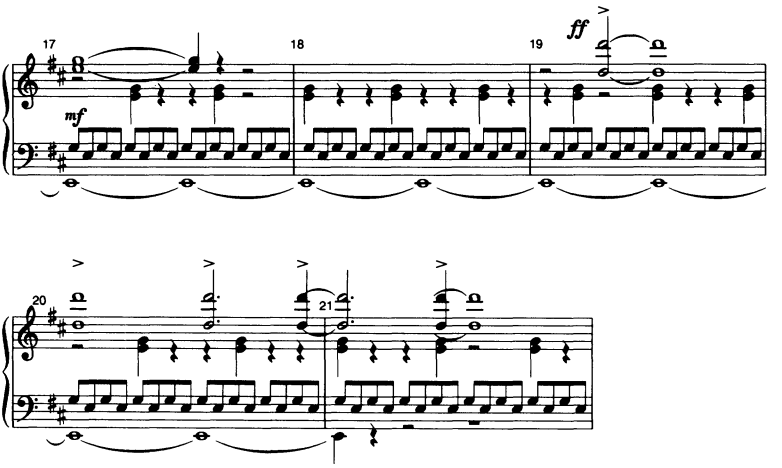

Figure 11. Orchestral reduction, *Harmonielehre* I (mm. 17–21).

Example (seventh appearing briefly):

In the second movement of *Harmonium,* a C♭, which seems to be held over from the B of the previous measure, appears along with a D♭ major triad for only two measures (mm. 106–107) of the sixty-three measure complex (mm 106–168; see figure 12). The lack of strong presentation indicates that this pc is neither a sonority tone nor a chord tone; thus, the D♭ *triad* is provisionally considered as the chord rather than the D♭ major-minor seventh chord formed at the beginning of the complex. The subsequent appearance of C-natural as a prominent member of an arpeggio repeated throughout most of this time span (mm. 117–168) sets

D♭maj7 ion

as the appropriate label for the chord and field.

C-PR2 (root):

If more than one complete chord is possible, the lowest sounding pitch in the time span identifies the root, if this pitch is the root of an allowable (diatonic) chord.

Example:

The second time span in the third movement of *Harmonium* (mm. 100–142)—strongly presenting pcs C♯, E, G, B, F♯, and A—can form three possible complete seventh chords:

C♯ø7, F♯m7, A7

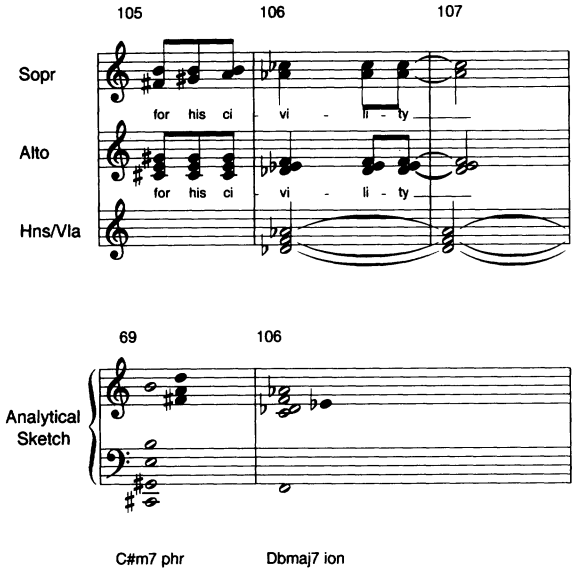

Figure 12. Reduced score (mm. 105–107) and analytical sketch (mm. 69–168), *Harmonium* II.

(see figure 13). The recognition of C♯ as the lowest sounding pitch in the time span identifies

C♯ø7

as the chord.

C-PR3 (arpeggio, block chord):

If the lowest sounding pitch is not the root of a possible chord, a clearly arpeggiated chord in one or more instruments, or a block chord presented prominently in a single instrumental choir, establishes the identity of the chord in that time span.

Example:

The fourth time span in the third movement of *Harmonium* (mm. 165–206)—containing pcs C♯, F♯, A, D, and E—can form two possible complete chords:

F♯m7, Dmaj7

(see figure 14). Since the lowest sounding pitch, C♯, is not the root of either of these chords, a clearly arpeggiated chord or a block chord is

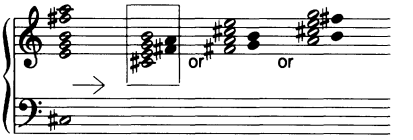

Figure 13. Possible chords, *Harmonium* III (mm. 100–142).

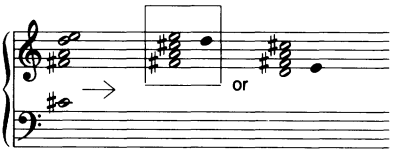

Figure 14. Possible chords, *Harmonium* III (mm. 165–206).

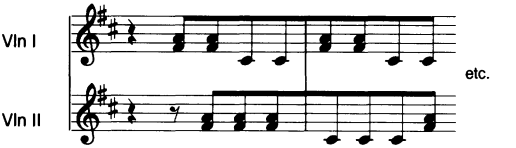

Figure 15. Score, violins only, *Harmonium* III (mm. 165–166).

sought. The violins present an F♯-minor triad in block form (see figure 15); the chord in the time span hence is identified as

F♯m7.

The potential for multiple chordal interpretations in this time span and in the previous one (mm. 100–142; figure 13) is distinctive since

F♯m7

is a possible choice of chord in both. Their close temporal proximity and use of the same field suggest such an overall interpretation. But, in addition to the power of the lowest sounding pitch, C♯, as the root of the first of these two chords (mm. 100–142), frequent arpeggios in the low strings and bass clarinet in the earlier time span, outlining

C♯ø7,

support this identification of the chord (see figure 16). Thus, despite the common diatonic set and common possible seventh-chord, two different chords are distinguished in this passage.

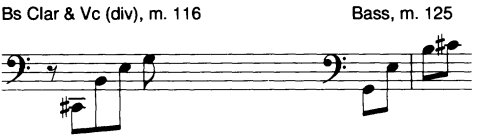

Figure 16. Bass arpeggios, *Harmonium* III (mm. 100–142).

SONORITY PREFERENCE RULE

S-PR1 (presentation)

Pcs that occur only briefly, such as pcs found in a melody but not included in the supporting harmony, are *not* considered as sonority tones since these pcs are not strongly presented.

Example:

The middle section in the first movement of *Harmonielehre* contains a broad, uninterrupted melody beginning in solo horn and solo cellos over a time span that strongly presents six diatonic pcs and one non-diatonic pc (mm. 254–287; see figure 17). The melody supported by the first complex, with

E♭m,

includes only pcs contained in the accompaniment, except for A-natural (mm. 264–265) which appears once in the melody. Although Adams emphasizes this pc to some extent, isolating it registrally through wide leaps and making it the lowest point of the melody, the brevity of this melodic note and the absence of A-natural from the accompaniment suggest that it is not strongly presented in relation to the entire time span; it is therefore not included as a sonority tone.

The second time span of the section (mm. 288–300) strongly presents only four pcs—a triad,

Dm

plus one other pc, E♭ (see figure 18). Whereas the melody supported by the first complex, described above, includes only one non-sonority tone (A-natural), the melody over the second complex incorporates

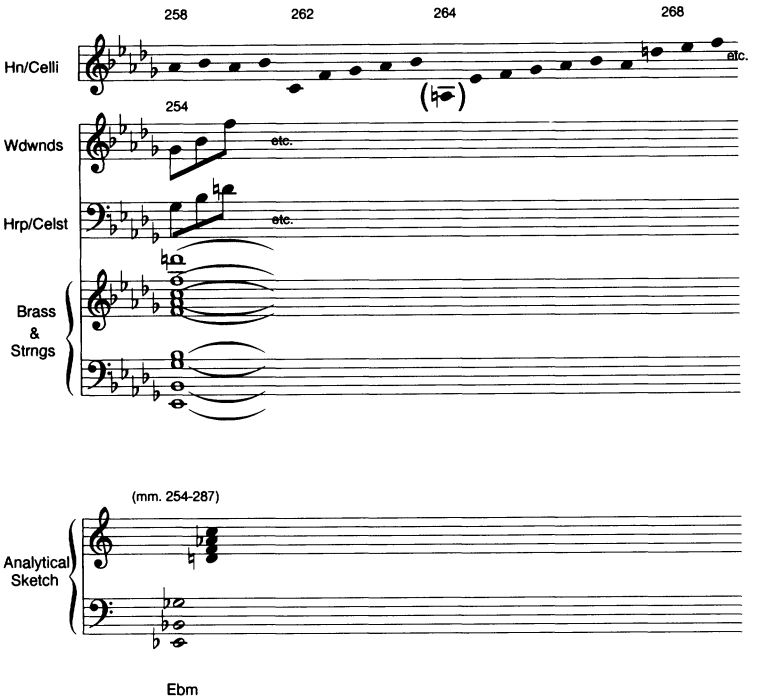

Figure 17. Orchestral sketch and analytical sketch, *Harmonielehre* I (mm. 254ff). Parentheses mark the non-sonority tones in the melody.

many pcs that appear only once or twice each, and never in the supporting accompaniment. These additional pcs are generally connected by stepwise motion to members of the sonority that appears in the accompanying instruments; they are therefore not considered part of that sonority. In this passage both the sonority tones and the non-sonority tones appear in groups, causing the melodic line to fluctuate between points of stability and instability. The restriction of non-diatonic tones to the melody highlights their instability in relation to both the diatonic context and the accompaniment and creates dramatic contrast with the more stable pcs. This "rhythmic" interrelationship between the two varieties of pcs in the melody helps compensate for the absence of temporal resting points, or cadences, in this extended passage.

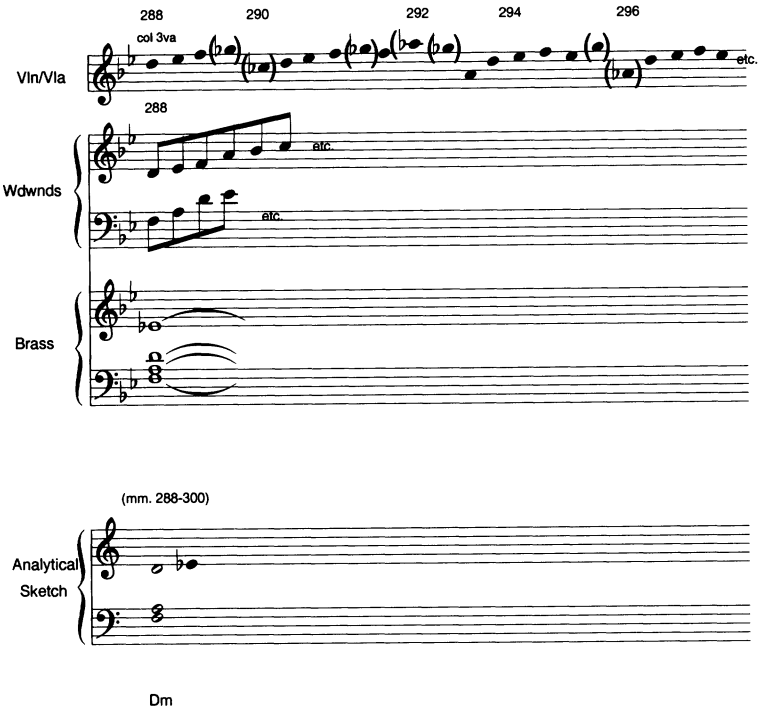

Figure 18. Orchestral sketch and analytical sketch, *Harmonielehre* I (mm. 288ff).

FIELD PREFERENCE RULES

F-PR1 (signature):

In the absence of other compelling musical factors, Adams's key signature indicates the diatonic field or the diatonic part of the superdiatonic field.[13]

In the works up to and including *Harmonielehre* (1984–1985), Adams adopts key signatures that imply diatonic fields underlying the actual pitches indicated in his scores. Beginning with *The Chairman Dances* (1985), on the other hand, he omits key signatures, though they can usually be inferred from the pcs employed.[14]

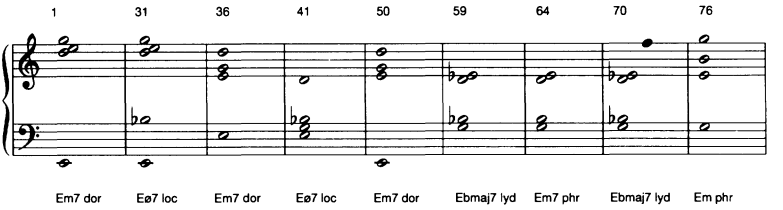

Figure 19. Sketch, *Harmonielehre* I (mm. 1–77).

Example:

As described in connection with Figure 11, the opening time span of *Harmonielehre* contains only three pcs—E, G, and D—forming

Em7.[15]

Although the field is ambiguous based on the pcs employed—either phrygian, aeolian, or dorian—the key signature contains two sharps and implies a dorian field. Adams continues to use this signature for the first three time spans that involve this chord, though the F♯ and C♯ do not appear (mm. 1–30, 36–40, 50–58; see figure 19).[16] Subsequently, in the next two time spans that involve this chord, the signatures contain no sharps and no flats and imply phrygian fields (mm. 64–69 and 76–77). Thus, Adams has set up two pairs of alternating complexes, with

Em7 dor, Eø7 loc

(mm. 1–58), and with

E♭maj7 lyd, Em(7) phr

(mm. 59–77), using four different complexes, though an E minor triad or seventh chord appears in each pair of complexes.[17]

F-PR2 (intervals)

The diatonic portion of the field can be determined by the quality of the chord, either alone or together with the intervals formed above its root by one or two additional pcs appearing in the time span (see figure 20).[18] In every case a single additional pc forms a tritone with some other pc in the field, or two additional pcs form a tritone with each other. After determination of the diatonic portion of the field, any non-diatonic pcs included in the sonority are added to form the complete field.

Triad	7th Chord		Interval Above Root	Modal Designation
maj	**maj7**	with	**A4**	lydian
maj		with	**P4 and M7**	ionian
	maj 7	with	**P4**	ionian
maj		with	**m7**	mixolydian
	maj-min 7			mixolydian
min	**min 7**	with	**M6**	dorian
min	**min 7**	with	**M2 and m6**	aeolian
min	**min 7**	with	**m2**	phrygian
°	**ø7**			locrian

Figure 20. Identification of diatonic field by chord quality and other intervals above the root.

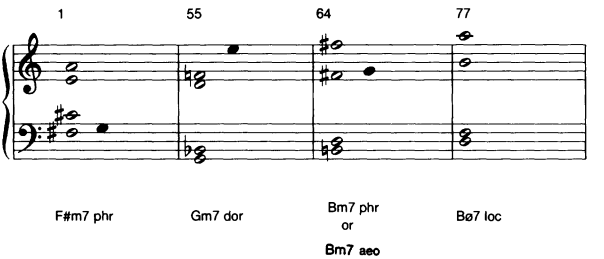

Figure 21. Modified sketch, *The Chairman Dances* (mm. 1–80). In this figure only the pcs necessary to identify the field are included as black noteheads.

Examples:

A few examples from *The Chairman Dances,* Adams's first piece without key signatures, will illustrate the identification of diatonic fields by means of these unique intervals (see figure 21). The first complex, with

F♯m7 phr

(mm. 1–54), can be identified as having a phrygian field only upon the appearance of the G in the bass, a minor second above the root, near the end of the time span (m. 49). On the other hand, the second complex, with

Gm7 dor

(mm. 55–63), can be identified immediately as having a dorian field by

the E, a major sixth above the root. The identity of the field for the third complex, with

Bm7

(mm. 64–76), cannot be determined by F-PR2 since the only pc appearing in addition to the chord tones is G, a minor sixth above the root (not a distinguishing interval). Thus, the diatonic field may be either phrygian or aeolian, depending on the quality of the absent second above the root. Such cases are decided by means of F-PR3 below. The diatonic field of the fourth complex, with

B$^{\varnothing}$7 loc

(mm. 77–80), can be identified without examination of other intervals above the root since half-diminished seventh chords only appear in locrian fields.

F-PR 3 (smallest change)

When the field cannot be determined by F-PR1 or F-PR2, the diatonic field or diatonic portion of the superdiatonic field may be identified by adopting the diatonic set, compatible with the chord and the maximum number of possible sonority tones, that is most closely related (most pcs in common) to the diatonic portion of the previous field. Any strongly presented non-diatonic pcs are then added to this diatonic set to complete the superdiatonic field.[19]

Example:

The third time span of *The Chairman Dances* strongly presents pcs B, D, F♯, G, and A—forming

Bm7

with G included as a sonority tone (mm. 64–76; see figure 22). Since a minor sixth above the root of a minor seventh chord does not conclusively indicate the diatonic field (either aeolian or phrygian), the nearest diatonic field to the previous one,

Gm7 Dor

(mm. 55–63) is adopted. The complex with

Bm7 aeo

involves a change of three pcs whereas the complex with

Bm7 phr

involves a change of only two pcs. Since no non-diatonic pcs appear in the sonority of this complex, the diatonic field of the latter alternative is adopted as the field for the complex.

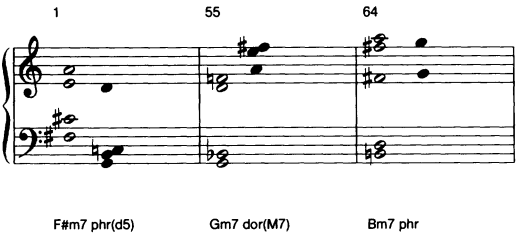

Figure 22. Sketch, *The Chairman Dances* (mm. 1–76).

Segmentation

The matter of segmentation poses difficult problems in the analysis of some pieces in any musical idiom, including that of traditional tonality. For example, the first two measures of Brahms's *Intermezzo in B minor,* op. 119, no. 1, may be segmented in a number of ways based on the usual guidelines for identifying chords in tonal music (see figure 23). This musical fragment may be segmented into four chords—B minor, E minor, C♯ diminished, and D major—reading two chords per measure, or it may be segmented into two chords, E minor seventh and D major seventh, reading one chord per measure.[20] Although we have intuitive rules for guiding our decisions, the reasoning behind them is circular: one chord is identified for each segment, and a segment lasts for the duration of one chord. In order to identify the chords, we must know the points of segmentation; in order to know the points of segmentation, we must identify the chords!

A similar circularity informs segmentation in Adams's music. For analytical purposes, I divide his music into time spans based on changes in chord or field or both. A sonority includes all strongly presented pcs in a time span; thus, the addition or deletion of pcs over the course of a time span does not create a time-span boundary. If the identification and segmentation strategies are carefully balanced, analytical decisions may proceed with general confidence according to the preference rules for identifying complexes and the following segmentation criteria (SC):

SC1

A new time span is recognized if the field changes.[21]

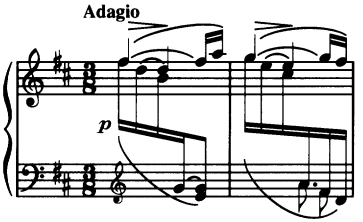

Figure 23. Score, Brahms, Intermezzo in B minor. op. 119, no. 1 (mm. 1–2).

Example:

The change between B and B♭ in the first two time spans of *The Chairman Dances* (mm. 1–54, 55–63) signals the boundary between the two complexes, with

F♯m7 phr(d5), Gm7 dor(M7)

(return to figure 22). The chromatically changed pc, B to B♭, appears as the first note in the cello and bass in each time span, strengthening the impact of this segmentation. On the other hand, a different non-diatonic pc appearing in the sonorities and fields of each complex, C in the first and F♯ in the second, weakens the impact of the boundary since these two pcs appear in the fields of *both* complexes.

SC2

A new time span is recognized if chord tones disappear and the remaining pcs plus any new pcs suggest a different chord.

Example:

Near the end of the second movement of *Harmonium* (mm. 250–262), but before the transition to the third movement (mm. 263–365), the root of

B♭m

(mm. 211–249) disappears and the remaining pcs form a new chord

Fm7

(mm. 250–281) to begin the transition (see figure 24). Although the choral voices present this new chord in block-chord form before this point (mm. 233ff), the persistence of B♭, the root of the previous chord, indicates that

B♭m

continues as the chord until the root disappears from the texture (mm. 250). This delayed disappearance of

B♭m

or premature entry of

Fm7

effects a smooth transition between the two chords in this delicate cadential passage. Similarly, at the following chord change, the disappearance of two pcs of

Fm7

and the appearance of the pc, D♭, effects a shift to

D♭

(mm 282ff). Although the two lowest pcs of

Fm7

continue as the lowest sounding pitches (sufficient to define the chord based on C-PR1), the elimination of two pcs of the previous chord (C and E♭) allows the entrance of the D♭ (m. 282) to change the identity of the chord.

SC3
A new time span is recognized if all or nearly all voices change simultaneously, and the new arrangement of pcs suggests a different chord.

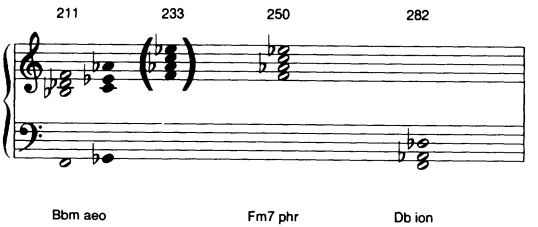

Figure 24. Modified sketch, *Harmonium* II (mm. 211–326). The chord in parentheses identifies the location of the block chord in the music and is not part of the analytical notation.

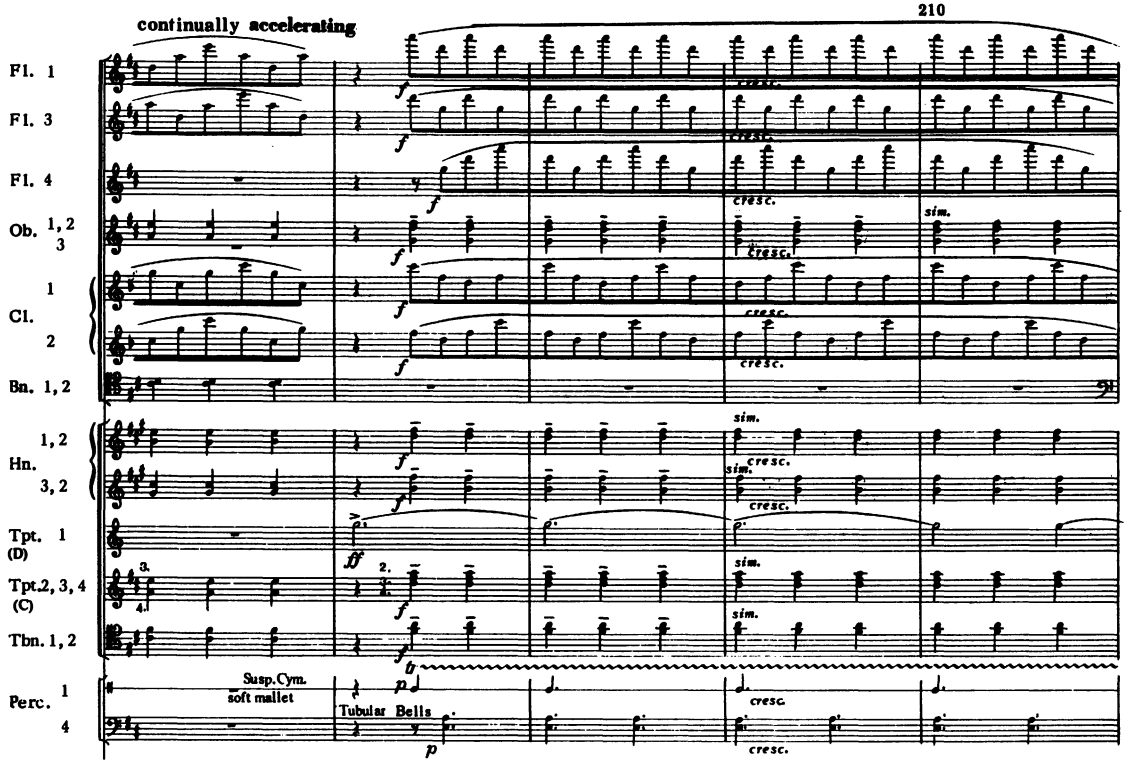

Figure 25. Score, *Harmonium* III (mm. 206–210).

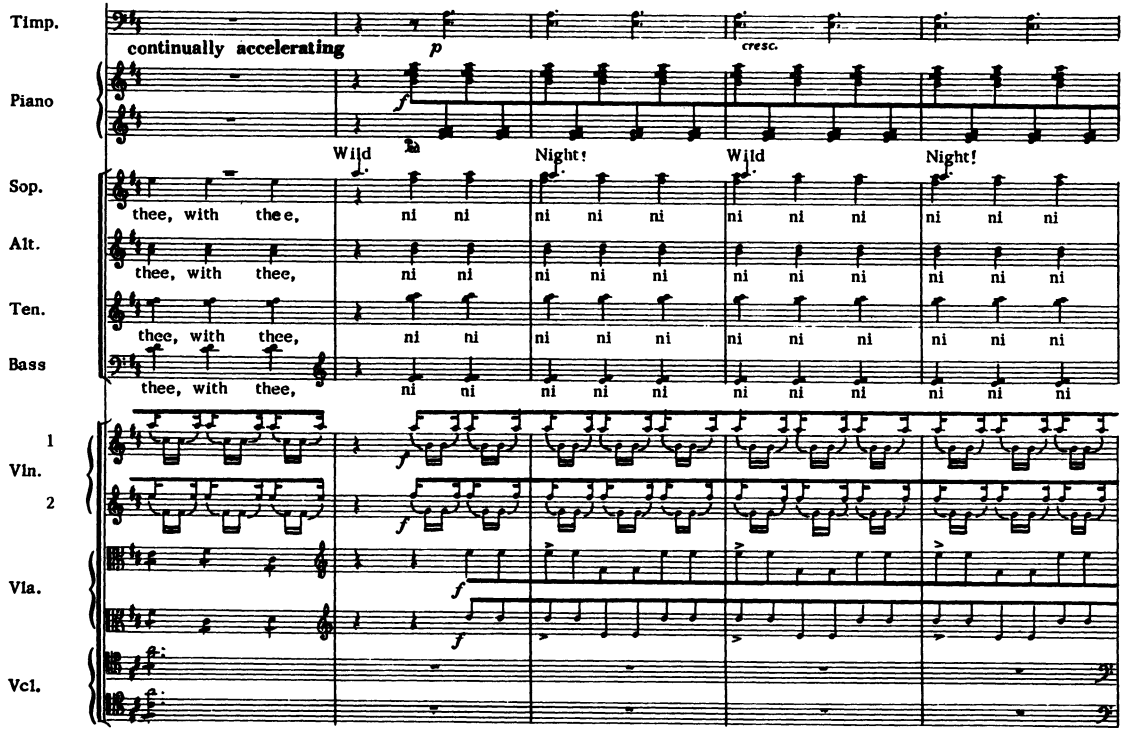

Figure 25 (continued)

Example:

In the third movement of *Harmonium,* the pitches of

F♯m7

(mm. 165–206) change simultaneously in all instruments (m. 207), but the pcs of the chord, except for the fifth, remain (see figure 25). Despite the continuation of these chord tones, the chord identity changes to

Em7,

to reflect the most plausible chord of the new time span, as suggested by the simultaneous pitch change in the different voices (see figure 26).

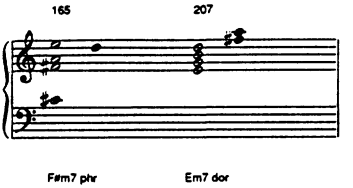

Figure 26. Sketch, *Harmonium* III (mm. 165–264).

Analytical Example: *Phrygian Gates*

Phrygian Gates (1977), with its modally suggestive title, offers the possibility of testing the modal field vocabulary outlined above against Adams's compositional realization of mode, or at least the phrygian mode. This virtuoso work for solo piano can be divided into three sections according to texture. The first section (mm. 1–639)—beginning with constantly moving eighth notes and, subsequently, sixteenth notes—leads directly into a section consisting of long, sustained simultaneities (mm. 640–808). Adams has labeled this middle section "A System of Weights and Measures." The final section (mm. 809–1092) returns to the texture of the first section.

The constant motion and frequent saturation of the diatonic fields in the outer sections make chords somewhat difficult to identify. The first time span (mm. 1–20) contains only three pcs, which do not form a triad (see figure 27). I identify the chord on the basis of C-PR1 (omitted third) and C-PR2 (the lowest sounding pitch, E, as the root) and the field based on F-PR1 (key signature of four sharps). Thus the chord-field pair is labeled

E ion,

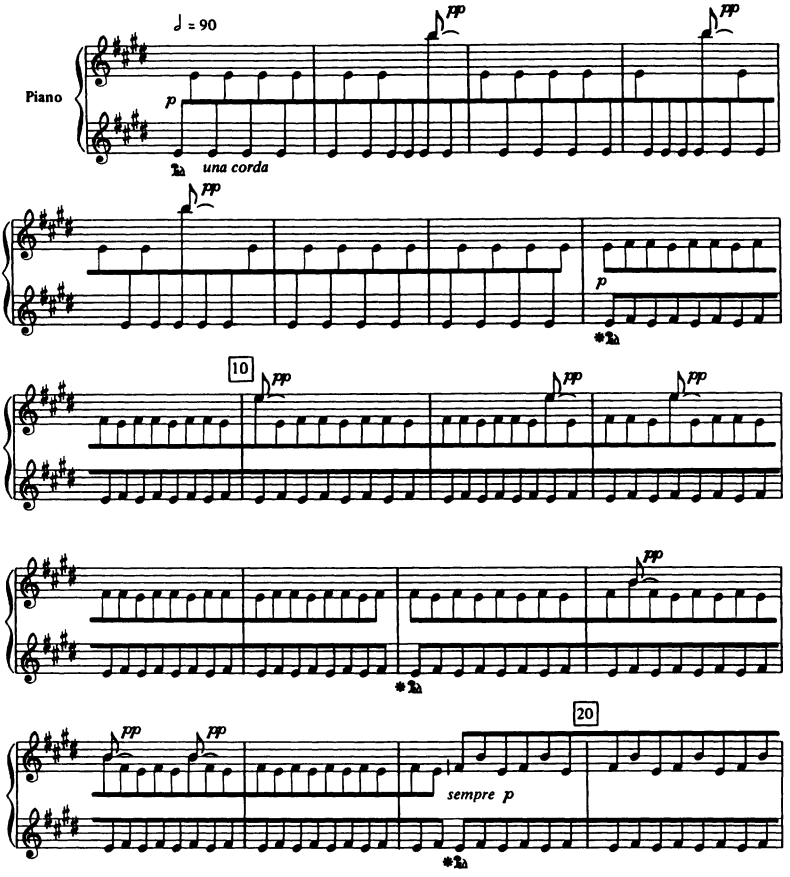

Figure 27. Score, *Phrygian Gates* (mm. 1–20).

and all three sounding pcs form the sonority. On the other hand, the next time span (mm. 21–43), which has the same field, poses no identification problems, and the chord-field pair can be immediately labeled

B mix

since the chord indicated by this label is the only triad or seventh chord that can be formed by the pcs of the time span (see figure 28).

As the key signature indicates, each of the chords in this first passage comprises pcs belonging to the same field, and these pcs are consistently anticipated by the sonority tones of the previous complex

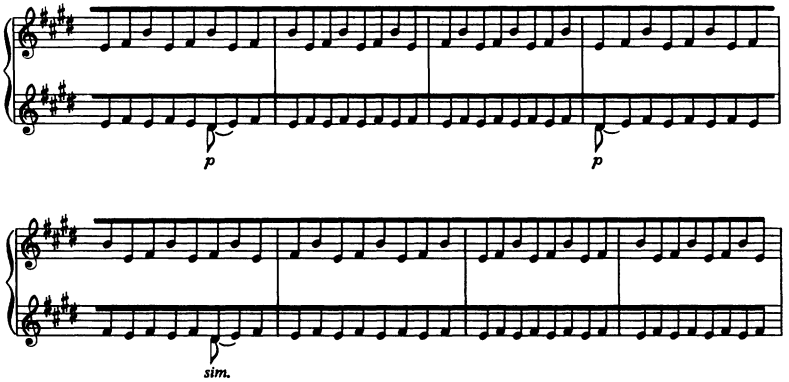

Figure 28. Score, *Phrygian Gates* (mm. 21–28).

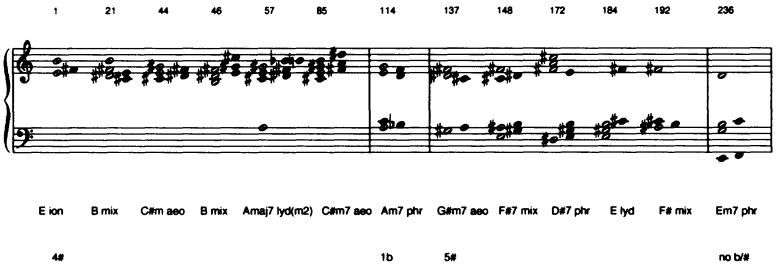

Figure 29. Modified sketch, *Phrygian Gates* (mm. 1–191), key signatures added below.

(see figure 29). For instance, the addition of D♯ (m. 21) to the F♯ of the initial sonority suffices to produce the second complex, with

B mix.

Similarly, in this second time span, the retention of E and subsequent appearance of C♯, both as sonority tones, anticipate the next chord, in the complex with

C♯m aeo.

Only with the addition of G♯ (m. 44) and the disappearance of the previous root, B (SC2) is this chord completed. These premature incursions of future chord tones as sonority tones continue until the change of key signature and field (m. 114).

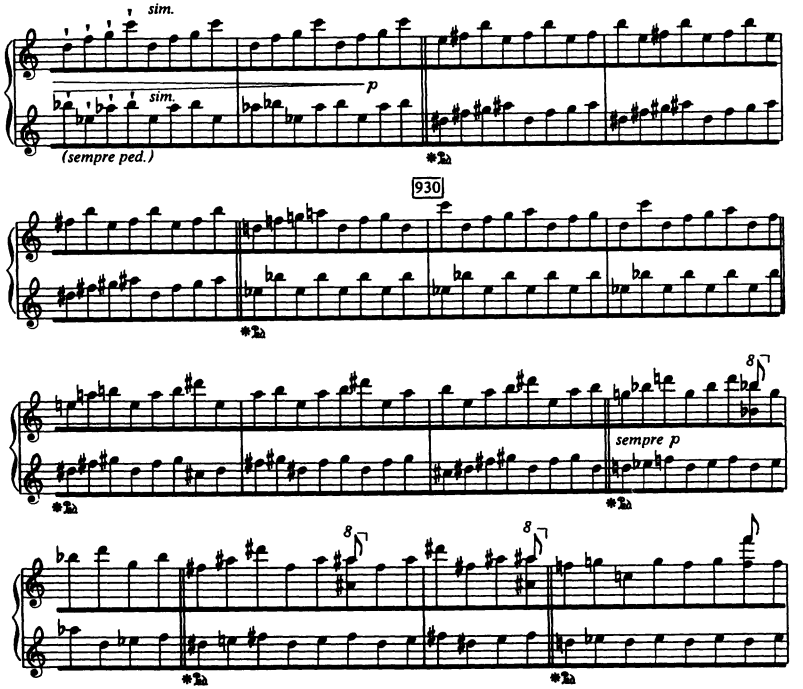

Figure 30. Score, *Phrygian Gates* (mm. 924–939).

Whereas most of the chord labels in this piece can be determined by carefully following the preference rules, diatonic fields can usually be determined immediately from the key signatures alone since no other musical factors contradict their implications. One passage in the last section of the work, however, does *not* employ a key signature, and complexes change relatively quickly (mm. 923–985; see figure 30 for an excerpt of the score). This passage seems to expand the complex with

D$^{\varnothing}$7 loc,

which begins and ends the passage, as well as the pc E♭/D♯, which appears as either a sonority tone or as a chord tone in every complex of the passage (see figure 31). All of the fields in this passage can be identified by the distinguishing intervals above the bass or by the smallest change in diatonic field.

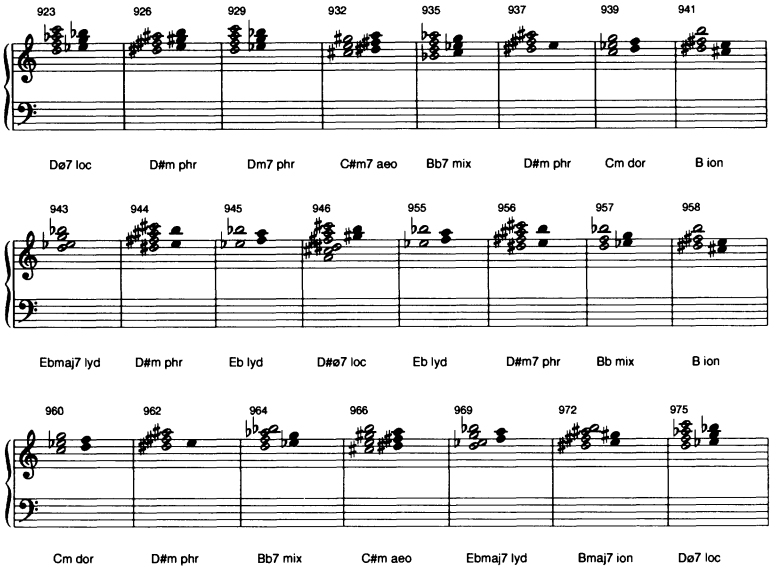

Figure 31. Sketch, *Phrygian Gates* (mm. 923–985).

Complexes can be grouped together into *complex-classes* based on the qualities of their chords and the identities of their fields. The complex-class generalizes the labels developed earlier for chord-field pairs. The location of the root of the chord and the constitution of the sonority are variable in complex-classes. For example, the complex-class,

m7 phr,

includes complexes using any of the twelve pcs as a root of a minor seventh chord, incorporating any pcs of the phrygian field as sonority members, and involving a phrygian diatonic field.

The method of field identification using modal names outlined in this article is extremely revealing in *Phrygian Gates*. I interpret Adams's title as a reference to the sudden shifts to

m7 phr,

a complex-class that occurs systematically. The first "phrygian gate" occurs at the point where the key signature changes from four sharps to one flat (m. 114; return to figure 29). Here the chord-field pair

Am7 phr

appears with a sonority consisting of the complete diatonic field of seven pcs (mm. 114–136). This first shift to a phrygian field occurs after the initial, relatively extensive passage in a key signature of four sharps that explores four different complexes—with

E ion, B mix, C♯m aeo, Amaj7 lyd

(mm. 1–113)—all involving the same field. After the first phrygian field, the next passage, in five sharps (mm. 137–235), one more sharp than in the first passage, is followed by a passage exploring the complex with

Em7 phr,

involving a key signature of no flats (mm. 236–265), one less flat than in the second passage (mm. 114–136; see figure 29). Thus, the four passages are paired, the key signatures of the second pair adding one sharp to (or, equivalently, subtracting one flat from) the signatures of the first pair. These paired key-signature relationships continue throughout the piece, cycling through the ascending circle of fifths (mm. 236ff, 334ff, 470ff, 640ff, 809ff, 986ff). The second key signature of each pair supports a complex with a phrygian field, or "phrygian gate":

Am7 phr, Em7 phr, Bm7 phr, F♯m7 phr,
C♯m7 phr, G♯m7 phr, D♯m7 phr.

Unlike this one-to-one relationship maintained in the second field of each pair, where a single complex appears with each unique field (always involving a minor seventh chord and a phrygian field), the first and third passages (mm. 1–113, 137–265) exploit the same field in a series of complexes. The remainder of the piece presents only one complex with each unique field, except in one passage where two complexes appear (mm. 809–838).

The fourth pair of fields involves an enharmonic change, where five flats appear in place of seven sharps (mm. 402–469), but this written change does not alter the aural pattern of ascending perfect fifths between every other field (see figure 32). The last two pairs of key signatures are repeated—employing the complexes with

Gm7 phr, G♯m7 phr,

three times (mm. 809–922) and with

B♭maj7 ion, D♯m7 phr,

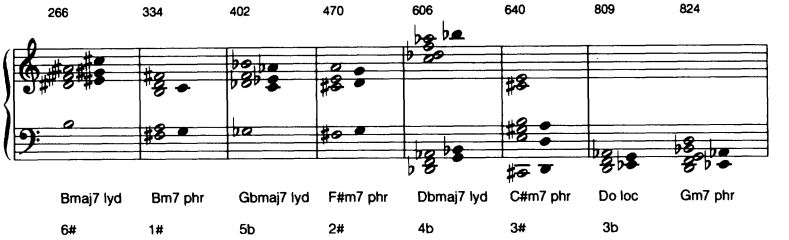

Figure 32. Modified sketch, *Phrygian Gates* (mm. 266–838); key signatures added below.

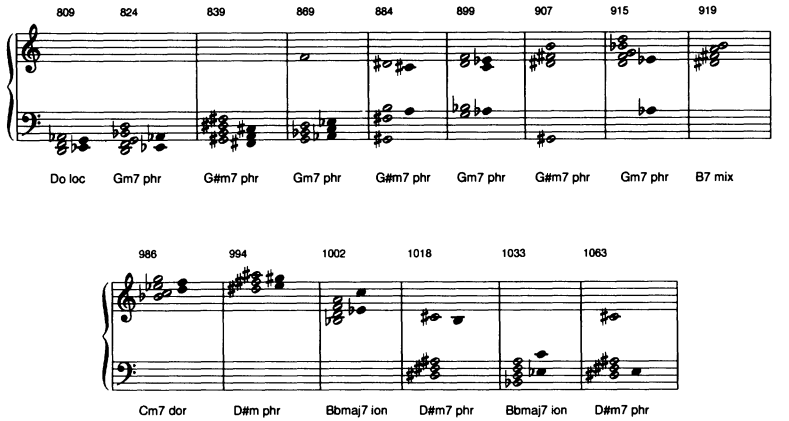

Figure 33. Sketches, *Phrygian Gates* (mm. 809–922, 986–end).

two times (986–end). These passages present two instances of one of Adams's most common compositional features, an alternation between two complexes in succession (see figure 33). Here the alternating complexes slow down the harmonic motion by limiting the repertory of complexes, and these passages seem to serve as cadential formulae preparing for the conclusion of the piece. The harmonic closure created by these alternations between complexes is counteracted brilliantly at the surface of the music where the continuous sixteenth-note motion abruptly ceases as the sonority rings until the sound fades (see figure 34).

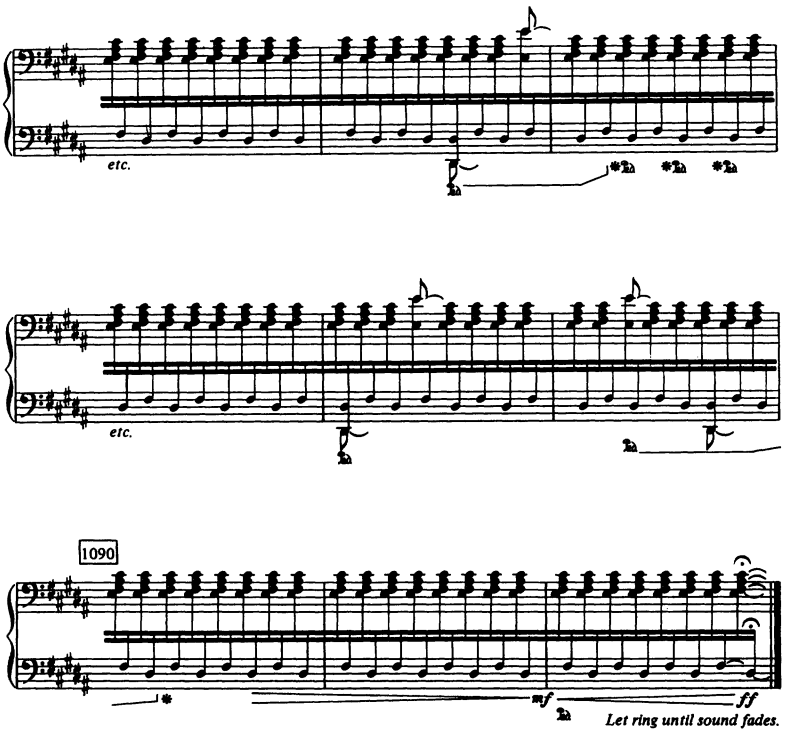

Figure 34. Score, *Phrygian Gates* (mm. 1083–end).

A particularly poignant succession of complexes involving phrygian gates occurs when the phrygian field is preceded by a lydian field (see figure 35). Maintaining both this field relationship and the transpositional pattern described above requires that a *major* triad or seventh chord be superseded by a *minor* triad or seventh chord with the same root. This change in affect, between major and minor, is an important part of Adams's aesthetic: he takes delight in changes between major and minor chords with the same root since he considers such a change to be the most powerful and primal chord relationship possible (Adams 1989). This relationship occurs five times in *Phrygian gates,* two times with one intervening complex (mm. 57–114, 184–236) and three times in immediate succession (mm. 266–334, 402–605, 606–640).[22]

This analytical exploration supports the chord and field symbology that I have described for Adams's music.[23] I have shown how modal

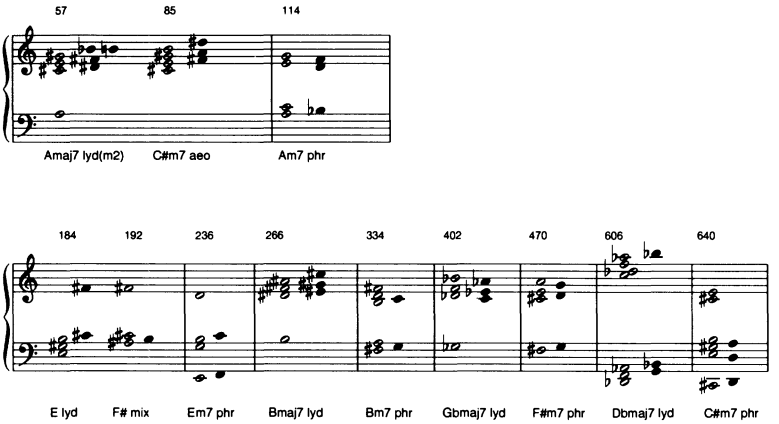

Figure 35. Sketches, *Phrygian Gates* (mm. 57–136, 184–808).

names correspond to Adams's title *Phrygian Gates* in a specific way and how indicating chord roots and qualities helps us observe affective change. The preference rules and the criteria for segmentation outlined in this article provide a concrete means of identifying all three components of complexes in both diatonic and superdiatonic contexts.[24]

In conclusion, organizing pitches into complexes allows hierarchical relationships to be observed among the three harmonic components—chord, sonority, and field. Admitting only diatonic triads and seventh chords as the smallest hierarchical component reflects the strong influence of traditional tonal harmony on Adams's music. Designating all strongly presented pcs as a separate hierarchical component, the sonority, recognizes the pervasive significance of nontertian structures. Finally, building the largest component of the hierarchy, the field, on a diatonic foundation, even when it contains non-diatonic pcs, emphasizes the diatonic orientation of all of Adams's music.

NOTES

I would like to thank John Clough for his dedicated assistance with earlier versions of this article. I would also like to thank Charles J. Smith and Robert Wason for their valuable comments and suggestions.

1. There are currently at least three active composers named John Adams; the subject of this article is John (Coolidge) Adams (b. 1947) who is perhaps best known for his opera, *Nixon in China.*
2. I use the restrictive meaning of the term *diatonic*—only the intervallic pattern consisting of five whole steps and two half steps corresponding to the major scale.
3. In Adams's melodic lines, unique for minimal music in their breadth and lyricism, the interaction of chord tones and non-chord tones projects stable and unstable areas. The interaction of these areas produces large-scale patterns in melodic phrasing. Similarly, the frequency and metric placement of chord tones and non-chord tones suggest large-scale rhythmic organization [for example, along the lines of Yeston (1976)]. A detailed exploration of these ideas and other aspects of melody and rhythm in Adams's music transcends the scope of this article.
4. For example, see Aldwell and Schachter (1989, 451). Roger Sessions (1951) introduced the term "frozen."
5. For a more detailed explication of the difference between intervallic context and interval content see Browne (1981).
6. The interval-class (ic) content of a set of pcs, originally studied by Hanson (1960) and later developed by Forte (1973), deals with the multiplicities of ics that can be formed in a set from ic 1 to ic 6. The interval "vector" for the diatonic set [254361] indicates that the set contains two occurrences of ic 1, five occurrences of ic 2, four of ic 3, three of ic 4, 6 of ic 5, and 1 of ic 6. Thus, the diatonic set contains only one tritone. For more information on the ic content of the diatonic set, see Browne (1981, 6–10), Gamer (1967a), and Gamer (1967b).
7. Adams refers to *Phrygian Gates* as "consciously modal" (Adams 1989) and "almost rigorously pure in its modal, diatonic expression" (Adams 1985, 37). A number of other writers have also applied modal designations to minimal music. However, none of these writers explore the theoretical implications of this association or use the term analytically with any rigor. For example, see Nyman (1974, 124–126), Griffiths (1981, 177), and Warburton (1987, 12–32). My application of modal terminology refers only to particular orderings of whole and half steps. It implies nothing about other aspects of modal organization such as ambitus, species of fourths and fifths, or *repercussio.*
8. The opening section of *Phrygian Gates* provides a notable exception to this generally one-to-one correspondence between chord and field. Two separate passages near the beginning of the piece, each in a *single* diatonic field, contain six and five consecutive chords, respectively (mm. 1–113, 137–235). I explore these passages in more detail in the analytical example at the end of this article.
9. Another familiar method for indicating chord quality uses uppercase and lowercase letters to differentiate major and minor. The method that I have adopted

eliminates the possible visual confusion between "C" and "c" and corresponds to the typical chord symbols found in jazz charts and in lead sheets of contemporary popular music.

10. Among the exceptions to this practice in the earlier works are a time span from the first movement of *Harmonium* (1980–1981) that strongly presents three non-diatonic pcs over

E♯7 loc

(mm. 442–457), and a time span from the second movement that strongly presents one non-diatonic pc, an augmented fourth, over

D♭maj7

(mm. 146–169). The non-diatonic pc in the time span from the second movement creates ambiguity in field between ionian, established initially by the presence of G♭ (mm. 106), and lydian, suggested by the added pc.

11. Recall that, by definition, non-diatonic pcs *cannot* be chord members; however, they can participate in complexes as sonority tones.
12. "*Preference rules* . . . designate out of the possible structural descriptions those that correspond to experienced listeners' hearings of any particular piece. . . . [Thus, given the possible structural descriptions,] the listener is more likely to attribute some structures to the music than others" (Lerdahl and Jackendoff 1983, 9).
13. Although I do not wish to analyze Adams's intentions, I feel the key signatures indicated are a significant aspect of the pieces and should not be overlooked in analysis. On the other hand, some time spans project fields that conflict with a given signature; thus I examine all time spans carefully, searching for pcs suggesting alternative fields.
14. In an interview Adams (1989) revealed that he stopped using key signatures mainly for the convenience of the players who often forget which of the frequently changing signatures is in effect; he also wished to cut down on the number of corrections necessary in rehearsals.
15. The position of this chord, with only E and G sounding, at the beginning of the piece suggests this reading for the chord rather than implying already the B-flat of the following chord,

E♯7,

since a bare harmonic minor third customarily implies a minor triad.

16. Key signatures containing sharps or flats not actually required in the passages they precede also appear occasionally in traditional tonal music.
17. Although the composer's intention, even when known through testimony, is not always the most reliable factor for analytical decisions, I see no compelling evidence tending to override the written key signature. Perhaps Adams heard the E minor-seventh chord first in the context of a dorian field and later in that of a phrygian field and wished to express the unique affect of these orientations to the musicians playing the piece; we know that he regarded affect as one of the most important elements of his music (Adams 1989). Moreover, the choice of different fields produces unique common-tone relationships between the pcs of adjacent complexes. For a detailed exploration of common-tone relationships in Adams's music, see my dissertation (Johnson 1991).
18. The additional pcs need not be strongly presented. Even pcs appearing only momentarily can reveal the identity of the field.

19. This rule reflects a preference for the smallest change between adjacent fields.
20. Both of these readings contain theoretically possible chords, though the latter alternative does not adhere to traditional principles of tonal progression.
21. A change in field is the least ambiguous criterion for segmentation. A chromatic change of one or more pcs after a long passage employing a single set of pcs signals a point of segmentation and usually accompanies a change in chord.
22. Similar situations occur in many of Adams's pieces such as the second movement of *Harmonium* where

    C♯m7 phr

    is immediately followed by

    D♭maj7 ion

    (mm. 69–168), a change from minor to major with enharmonically equivalent roots.
23. Adams (1980) has provided an analytical description of this piece in the liner notes for the Arch recording. Many of my observations correspond with Adams's views of his own piece; the tripartite division, the subdivision according to key signature, and the significance of the phrygian mode. But I have taken a more detailed and systematic approach than he provides in his notes, and our respective identifications of roots differ considerably.
24. In addition, the preference rules may prove useful in the study of other twentieth-century tonal music—for example, the music of Prokofiev—where in many contexts the presence of traditional triads and seventh chords is unclear, though implied.

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