### *C h a p t e r 2*

## *Eleven pitch-class tonality*

### *I. A new theory of symmetrical divisions underlying "key-centered" tonality*

Conventional tonal theory interprets chromaticism as a diatonic adjunct that either embellishes the tonal surface or supports the coherence of higher structural goals in a voice-leading fabric.1 In this context, chromaticism is understood to support and define the diatonic key. However, we propose a new construct where the roles traditionally assigned to the diatonic and chromatic are reconsidered. This theory places structural emphasis on tritone symmetries and eleven pitch-class harmonic areas and, in so doing, uncovers common compositional approaches to specific chromatic relationships of seemingly divergent musical epochs. Therefore, the theory attempts to create a basis for a discussion of *commonality* among style periods whereas musical historiography has essentially focused upon *distinction*. In our view, changes in style occur as composers face the challenge of presenting the chromatic aggregate (the "commonality") in new ways within the diatonic surface, whether that surface is modal, tonal, atonal, or a hybrid of any of these. Further, we hope to accomplish something never before attempted on a large scale: to provide musical discourse with a "unified field theory" in a bid to tie together loose ends that have begun to form as the discipline has become more sophisticated and increasingly successful in determining the nuts and bolts of musical language. Again, our

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[1] For example, see Edward Aldwell and Carl Schachter, *Harmony and Voice Leading*, second edition (New York: Harcourt Brace Jovanovich, Inc., 1989):13, where the authors state: "chromatic elements embellish a basically diatonic substructure; the term *chromatic* (Greek *chroma*, color) clearly conveys the decorative character of these tones."

jumping off point differs from conventional theory since we begin not with the diatonic, and the relationships among scale steps,
but with the total gamut of, and wide variety of, compositional choices present in the chromatic. We offer this new theoretical approach as a means toward the explanation of the potentiating force of the chromatic pitch class within a tonal context and, in so doing, attempt to answer some problematic questions as yet unanswered by present-day music theory.

Our theory of eleven pitch-class tonality encompasses two divergent but interrelated hypotheses that, when considered in tandem, form a larger and more meaningful construct: the first involves the consistent absence of a specific pitch class (referred to as “the missing pitch”) from the total chromatic aggregate, yielding an eleven pitch-class field; the second involves the Primary Chromatic Array in which the total chromatic aggregate is linearized, in ascending half-step order, over the course of entire movements.

The term “eleven pitch-class tonality” relates directly to the first of these concepts, that of the missing pitch. The nomenclature associated with an eleven pitch-class field is the “system.” A system comprises an eleven pitch-class field or collection whose missing pitch determines the specific system. For example, a “0” system is an eleven-note collection whose root is C (C = 0) and which contains every chromatic note within that octave except E♭ or D♯. A root is defined here as the pitch class that generates any given eleven pitch-class collection. The “root” of any given system is not to be confused with the “key”: a “0" system can accommodate any number of keys formed from the field of eleven pitch classes and ordered into a harmonic progression tonicizing a local harmonic area.

If one numbers each note of a chromatic scale as an ordered sequence of pitch classes from 0—11, E♭ or D♯ would be pitch class number 3. In general terms, therefore, pc 3 is the missing pitch from the total chromatic aggregate. More specifically, in a "0" system, the missing pitch, pc 3, is spelled either as E♭ or D♯. Therefore, the missing pitch of any system is that pitch which is a minor third or augmented second above the root.

Other recent theories seemingly address the issue of structurally significant third relationships in chromatic contexts and as expressions of a tonic background. One branch of music theory that has contributed some of the most recent and most significant research on chromaticism in tonal music calls itself "Neo-Riemannian". It addresses music that maintains its formal tonal and triadic underpinnings, but whose tonal unity is often indefinite or ambiguous. Such music is represented in works of Wagner, Liszt, Scriabin, early Schoenberg, et al., but might also encompass unusual harmonic progressions by Beethoven, Schumann or even Mozart. The Neo-Riemannians suggest that even though this music employs explicit tonal passages and even tonally conceived cadence formulas, its hybrid nature has left more traditional analytical methods with less-than-successful interpretations of a significant body of literature.

David Lewin is one of the first of the Neo-Riemannians to recently examine these problematic works.2 Lewin suggests a contiguous line of major or minor thirds, derived from the alignment by thirds of two series of perfect fifths, where any three successive choices of notes will create a consonant triad. He employs the series b♭-D♭-f-A♭-c-E♭-g-B♭-d-F-a-C-e-G-b-D-f♯-A-c♯-E-g♯-B-d♯ as a tool to determine the relational properties of the harmonic organization of these works. This harks back to the mid-Nineteenth-century theories of Hugo

[2]David Lewin, "A Formal Theory of Generalized Tonal Functions," *Journal of Music Theory* 26/1 (1982):23-60.

Riemann. Edward Lowinsky has referred to the harmonic language of this difficult music as "triadic atonality,"3 while Richard Cohn has used the term "triadic post-tonality".4 Such discussions recall previous efforts of Adele Katz,5 Carl Dahlhaus,6 and Gregory Proctor.7 Cohn points out that "both Neo-Riemannian and post-structuralist paradigms ... recognize the potential for tonal disunity in music that uses classical harmonies, and accordingly resists shoehorning all chromatic triadic music into the framework of diatonic tonality."8

It must be underscored, however, that the prevalent major third or minor third relationships described in traditional Riemannian and neo-Riemannian theory have no affinity whatsoever to the present theory's identification of pc 3 as the missing note of an eleven pitch-class area. While thirds are significant entities both in the present theory and in neo-Riemannianism, the latter posits the third as an organizational feature of more foreground elements in relevant works related to the interaction of primary chordal harmonies and potential

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[3]Edward Lowinsky, *Tonality and Atonality in Sixteenth-Century Music* (Berkeley and Los Angeles: University of California Press, 1961).

[4]Richard Cohn, "Introduction to Neo-Riemannian Theory: A Survey and Historical Perspective," *Journal of Music Theory,* 42/2 (Fall 1988):167-80.

[5]Adele Katz, *Challenge to Musical Tradition* (New York: Alfred A Knopf, 1945).

[6]Carl Dahlhaus, *Between Romanticism and Modernism: Four Studies in the Music of the Later Nineteenth Century*, trans. Mary Whittal (Berkeley and Los Angeles: University of California Press, 1980).

[7]Gregory Proctor, "Technical Bases of Nineteenth-Century Chromatic Tonality" (Ph.D. diss., Princeton University, 1978).

[8]Cohn, *op. cit.*, p. 169.

substitutions for them. The present theory, on the other hand, emphasizes fixed minor third relationships as a byproduct of the equal subdivision of the tritone. These third relationships represent the interaction among background complementary eleven pitch-class areas.

In our basic definitions of systems, we see that in a 1♯ system, a system that unfolds eleven notes above the root G, pc 3 is B♭ or A♯; in a 1♭ system, a system whose root is F, pc 3 is A♭ or G♯. The system, then, is defined by the root pitch class of the major-mode diatonic scale associated with that collection of notes. Consequently, a composition in G major or one in E minor, would reside within a 1♯ system whose root is G, while a composition in D major or B minor would be said to be in a system of 2♯s whose root is D. Notice, too, that the present theory views the diatonic key as a "subset" of an eleven pitch-class collection identified by its key signature and by its missing pitch: a missing pitch of C♯ or D♭ would signify a piece of music whose diatonic key is B♭ major or G minor and whose operational system is defined by its signature; however, the note that generates a 2♭ system, meaning its root, is B♭. Therefore, we consider the minor mode as a reordering of the major mode. The consideration of the minor mode ultimately derived from the major has it roots in the earlier church modes whose octave species, whether dorian or mixolydian, derive from reorderings of the natural gamut of overlapping major third ( *mi-fa*) hexachords. This will be discussed more fully in Chapter 3.

The introduction of the missing pitch within the context of an eleven pitch-class field (not an unusual occurrence since, after all, most compositions use all twelve pitch classes!) indicates a transposition from one eleven-note pitch field to another. For example, the use of E♭ in a "0" system moves us into a 3♭ system. Why this must happen will be considered below in the discussion of the "system-consonant tritone"; however, for now, it must be noted that the employment of E♭ in C major is much more than a simple "borrowing" from the tonic minor since the E ♭ is the root of a new eleven pitch-class field that has a signature of three flats and which contains the C minor diatonic scale as a subset.

It must be emphasized that the missing pitch is only necessarily missing from *any given eleven-note field* compared to the entire chromatic aggregate. The term “missing” should not be inferred to mean a pitch missing from *the composition* or the last chromatic to enter the total pitch field; pc 3 will enter whenever the compositional argument demands its presence.

All eleven pitch-class systems are constructed around a “system-consonant” tritone; meaning that tritone which divides the root or tonic octave at its midpoint. Again, in reference to the “0” system, C—F♯ is the system-consonant tritone since F♯ is the symmetrical axis of the C octave. Notice, too, that the missing pitch divides the system-consonant tritone at *its own midpoint*: in the “0" system, E ♭ (or D♯) symmetrically divides C—F♯. Therefore, depending upon the way in which the missing pitch is introduced into a composition, in any of its enharmonic variants, pc 3 bisects the system-consonant tritone symmetrically. We will see later that the enharmonic choice within a compositional context for pc 3 determines the role of the missing pitch and the determination of the motion from one 11-pitch class system to another. Therefore, enharmonic equivalence has no place in this theory.

The division of the system-consonant tritone at its midpoint creates a consequent “system-dissonant tritone”, which is defined as that tritone which includes the missing pitch (pc 3) and which further implies a complementary eleven pitch-class system where that particular tritone would, thus, be “system consonant”. In a “0" system, the system-dissonant tritone may be spelled either as E ♭—A or A—D♯, depending upon the spelling of pc 3.

Notice that the tritone discussed here is *literally* a tritone ( an augmented fourth) as opposed to the interval of a diminished fifth. Therefore, the system-consonant tritone of a “0” system will consistently be spelled C—F♯, not C—G ♭. The tritone G ♭—C would be system-consonant in a six ♭ eleven-note system. The missing pitch spelled E ♭ in a “0" system would indicate that pitch as the root of its own 3 ♭ eleven pitch-class system (whose system-consonant tritone is E ♭—A), whereas, the missing pitch spelled D♯ would indicate that pitch as the octave divider of a 3♯ system a tritone below it, one whose system-consonant tritone is A—D♯ (see Figure 2.1).

E♭ root octave (E♭ - A tritone)

C - C♯ - D - [E♭/D♯] - E - F - F♯ - G - A♭ - A - B♭ - B - C

A root octave (A - D♯ tritone)

C root octave (C - F♯ tritone)

**FIGURE 2.1: The system-consonant tritone and the two system-dissonant tritones of a “0” eleven pitch-class system: note that the E ♭/D♯ missing pitch is in brackets**

[insert Figure 2.1 here – portrait]

Whereas prevailing music theories of the common practice period, from Hugo Riemann to Heinrich Schenker, treat the chromatic aggregate as a colorfully fleshed-out diatonicism, the theory of eleven pitch-class tonality treats the diatonic as a special case, or, as stated above, a subset, of the chromatic eleven-note system. Also, since this is not a theory of diatonicism, it is also not, nor can it be, a theory informed by voice-leading principles. As a result, individual pitch classes designated as structurally significant in eleven pitch-class analysis may seem unusual choices to those conversant with modern diatonic theories. This will become particularly noticeable in analyses that utilize the Primary Chromatic Array, the second hypothesis of eleven pitch-class tonal analysis.

Simply defined, the term "Primary Chromatic Array (PCA)," as we have termed this organizational entity, describes a higher-level unfolding of each chromatic pitch class of the aggregate successively, starting from pc 0, the tonic pitch class of the composition, until the entire chromatic octave (including the missing pitch) has been unfolded over the course of a movement. Especially in sonata-form movements, large segments of the PCA (pcs 0 — 7, for instance, counting the tonic as pc 0) will repeat themselves before reaching octave completion, and within differing harmonic contexts. The total chromatic octave itself may be repeated, as it usually does in a recapitulation, depending on the length and complexity of the composition.9 Significantly, the PCA may inform the harmonic structure of the movement through compositional choices of structural harmonic goals on both middleground and background levels.

Composers may or may not be conscious of this unfolding, since much of it happens as a condition of tonality regardless of whether the composer intends it or not. George Perle refers to the unconscious application of characteristic stylistic conventions as part of the toolbox of "precompositional" ideas that permeate all compositions within a given temporal vocabulary.10 These are the concepts that are taught to undergraduates who still need to learn the basic "nuts and bolts" of music. We expect the symphonies of Mozart and Haydn to have a great

[9]For a more detailed discussion of the derivation of the PCA (originally designated as the *Principal* [later changed to *Primary*] Chromatic Array) and its manifold presentations in sonata-form movements, see H. Burnett, "Levels of Chromatic Ordering," *op. cit*.

[10]George Perle, *Serial Composition and Atonality* (Berkeley and Los Angeles: University of California Press, 1977): 8 n. 12.

commonality of harmonic, melodic and formal features; but, on the other hand, it is less likely that the surface details of works by Mozart and Ravel will be as similar. As composers become increasingly separated in time, these precompositional ideas vary accordingly. On the other hand, Perle also discusses those issues that are composition-specific, those that surpass the ordinary and move into the realm of the true creative process where the composer attains an acute realization of the internal logic and rationale of his compositional material and is able to develop such material in a manner which is both internally rational and creative. He employs the term "reflexive reference" to describe this, a term originally utilized to describe poetry.11

The PCA, then, functions on both levels: we have yet to examine a chromaticized work where the PCA fails to convincingly operate. And yet, there also seem to be as many cases where the PCA acts as a determining compositional force within the work, each successive chromatic entity becoming an apparently purposeful event as the composition moves from one structural goal to the next. We will see an example of this in the analysis of the Schubert C Major Quintet below. Also, some of Beethoven's more complex compositions lend themselves particularly well to PCA analysis. The emphasis that Beethoven often places upon the Neapolitan within the first period — for example, in both first movements of the "Appassionata" Piano Sonata in F minor, Op. 57, and the String Quartet, Op. 132 in A minor — dramatizes the position of pc 1 before it ascends to pc 2 by providing it with its own harmonic area. Especially in his late works,

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[11] *Twelve-tone Tonality* (Berkeley and Los Angeles: University of California Pres, 1977) 162; Perle cites Joseph Frank, "Spatial Form in Modern Literature," in *Criticism: The Foundations of Literary Judgment*, ed. By Mark Schorer et al. (New York, Chicago, Burlingame: Harcourt, Brace and World, 1958) 383.

Beethoven seems to take great pains to articulate many of the PCA pitch classes, giving these tones not only harmonic support, but even more dramatically, their own harmonic areas.

Since the PCA operates on the deepest structural level, and is the slowest moving in its unfolding, other chromatics, not in any particular order, may be presented around it, always moving at faster rates and occupying lower structural levels (such as foreground chromatic scales or segments thereof, etc.). These create secondary chromatic arrays (SCA) that occupy the foreground.[12] This may be likened to the various functions of the dominant chord in Schenkerian analysis, whether one hears it locally as a foreground event or operating on a deeper background level, informing the design and structure of the movement. In voice-leading analysis, dominant triads will appear all over, but only one obtains the highest level of structural significance. So too do chromatic pitch classes operate within various levels of chromatic arrays depending on their own degrees of structural magnitude. This places the choice of a single note, even one that may appear to be quite secondary by the voice-leading criteria, in a potentially active, and therefore quite significant, position. Consequently, we have discovered that particular gravity is often accorded pc 3 at the point that it is unfolded in the PCA. We will see later that the interaction of the two possible enharmonic presentations of pc 3 in conjunction with the unfolding PCA becomes an exceptionally important compositional attribute.

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[12]Cf. H. Burnett, "Levels of Chromatic Ordering", *op. cit.*, for a more detailed discussion of secondary arrays.