Class Notes for Advanced Atonal Music Theory,
by Robert D. Morris.
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Review by Robert W. Peck

Since the publication of Robert D. Morris's *Composition with Pitch-Classes* in 1987, the field of atonal music theory has developed in myriad ways. It has become increasingly difficult for researchers, as well as pedagogues and composers, to remain abreast of significant new contributions, because they are numerous, varied, and often highly specialized. Morris's *Class Notes for Advanced Atonal Music Theory* brings together several of these new developments, along with many of their precursors, in a two-volume collection that is unified by style and notation. According to Morris, it is intended to serve pedagogues, researchers, and composers (ix); and, in terms of its being a unified store of current thinking on atonal music theory, it succeeds.

Class Notes for Advanced Atonal Music Theory is notable not only for its scope and consistency, but also for its generality. Morris presents the material in a sufficiently abstract manner as to be applied to multiple contexts. Even though the text focuses almost exclusively on pitches and pitch-classes, most of its techniques are appropriate to other musical parameters as well. Morris accomplishes this generality by invoking mathematical, or mathematically oriented, approaches frequently. However, its abstract quality is occasionally one of the text's weaknesses. It contributes to two problems that run throughout the work: insufficient examples and imprecision.

On the whole, *Class Notes for Advanced Atonal Music Theory* is characteristic work by one of the most original and prolific music scholars of our time. Through it, readers are able to benefit from his extensive teaching experience in "Theory of Twentieth-Century Music, II" at the Eastman School of Music, from his lecture notes and handouts from which this book derives (ix). The following paragraphs will take a closer look at its organization and content. After some comments on its overall layout, this review will proceed chapter by chapter, examining and critiquing the text in finer detail. Finally, it will offer a few brief conclusions, and further suggestions on the book's potential uses.

Layout of the Text

Class Notes for Advanced Atonal Music Theory is in two volumes: Volume 1 contains the text, and Volume 2 contains the examples, tables, appendices, glossary, and reference list. Having to switch between volumes to see examples and so forth does not bother me. Indeed, I find it convenient at times to be able to leave an example visible while reading subsequent pages of the text. Both volumes also feature a very detailed table of contents, which is indispensable given the lack of an index. (The glossary also cross-references sections of the text.) The margins are wide, and the print is large and easily readable, as are most of the examples. Some of the tables and appendices, on the other hand, appear in small print, and are more difficult to read. My primary criticisms do not have to do with the layout itself, however, but more with the book's production. Whereas the advantages of the text's being published through an on-demand press are considerable—it helps keep the cost low, and facilitates necessary revisions—the quality of the material (cover, pages, etc.) does not hold up even to moderate use.

Morris states that he has organized the material for people who wish to read the text front-to-back, as well as for those who are reading only particular sections or chapters (x). Both ways of using it are very practical and valuable. Chapter 1, "Basic Terms and Concepts," serves as a preliminary introduction to the mathematical techniques employed throughout the rest of the text. The reader may begin with this chapter, or may merely refer back to it if needed. (One is reminded here of other similar introductions, such as Chapter 1 of David Lewin's 1987 *Generalized Musical Intervals and Transformations.*) The subsequent chapters cover various topics, in varying degrees of continuity from one to the next: "Topics in Contour-Space and Pitch-Space" (Chapter 2), "Relating Pc Entities" (Chapter 3), "Aspects of TTOs" (Chapter 4), "The TTO group: its subgroups and supergroups" (Chapter 5), and "Twelve-Tone Topics"

(Chapter 6). According to Morris, certain chapters may form groupings, such as Chapters 4 and 5; Chapters 5 and 6 may also be read together (xii). In general, aside from presenting concepts in a particular order, the text as a whole does not develop a sole premise or theory, but is rather a survey of theoretical and analytical techniques.

The most likely potential objection to the book's organization among its readers might be the near lack of examples from the musical repertoire. The first such example occurs on p. 22, and consists of the following: "<3 2 0 1 5 4> is the contour given by <D4, C♯4, A3, B♭3, F4, E♭4>, the first six notes of the first violin part at the opening of Schoenberg's Fourth String Quartet, Op. 37." The next musical examples from the repertoire appear twelve pages later: "the pset {-12, -4, -1, 4, 9} is the 'Farben' chord of Schoenberg's opus 16, no. 3," and "<-3, -2, 1, 0, -1> is the pitch sequence of the opening phrase of Bartók's *Music for Strings, Percussion, and Celesta.*" The next brief reference to existing music appears twenty-two pages later. Chapter 6 uses the tone-row from Berg's Violin Concerto in a number of examples, but does not put forth an analysis of the piece per se. As in Morris's 1991 *Class Notes for Atonal Music Theory*, which serves as a quasi-prerequisite for the present text, and which he advises be read along with another introductory text,[1] such as Rahn 1980 or Straus 2000, the reader must find (or, better, compose) musical examples for aural re-enforcement, if needed or desired.[2] The infrequency of examples from the repertoire certainly does not invalidate the book's theoretical points—it is, after all, a book about atonal music *theory*, not analysis—but it may present an obstacle to readers who rely on this type of material for reasons of guidance or convenience.

Mathematical Foundations

As stated above, Chapter 1, "Basic Terms and Concepts," presents the fundamental mathematical, primarily algebraic,

[1] See Morris 1991: viii.

[2] The text contains some suggestions for compositional applications (particularly in Chapter 5).

techniques on which musical theoretical models are built later in the text. Following the procedure Morris used earlier in *Class Notes for Atonal Music*, he follows nearly every term or concept with some sort of example. This practice runs through all six chapters. The definitions and examples are usually worded clearly, and present little trouble for readers who have some prior experience: "Previous work in elementary atonal theory will have set the stage and provide a relevant conceptual framework" (x). Nevertheless, the mathematical material in Chapter 1 receives no citations in the reference list (at the end of Volume 2). As most of its concepts may be found in any standard abstract algebra textbook, it would be convenient to have Morris's recommendation on which source(s) to consult for discussion or exercises on such topics as functions, relations, groups, and so forth.[3]

Chapter 1 contains occasional inaccuracies and over-generalizations. For instance, §1.3.5.5 ("Cyclic groups") states: "Cyclic groups have a single generator," which is true. It then presents an example of a cyclic group, OPS = $\{T_0, T_3, T_6, T_9\}$, and states: "T_3 is *the* generator of this cyclic group" (my italics). In fact, this group may also be generated singly by T_9. The problem here could be fixed by adding a further illustration of how T_9 also generates OPS; it would be even better to demonstrate how the single generator for a cyclic group may be any of its co-prime members.[4] Similarly, §1.3.5.6 ("Dihedral groups") states: "Dihedral groups are denoted by D_{2n} and are generated by two operations, A and B.[5] A has a period of n and B is an involution." This assertion is true as describing the main idea of a dihedral group, but it might easily be misread as a definition, in which case it would be false. B cannot be just any involution; it must be an

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[3] For example, Dummit and Foote 1999 contains further information on many of these topics.

[4] Similarly, §1.3.4.8 maintains that "T_1 is the *sole* generator" (my italics) of the pc transposition group, which is not entirely true. Whereas T_1 may singly generate that group, it is also singly generated by any of the following operators: T_5, T_7, or T_{11}, which are co-prime to T_1 in the group.

[5] The notation D_{2n} for a dihedral group of order 2n is standard in many mathematical texts. However, the notation D_n is used in other sources for the same group, including the work of several music theorists. A footnote in Morris's text would help dispel possible confusion among its readers.

involution that conjugates A to its inverse: that is, $A^B = A^{-1}$. For example, let $A = T_1$ and $B = T_6$. In this case, A has a period of 12, and B is an involution, but they do not generate a group isomorphic to D_{24}. Specifically, for this A and B, $A^B = A$. These examples, as they are, may lead the reader to imprecise notions. The same is true of certain other examples throughout the chapter and the rest of the book.

From Contour to Pitch-Class

Chapter 2, "Topics in Contour-Space and Pitch-Space," begins the main part of the text. The presentation of these two topics in the same chapter is logical, since both are concerned with non-modular spaces. The first half of the chapter (§2.1) recounts the theory of contour-space, and is a compression of Morris 1993 and 1995 (xi). It also acknowledges the contributions of several other contour theorists, such as Friedmann (1987), Polansky (1987), Marvin and Laprade (1987), among others. Morris also spends some time examining the "impossible melodies" of Polansky and Bassein 1992 (31). In essence, the first half of Chapter 2 leads to the Contour Reduction Algorithm (§2.1.4), then discusses the special cases of contours with repetitions and simultaneities.

The second half of the chapter (§2.2) adds the concept of pitch, as distinct from pitch-class, and proposes a basic theory of psets. As Morris states: "With the exception of Bernard 1987, the lack of theoretical or analytical work on pitch-relations without reference to pc function suggests that for most theorists, the study of atonal music considers relations between the underlying pitch-class entities and their musical *realizations* as pitches in time" (33). This theory, then, is an original contribution, as it does not rely on pitch-class function, although it does ultimately invoke octave equivalence. The treatment of psets leads to a discussion of two equivalence relations: PCINT (for "pitch-class INT equivalence," §2.2.3.1) and FB (for "figured bass" equivalence, §2.2.3.2). These two relations encompass psets "whose spacing intervals are identical, expanded, or contracted...by any number of octaves" (37). The former also preserves the particular ordering of the pset from low to high. Chapter 2 concludes with a discussion of similarity relations among psets, including those incorporating fuzzy set theory, setting the stage for the longer discussion of similarity relations in Chapter 3.

Many of the techniques in *Class Notes for Advanced Atonal Music Theory* are general enough to be extended to musical parameters beyond pitch and pitch-class. Chapter 2, particularly the unit on contour-space, contains the most examples of these types of applications actually spelled out in the entire text. Example 2.1.1a incorporates pitches in time, dynamics in time, and chord densities in time; Examples 2.1.6a and c add contours that use timepoints. Additional applications occur in this chapter, but it would be interesting, and potentially useful, to see more of these types of examples throughout the other chapters.

The concept of pitch-class first appears significantly in Chapter 3, "Relating Pc Entities." In addition to work by Forte (1973 and 1988), Cohn (1986) and Mead (1988), and previously published work by Morris (1980, 1982, 1990, 1994, and 1997), this chapter also includes some new, unpublished material (ix). The chapter divides into three primary sections: equivalence relations, partial orderings among pitch-class entities, and similarity relations among set-classes. The first section (§3.1) concerns various partitions of the pitch-class set universe into set group systems (SGs), including the standard canonical groups of transposition operators (SG 1); transposition and inversion operators (SG 2); and transposition, inversion, and multiplicative operators (SG 3). Morris goes on to define some of SG 3's salient subgroups, as well as supergroups that obtain by adjoining non-standard operators to canonical groups. He also develops direct product groups of pitch-class and order-number operators.

The second section (§3.2) examines partial orderings, primarily from the perspective of inclusion relations, such as Forte's K and Kh. Morris adds another relation, KI, which does not invoke complementary set-classes (64). He shows how these relations are modeled graphically by lattices, leading to a discussion of Forte's theory of pitch-class set genera. The second section concludes with material on Cohn's *transpositional combination* (TC) and Morris's *complement union property* (CUP). The emphasis on graph theory in this section is useful, particularly from a pedagogical point of view.

The third section (§3.3) returns to the topic of similarity, now in the context of pcsets, and moves quickly into a subsection on aural similarity (§3.3.1). Here, Morris points out three basic problems in trying to provide a measure of "aural similitude": diversity, type-token, and realization. The first problem recognizes that many types of similarity (or dissimilarity) relations may potentially be defined, but unless a single property, such as symmetry or inclusion, serves as a basis for comparison among pcsets (or set-classes), multiple measures should perhaps be employed. The type-token problem addresses the question of recursion in similarity measures among pcsets and set-classes. Realization, then, calls on the freedom with which pcsets may be articulated in music. Ultimately, "it is important not to confuse the technical definitions of similarity...with the connotations of 'similarity' or 'resemblance' in ordinary language" (5). To that end, Morris defines two relations, FSIM (Forte 1973) and SIM (Morris 1980), which examine a salient, if not always audible, aspect of pcsets: interval-class vectors. FSIM compares only pcsets of the same cardinality, whereas SIM may compare pcsets of varying cardinalities.

My principal objection concerning Chapter 3 is the manner in which it subtly privileges SGs 1 and 2, and the canonical groups of transposition, and transposition and inversion operators. For example, the generalized definition of Z-relations, DEF. 3.1.4e, states: "For any SC(X) **H** system, two pcsets W and Y with interval-class vectors V(W) and V(Y), respectively, are *Z-related* if V(W) = V(Y) but $SC_H(W) \neq SC_H(Y)$." This definition is sufficiently general to account for pcsets in various set groups,[6] but the subsequent example and other examples throughout the text imply that the interval-class vector is the usual 6-coordinate (or 7-coordinate, accepting interval-class 0) vector of standard pcset theory. This vector is primarily applicable to members of SGs 1 and 2, whose operators hold these interval-classes invariant.[7] Earlier (49),

[6] SG iv, in which set-class membership is determined by interval-class vector equivalence, is a trivial example.

[7] The standard interval-class vector is also applicable to groups generated by T_n (and I) and any operations that commute with them, as they would also preserve such interval-classes.

Morris proposes an alternate interval-class vector for SG 3, which equates the standard interval-classes 1 and 5. Other set groups suggest further notions of interval-class and interval-class vector constructions. If there is a particular reason to favor the traditional interval-class vector, it should be stated early in the chapter.[8] Still, it would be helpful, if not necessary, to provide an example or two of alternate interval-class vector situations.

Treatment of the Twelve-Tone Operations

According to Morris, Chapters 4 and 5 form the core of the text (xii). These chapters suggest new approaches to many of the specialized techniques represented in the reference list. Chapter 4, "Aspects of TTOs," derives many of its ideas from, and furthers the work by, Alphonce (1974), Perle (1977), Morris (1982, 1987, and 1990), Lewin (1990), and Klumpenhouwer (1991), and also contains original, unpublished material. The chapter contains multiple sections, but I feel a few are of particular note: "Operations as Set Labels" (§4.7), "Context Sensitive Operations" (§4.9), and "Klumpenhouwer Networks" (§4.10), as they relate to various current areas of transformation theory. Through most of the chapter, Morris adopts the notation T_nM_m for TTOs, which facilitates the realization of their compositions.[9] Whereas this notation associates easily enough with the T_n, T_nI, T_nM, and T_nMI labels elsewhere in the text,[10] since they are used here, they may as well appear consistently. They are, at least in terms of their algebraic equivalents, more convenient than the latter notation.

I was pleased to see Morris's emphasis on algebraic conjugation throughout this section. Klumpenhouwer (1998: 91-92), whose

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[8] On p. 52, Morris writes: "Admittedly, it makes sense to consider the T_nM and T_nMI operations to be nonstandard, because they change the *interval-class content* of pcsets" (my italics). He goes on to say: "While only the T_n and T_nI operations preserve 'distance'..., the T_nM and T_nMI operations preserve *ratios* of... distances" (Morris's italics).

[9] The composition $(T_nM_m)(T_bM_a)$, in left orthography, is $T_{n+mb}M_{ma}$.

[10] $T_nM_m = T_n$, when m=1; $T_nM_m = T_nM$, when m=5; $T_nM_m = T_nMI$, when m=7; and $T_nM_m = T_nI$, when m=11.

article on the topic is unfortunately not cited in the reference list, states that "the case for inner automorphisms is (relatively speaking) more 'phenomenologically' regulated than is the case for outer automorphisms, in the sense that it conforms more closely to a requirement that methodological structures and procedures ought to be meaningful in some extended sense to musical experience (broadly construed)." The discussion of automorphisms in *Class Notes for Advanced Atonal Theory* does not appear until Chapter 5, but the relation between inner automorphisms and conjugation is significant: inner automorphisms obtain by conjugations of a group by its members. Consequently, transformations by conjugation are also "meaningful in some extended sense to musical experience," and conform to intuitive notions of transforming one operator (or set of operators) *by another operator.* The emphasis on conjugation confirms Morris's constant commitment to the experience of music—through perception, composition, or performance—even where the mathematical techniques he employs may seem distantly related to such experience.

Chapter 5, "The TTO group: its subgroups and supergroups," continues the work of the previous chapter, examining in greater detail the group structure of the forty-eight TTOs, U.[11] After a brief re-introduction of basic terminology (which is somewhat redundant for the reader who is going through the book from front to back), Morris begins with a section (§5.2) on the subgroups of U. The description of group orbits (Def. 5.2.2) here and throughout the chapter is well done, and quite useful in a variety of contexts, including combinatoriality and "pc-to-pc designs" (§5.2.5.1). This latter section is the most extensively devoted to compositional design in the entire text, and follows the procedures of Morris's 1987 *Composition with Pitch-Classes.* The next section, "Cosets of a Subgroup" (§5.3), is also applicable to multiple contexts, as pre- and post-multiplication of a subgroup by some operator is an important feature of many atonal, as well as tonal, transformational music theories.

[11] Earlier, Morris describes the tranposition group as being isomorphic to the cyclic group C_{12}, and the transposition and dihedral group as isomorphic to the dihedral group D_{24}. It might be helpful in this section to note that the group U of all TTOs is isomorphic to the direct product group $D_6 \times D_8$.

The next section, "Automorphisms and Inner Automorphisms" (§5.4), serves as the culmination of the first half of Chapter 5. Nevertheless, there are some problems in this section, which I will describe below. The next three sections are relatively brief, "Automorphisms and Subgroups" (§5.5), "Conjugacy-Classes" (§5.6), and "Operator Cycles and Orbits in the Automorphisms of Groups" (§5.7). The second section fixes the terminology of *Composition with Pitch-Classes*, in which conjugacy classes are labeled "automorphism-classes."[12] §5.8 presents another compositional application, and §5.9 begins a lengthy discussion of "The TTO Group as a Subgroup." This section represents the culmination of the chapter's second half. In it, Morris describes how certain operations may be adjoined to the TTOs to form larger groups of operations. (Morris is also concerned with strategies for minimizing the size of these supergroups, so as to prevent them from becoming too unwieldy for practical use). These operators may be of particular theoretical significance, in the same way that the M and MI operations help us understand certain aspects of the T_n and T_nI operators that would not be obvious otherwise (138). The chapter ends with a section on "Simply Transitive Groups and Generalized Interval Systems" (§5.10). It is an elegant and lucid summary of Lewin's exposition of these topics, and "is offered as an invitation to begin reading Lewin (1987)." Morris hopes that "the group theoretic mechanics we have used to study the TTOs and their subgroups will prove helpful in mastering Lewin's important contributions to music theory" (149).

As I suggested above, the main fault of Chapter 5 has to do with its discussion of automorphisms. Perhaps this difficulty traces back to the earlier question of co-prime generators of cyclic groups, and its implications for Theorem 5.2.4.2.2: "The set of orbits of a cyclic group **G** generated by G contains the orbits of the cyclic group **G′** generated by G^y for all y. If y divides the order of **G**, then **G′** has y times as many distinct orbits as **G** and the length of (at least some of) the orbits of **G′** are 1/y of the length of (some of) the orbits of **G**. If y does not divide the order of **G**, **G′** has the

[12] The definition of "automorphism-classes" (Def. 4.11) in *Composition with Pitch-Classes* actually describes the algebraic concept of "conjugacy-class." Def. 5.4.2.2 of *Class Notes for Advanced Atonal Theory* fixes this problem.

same orbits as G and G and G′ are *isomorphic*" (my italics). The last sentence of the theorem could, and perhaps should, be extended to a stronger proposition: If y does not divide the order of G, G′ (which is generated by G^y) and G are related by a function that is an automorphism, not merely an isomorphism.[13] In other words, G and G′ are the same group, and whereas an isomorphism shows a particular correlation between groups, an automorphism illustrates symmetries within a single group. The cyclic T_n group serves as an example. Let G = T_1 and y = 5. In this case, y does not divide 12, the order of G. Therefore, G^y = T_5 also generates a cyclic group of order 12, but this group is the same as G, not a different group. The function here that takes all G^x to G^{5x} is an automorphism.

Another problem occurs in the definition of outer automorphisms (DEF 5.4.2.1): "Let G_1 be a member of group G. An outer automorphism is the mapping $G_1G = GG_1$ that keeps G invariant." Morris adds a footnote (130), which states: "I have coined the term 'outer automorphisms' to contrast with the established group-theoretic term 'inner automorphisms.' This clears up the ambiguity in group theory between the use of the term automorphism to mean any isomorphism from a group to itself and the particular type of automorphisms we call outer automorphisms." In fact, there is little ambiguity in the standard group theoretic definitions of these terms: (1) an *automorphism* is an isomorphism of a group to itself, (2) an *inner* automorphism is one obtained via conjugation, and (3) an *outer* automorphism is any that is not inner.[14] It is not the ambiguity, however, but Morris's definition of outer automorphisms that forms the larger problem. The mapping "$G_1G = GG_1$ that keeps G invariant" is generally not an automorphism. Returning to the example where G is the T_n group, let $G_1 = T_1$. $G_1G = GG_1$, and the corresponding elementwise mapping F: $T_n \rightarrow T_{n+1}$ keeps G invariant. However,

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[13] An automorphism is an isomorphism of a group to itself.

[14] The set of all automorphisms of a group G forms a group structure, Aut(G), as do the set of all inner automorphisms, Inn(G); the latter is a subgroup of the former. The outer automorphisms, on the other hand, do not form a group. They do not include the trivial mapping, which serves as the identity element of a group of automorphisms.

the mapping is not a homomorphism. That is, $F(G_x)F(G_y) = F(G_xG_y)$ fails in general. For instance, under this F, let $G_x = T_0$ and $G_y = T_3$, so $F(G_x) = T_1T_0 = T_1$, $F(G_y) = T_1T_3 = T_4$, and $F(G_xG_y) = T_1(T_0T_3) = T_4$. (I have arbitrarily selected left multiplication by G_1.) Now, $F(G_x)F(G_y) = T_1T_4 = T_5 \neq F(G_xG_y) = T_4$, so the mapping is not a homomorphism, and, by extension, it is also not an automorphism. A little later, Morris states: "perhaps the most important difference between an outer and inner automorphism is that the former maps the identity element to another member of the group whereas the latter maps the identity element to itself" (131), but any automorphism must map the identity element to itself to satisfy the homomorphism condition. The mappings Morris describes are indeed one-to-one and onto, but they are merely permutations.[15]

Ordered Sets and Their Properties

In my opinion, Chapter 6, "Twelve-Tone Topics," represents the best part of *Class Notes for Advanced Music Theory*. It is illustrative of Morris's mastery of twelve-tone theory and composition, while also being extremely well constructed pedagogically. In addition to Morris's own contributions, he also acknowledges the work of several other twelve-tone theorists, especially Lewin (1976 and 1987), Starr (1980 and 1984), and Mead (1988 and 1989). The first section, "Types of Rows" (§6.1), surveys some of the most common special properties of twelve-tone series (all-combinatorial rows, all-interval rows, ten-trichord rows, supersaturated rows, and multiple order-number function rows), while drawing on musical examples from Berg, Babbitt, and Morris. §6.2, "Row Relations Within a Single Row-Class," examines various pitch-class associations, drawing its examples primarily from the tone-row from Berg's Violin Concerto. §6.3, "Pc Binary Relations," begins with Lewin's (1976) protocol pairs, and extends the concept to Starr's (1984) PCRs (pitch-class relations) and Lewin's (1987) special PCRs, PROT(X). Morris's

[15] These terms have been standardized in the mathematical literature for several decades. For instance, see Dummit and Foote 1999.

application of these techniques on partially ordered sets, and their relations, is especially well done.

Chapter 6 continues with a substantial section (§6.4) on "Partitions of the Aggregate," which includes a substantial subsection (§6.4.4) on "Mosaic Theory." It reviews the basic notation for partitions in number theory, and examines the partitions of the number 12. Next, it introduces the concepts of partition- and mosaic-class (the former requires the same cardinality for each of its segments) in terms of the standard set-classes of atonal theory (i.e., the orbits of pitch-class sets under the transposition and inversion group). Subsection §6.4.3.2, "Latin squares and combinatoriality," intersects very well with the introduction of the group tables for two order 4 groups (C4 and the Klein four group), which were introduced earlier in the text. §6.5, "Pitch-Class and Order-Number Isomorphisms," derives significantly from Mead 1988. It also helps shed light on some of the earlier twelve-tone theories of Milton Babbitt (1960). Using again the tone-row from Berg's Violin Concerto, Morris shows several aspects of the salient relationship between pitch-class and order position.

I really have only one reservation about Chapter 6: the examples draw primarily from the tone-row from Berg's Violin Concerto. Whereas it is pedagogically expedient to reference the same material from varying perspectives, I would be interested in seeing examples of how its concepts extend to twelve-tone-rows with the special properties listed in §6.1. The chapter contains some further examples of tone-rows in the context of the various topics studied, but not any that specifically reference these special properties.

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In summary, *Class Notes for Advanced Atonal Music Theory* is an impressive compendium of current thinking, brought together, and even furthered, by one of the shapers of the field. Morris's ability to present this volume of highly specialized material cleanly, and in a unified manner, is quite commendable. The book is at its best when Morris is discussing one of his own specialties, in particular twelve-tone theory. Elsewhere, the quality of the material varies somewhat, but rarely drops below a high level. When it does so occasionally, in most cases it could be fixed by including more examples or a higher degree of precision. Most of the text's other shortcomings do not undervalue its better points, but I would like to see the too frequent typographical errors, grammatical problems, and other results of cursory editing, fixed in a subsequent edition.

Morris intends the book for two types of readers: those who will read it through, and those who will consult it more as a reference. It could work well as a textbook for an advanced atonal theory course (though certainly not in an introductory course), but the instructor should be prepared to find his or her musical examples if the class is going to include musical analysis. Also, as a textbook, it does not present any exercises or other pedagogical material. The book should be used along with a supplement, as Morris suggests for *Class Notes for Atonal Music Theory* (1991), perhaps an anthology of atonal music. In any case, *Class Notes for Advanced Atonal Music Theory* should be part of any pedagogue's or researcher's atonal theory library.

References

Alphonce, Bo. 1974. "The Invariance Matrix." Ph.D.diss., University of Rochester.

Babbitt, Milton. 1960. "Twelve-Tone Invariants as Compositional Determinants." *The Score and IMA Magazine* 12: 53-61.

Bernard, Jonathan. 1987. *The Music of Edgard Varèse.* New Haven: Yale University Press.

Cohn, Richard. 1986. "Transpositional Combination in Twentieth-Century Music." Ph.D. diss., Eastman School of Music, University of Rochester.

Dummit, David S., and Richard M. Foote. 1999. *Abstract Algebra,* 2nd ed. Upper Saddle River, NJ: Prentice Hall.

Forte, Allen. 1973. *The Structure of Atonal Music.* New Haven: Yale University Press.

_____. 1988. "Pitch-Class Set Genera and the Origin of Modern Harmonic Species." *Journal of Music Theory* 32/2: 187-270.

Friedmann, Michael L. 1987. "A Response: My Contour, Their Contour." *Journal of Music Theory* 31: 268-74.

Klumpenhouwer, Henry. 1991. "A Generalized Model of Voice-Leading for Atonal Music." Ph.D. diss., Harvard University.

_____. 1998. "The Inner and Outer Automorphisms of Pitch-Class Inversion and Transposition: Some Implications for Analysis with Klumpenhouwer Networks." *Intégral* 12: 81-93.

Lewin, David. 1976. "On Partial Ordering." *Perspectives of New Music* 14/2-15/1: 252-59.

_____. 1987. *Generalized Musical Intervals and Transformations.* New Haven: Yale University Press.

_____. 1990. "Klumpenhouwer Networks and Some Isographies that Involve Them." *Music Theory Spectrum* 12/1: 83-120.

Marvin, Elizabeth West, and Paul A. Laprade. 1987. "Relating Musical Contours: Extensions of a Theory for Contour." *Journal of Music Theory* 31: 225-67.

Mead, Andrew. 1988. "Some Implications of the Pitch-Class/Order-Number Isomorphism Inherent in the Twelve-Tone System: Part One." *Perspectives of New Music* 26/2: 96-163.

_____. 1989. "Some Implications of the Pitch-Class/Order-Number Isomorphism Inherent in the Twelve-Tone System: Part Two." *Perspectives of New Music* 27/1: 180-233.

Morris, Robert D. 1980. "A Similarity Index for Pitch-Class Sets." *Perspectives of New Music* 18/2: 445-60.

_____. 1982. "Set Groups, Complementation, and Mappings Among Pitch-Class Sets." *Journal of Music Theory* 26/1: 101-44.

_____. 1987. *Composition with Pitch-Classes: A Theory of Compositional Design.* New Haven: Yale University Press.

_____. 1990. "Pitch-Class Complementation and Its Generalizations." *Journal of Music Theory* 34/2: 175-246.

_____. 1991. *Class Notes for Atonal Music Theory*. Lebanon, N.H.: Frog Peak Music.

_____. 1993. "New Directions in the Theory and Analysis of Musical Contour." *Music Theory Spectrum* 15/2: 205-28.

_____. 1994. "Recommendations for Atonal Music Pedagogy in General; Recognizing and Hearing Pitch-Class Sets in Particular." *Journal of Music Theory Pedagogy* 8: 75-134.

_____. 1995. "Equivalence and Similarity in Pitch and Their Interaction with Pcset Theory." *Journal of Music Theory* 39/2: 207-44.

_____. 1997. "K-, Kh-, and Beyond." In *Music Theory in Concept and Practice*. Edited by James Baker, David Beach, and Jonathan Bernard. Rochester, N.Y.: University of Rochester Press.

_____. 2001. *Class Notes for Advanced Atonal Music Theory*. Lebanon, N.H.: Frog Peak Music.

Perle, George. 1977. *Twelve-Tone Tonality*. Berkeley: University of California Press.

Polansky, Larry. 1987. "Morphological Metrics: An Introduction to a Theory of Formal Distances." In *Proceedings of the International Computer Music Conference*. Compiled by James Beauchamp. San Francisco: Computer Music Association.

Polansky, Larry, and Richard Bassein. 1992. "Possible and Impossible Melodies: Some Formal Aspect of Contour." *Journal of Music Theory* 36: 259-84.

Rahn, John. 1980. *Basic Atonal Theory*. New York: Longman Press.

Starr, Daniel V. 1980. "Derivation and Polyphony in Twelve-Tone Music." Ph.D. diss., Princeton University.

_____. 1984. "Derivation and Polyphony." *Perspectives of New Music* 23/1: 180-257.

Straus, Joseph N. 2000. *Introduction to Post-Tonal Theory*, 2nd ed. Englewood Cliffs, N.J.: Prentice Hall.