I

Tonality, Atonality, Dodecaphony

Atonality originates in an attempt to liberate the twelve notes of the chromatic scale from the diatonic functional associations they still retain in "chromatic" music—to dissociate, so to speak, the chromatic scale from "chromaticism." The expanded harmonic vocabulary of late nineteenth-century music had extended the range of tonal relationships to the point where the traditional articulative procedures were no longer adequate. The final step in this development was taken by Arnold Schoenberg in a radical stylistic departure based upon a rejection of any general principles regulating simultaneity and progression. In the compositions Schoenberg wrote between 1908 and 1923, the period of "free" atonality, he disclosed that this ultimate expansion of possible relations to include the whole range of combinations contained in the semitonal scale demands a revaluation of every aspect of the musical language.

The composer working within the diatonic tonal system may take for granted the existence of specific properties of that system: a seven-tone scale, triadic harmonic structure, a key center, and so forth. The atonal composer, however, can take for granted nothing except the existence of a given limiting sound world, the semitonal scale. Aside from this assumption, it is impossible to state the fundamental conditions of atonality *in general*, except in a negative way, merely stipulating the absence of a priori functional connections among the twelve notes of the semitonal scale. Musical coherence requires additional limiting factors, but these are not reducible to a set of foundational assumptions in terms of which the compositions that are collectively designated by the expression "atonal music" can be said to represent a "system" of composition.

In 1923 Schoenberg first published a composition employing the "method of composing with twelve notes." This "method" soon proved to have some general relevance to the special problems of atonal composition. It is consistent with both the positive and negative premises of atonality, affirming the availability of twelve notes while denying a priori functional precedence to any one of them.

In Schoenberg's twelve-tone system all the tone relations that govern a given musical context are referable to a specific linear ordering of the twelve notes of the semitonal scale. Neither register, duration, timbre, or intensity—in other words, no attribute other than that represented by the pitch-class name of what is informally called a "note"[1]—is defined by this referential permutation of the semitonal scale, a permutation denoted by the term "row," "series," or "set."[2] An unambiguous ordering is assumed; but the degree to which this ordering actually determines the general musical procedures varies greatly from one work to another, even where these are by the same composer. The total musical texture inevitably entails intervallic relations not directly specified by the set, and even on a purely linear plane deviations occur. Yet the premise of an ordered arrangement of the twelve notes, if it is to have any meaning, must somehow govern the essential musical events in a consistent and logical manner, in spite of ambiguities and licenses. The possibility of modification, however momentary, of the preestablished order implies the occasional presence of further preconditions. What these are, and what their relation is to the essential preconditions, will be discussed in detail later.

The following postulates, then, must be understood to refer only to the set on which a given work, or section of a work,[3] may be based. The compositional implications of these postulates are the subject of Chapters IV, V, and VI of this book.

1. The set comprises all twelve notes of the semitonal scale, arranged in a specific linear order.
2. No note appears more than once within the set.
3. The set is statable in any of its linear aspects: prime, inversion, retrograde, and retrograde-inversion.

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[1]Cf. Milton Babbitt, "Twelve-Tone Invariants as Compositional Determinants," *The Musical Quarterly,* XLVI (1960), 246 ff. This issue has been reprinted as *Problems of Modern Music* (New York: Norton, 1960).

[2]The accepted German term *Reihe* may mean "row," "series," or "set." Of these, "row," the earliest to gain acceptance in writings in English on the subject, is the least appropriate, since it implies a certain regularity, not necessarily characteristic of the set. To a large extent it was replaced by "series," mainly through the books and articles of Ernst Krenek. The term "set," introduced in 1946 by Milton Babbitt in *The Function of Set Structure in the Twelve-Tone System* (reproduced in typescript by Princeton University, Dept. of Music), has gained general currency.

[3]The reason that the extent of the musical area governed by a particular set is not specifically delimited here is given in Chap. IV, "Motivic Functions of the Set." A "rule" to the effect that a composition should be based on a single set is given in practically every presentation of the principles of Schoenberg's twelve-tone system (see Josef Rufer, *Composition with Twelve Notes* [New York: The Macmillan Co., 1954], pp. 106 ff., and Schoenberg's own statement, quoted therein: "It does not seem right to me to use more than one series"). Webern's works conform to this "rule," but it is not an adequate formulation of the practice of either Schoenberg or Berg. In the twelve-tone system devised by Josef Hauer (see below) there is free progression from one set, or "trope," to another.

4. The set in each of its four transformations (that is, linear aspects) is statable upon any degree of the semitonal scale.

In the examples, black unstemmed noteheads will stand for pitch-class names. The integers from 0 to 11 can be substituted for pitch-class names by assigning these integers to the successive notes of an ascending semitonal scale beginning on *c*. Thus, example 4 (see page 7) can be represented as:

2 1 9 10 5 3 4 0 8 7 6 11

This form of the set is "P_2," that is, the prime set beginning on *d*. If this form of the set is transposed to, say, the "perfect fifth" above, which we represent by the "transposition number" T(7), it will be identified as "P_9," i.e., 2 + 7, and its numerical representation can be deduced by adding 7 to each pitch-class number of P_2. Where the resulting sum is 12 or more, 12 (representing the octave) should be subtracted. Thus, P_9 will read, in pitch-class number notation,

9 8 4 5 0 10 11 7 3 2 1 6

The retrograde forms of P_2 and P_9 are, respectively, "R_2" and "R_9," that is, the retrograde forms whose last notes are, respectively, *d* and *a*. The numerical representation of the inversion may be deduced by subtracting each pitch-class number of a prime form of the set from a given "sum of complementation," the latter depending on the desired transposition. Thus, I_7, the sum-9 complement of P_2, will read, in pitch-class number notation (cf. example 5, page 7):

7 8 0 11 4 6 5 9 1 2 3 10

The same series of pitch-class numbers read backwards gives us "RI_7." The interval succession of a set is the series of integers determined by subtracting each pitch-class number from the following or from the latter plus 12. Thus, the prime form of the set, regardless of transposition, will be represented by the following series of interval numbers:

11 8 1 7 10 1 8 8 11 11 5

The complementary interval numbers (the differences when each interval number of the prime set is subtracted from 12) will represent the inversion:

1 4 11 5 2 11 4 4 1 1 7

Whereas the retrograde of a given set may be found by reading the pitch-class number succession of its prime form backwards, the same procedure applied to the interval number succession of the prime will give the interval number succession of the retrograde-inversion. Similarly, the pitch-class number succession of the inversion read backwards gives the pitch-class number succession of the retrograde-inversion, while the interval number succession of the inversion read backwards gives the interval number succession of the retrograde.[4]

The term "set-complex" refers to the forty-eight different forms generated when a given series is stated at all twelve transpositions in each of its four aspects. The term "set-form" refers to any given member of this complex. It is immaterial which aspect of a given set is designated as the prime, so long as the

[4]See Babbitt, n. 1, above.

remaining terms are properly interchanged in order to reflect the reciprocal relations among the set-forms.[5] (In twelve-tone music there is, in principle at least, no difference in the meaning of enharmonically equivalent notes. Which spelling is selected is merely a matter of convenience.[6] In the notation of set-forms in the examples below, each accidental affects only the note before which it stands.)

Some former misconceptions are of interest as curiosities. Postulates 1 and 2 have been grotesquely misinterpreted to imply that "every theme must have twelve notes," an assertion as absurd as would be the analogous statement that in tonal music "every theme must have seven notes." Postulate 2, in spite of evidence to the contrary in almost every bar of Schoenberg's twelve-tone compositions, has been misunderstood to refer to a purely compositional and metrical device: the reiteration of a single note, with none other intervening, a procedure that obviously has no effect whatever upon pitch relations, and that therefore is of no relevance to questions of set-structure.[7] Another serious misunderstanding, and one to which some proponents of the system have contributed, is the confusion of postulate 3 with contrapuntal thematic operations. Postulate 3 simply affirms that intervallic relations between adjacent elements are only temporally affected when the set is inverted, nor is the totality of these relations altered when the original set and its inversion are strictly reversed. At the same time, postulate 3 implies that no other rigorous statement of the set exists, while postulate 4 asserts that transpositions of the set, in any of its four possible aspects, cannot affect the intervallic structure.

The twelve notes of the set derive from a division of the octave into twelve equal parts, a formation that should not be confused with the tempered chromatic scale, even though the resulting elements are respectively identical. The tempered chromatic scale is understood to be a necessary compromise with regard to the tone material of diatonic tonality, providing mere approximations of an infinite series of "real" notes. But where these elements are employed as components of a twelve-tone set one may presumably understand them not as practicable approximations of "real" notes generated by the cycle of fifths, but as "real" notes in themselves, generated by an equal division of the octave. The chromatic scale is still premised upon the perfect fifth as a "natural" referential structure that defines the functional relations, but the

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[5]"Prime" (in place of "original"), "set-complex," and "transformation" are terms introduced by Babbitt in the unpublished study mentioned in note 2, above.

[6]That is, there is no difference based on criteria that can be deduced from the postulates given above, or that can be shown to have any general relevance to the corpus of music that is known as "twelve-tone music." It is clear, however, that in much of this music certain "voice-leading" or harmonic implications seem to be suggested by the preference for one rather than another spelling in given instances.

[7]See Deems Taylor, *Music to My Ears* (New York: Simon & Schuster, 1949), p. 267.

twelve-tone set does not necessarily presuppose such a criterion of intervallic stability.[8]

An invariant series of intervals, as Schoenberg points out, "functions in the manner of a motive."[9] This ostinato twelve-tone motive, however, differs fundamentally from the tonal motive. A twelve-tone work, in Schoenberg's system, consists of perpetually varied restatements of a twelve-tone set. As a result of compositional operations the set may acquire certain thematic characteristics, distinctive features in contour, rhythm, phrase structure, dynamics, and so forth—features that may transform the abstract series into a more or less tangible thematic formation. At the same time, all the other pitch components of the work are derived from the set. If the set is understood to be a "motive" in itself, in terms of the ordered pitch relations which it presents, how is the "thematic" to be differentiated from the "nonthematic"? What is the context within which the "motive" is manipulated and developed? It is precisely the literal character of the transformations and transpositions of the set that implies its extramotivic function. Were these operations merely motivic, as they are frequently assumed to be, they would not need to be literal. But since they are the different aspects of a single abstract intervallic structure that provides the frame of reference, they can only be literal.

The specific ordering of the notes is a necessary consequence of the concept of the set as a unitary structure whose elements are not functionally differentiated. An unordered twelve-tone set would be equivalent to the semitonal scale, that is, it would be simply a statement of the available tone material. The seven-tone scale may be analogously regarded as a statement of the available tone material of the diatonic system, but in addition, certain functional relations among the elements of the seven-tone scale are implied. Since the elements of the twelve-tone set are not thus functionally differentiated, and since, unlike the seven-tone scale, the set comprises the totality of pitch classes, they must be ordered if the set, conceived as a unitary structure, is to have any constructive significance whatsoever.

Another twelve-tone system was devised by Josef Matthias Hauer.[10] Hauer's set, or "trope," as he terms it, is not a unitary structure but a combination of two six-note segments of mutually exclusive content, within each of which only the content, not the order, is specified. Thus the order in which the notes are

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[8]The attempts of Schoenberg (see Josef Yasser, "A Letter from Arnold Schoenberg," *Journal of the American Musicological Society,* VI [1953], 53 ff.) and others to derive the twelve notes from the "overtone series" are so farfetched and self-contradictory that they hardly require discussion. Their refutation, however, has no bearing on the musical validity of atonal composition (as H. Schnippering assumes it to have, in his "Atonalität und temperierte Stimmung." *Melos,* XVII [1950], 9 ff., and "Von der Zwölftonmusik," *Melos,* XVII, 312 ff.).

[9]Schoenberg, *Style and Idea* (New York: St. Martin's Press, 1975), p. 219.

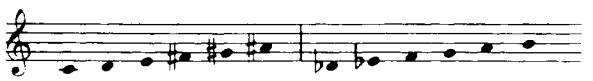
[10]J. M. Hauer, *Vom Melos zur Pauke* (Vienna: Universal-Edition, 1925); *Zwölftontechnik* (Vienna: Universal-Edition, 1926).

to be stated is a purely compositional matter, the set functioning only as a means of partitioning the total tone material into specified groups of notes. A similar procedure is employed by Debussy in the Prelude for piano, *Voiles* (see below, pp. 40 f.). With the single exception of two passing notes in bar 31, the outer sections of this work are limited to the notes shown in example 1:

EXAMPLE 1

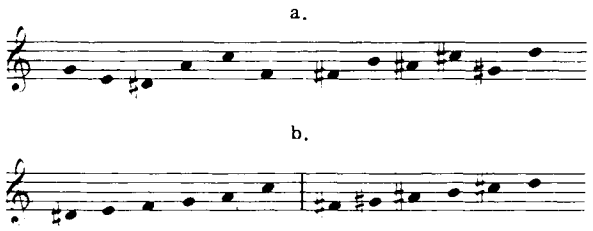
Had the remaining elements of the chromatic scale been employed to define another tonal area, the two hexachords together would have provided an example of one of Hauer's tropes (ex. 2). Since in Hauer's system the set has no preestablished linear structure, there is no question of the aforementioned problematical feature of Schoenberg's system—the relationship of the pre-compositional linear structure of the set to the compositional motive.

EXAMPLE 2



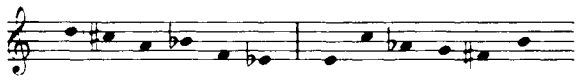
In Hauer's system, as in Schoenberg's, a given set is understood to retain its identity at all transpositions. Postulate 3, however, does not apply: the term "retrograde" can have no precompositional meaning where order is not one of the defining properties of the set; an unordered set may be inverted, but this operation, except in certain special cases (e.g., ex. 2), will revise the relative pitch content comprised within each segment and therefore generate a new trope. Consider the set of Schoenberg's *Third Quartet*, Opus 30. The prime form of this set (ex. 3, *a*) is represented as a trope in example 3, *b*. In order that the inversion of a set may represent the same trope as the prime, one or both of the following conditions must be met: each segment must be capable of inversion without revision of its content; the content of one segment must be statable as the inversion of the content of the other. An inspection of example 3, *b*, establishes the impossibility of either alternative.

EXAMPLE 3

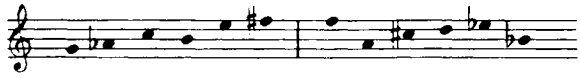


In his later work Schoenberg consistently employs special sets whose segmental content remains invariant under certain operations. For example, the prime set of the *Fourth Quartet* (ex. 4) is inverted as in example 5. The first segment of the prime and the second segment of the inversion are different permutations of the same six notes: consequently an identical relationship exists between the second segment of the prime and the first segment of the inversion. Obviously, such a relationship exists also between the retrograde (obtained by reading ex. 4 backward) and the retrograde-inversion (obtained by reading ex. 5 backward), so that the four aspects of the set are derivable from a single trope. Schoenberg thus combines the two basic, and originally independent, dodecaphonic serial procedures.[11]

EXAMPLE 4



EXAMPLE 5



[11]Which system, Schoenberg's or Hauer's, is entitled to the honor of chronological priority will not be considered here. On the origins of twelve-tone music see Herbert Eimert, *Lehrbuch der Zwölftontechnik* (Weisbaden: Breitkopf & Härtel, 1950), pp. 56 ff.; Willi Reich, "Versuch einer Geschichte der Zwölftonmusik," in *Alte und neue Musik* (Zurich: Atlantis Verlag, 1952), pp. 110 ff.; Schoenberg, letter to the New York *Times*, Jan. 15, 1950; Egon Wellesz, *The Origins of Schoenberg's Twelve-Tone System*, a pamphlet published by the Library of Congress (Washington, 1958); Perle and Lansky, "Twelve-Note Composition," in *The New Grove Dictionary of Music and Musicians* (1980); Jan Maegaard, "A Study in the Chronology of Op. 23-26 by Arnold Schoenberg," *Dansk Aarbog for Musikforskning*, 1962, 93 ff.; Bryan R. Simms, "Who First Composed Twelve-Tone Music, Schoenberg or Hauer?" *Journal of the Arnold Schoenberg Institute*, X/2 (November 1987). See also Chap. VI, n. 7.

Schoenberg objected to the use of the term "atonality" to designate a musical idiom not based on the traditional tonal functions, recommending in its place "pantonality." The intended implication, presumably, is that the new musical language is a consequence of the merging of all tonalities. But since, according to Schoenberg and his followers, the immediate effect of this supposed merging of all tonalities was the obliteration of the characteristic features of tonality in general, "atonality" would seem to be a more appropriate designation for this language.

Nevertheless, there are certain ambiguities, depending upon how one chooses to define "tonality." Contemporary musical developments have made it evident that triadic structure does not necessarily generate a tone center, that nontriadic harmonic formations may be made to function as referential elements, and that the assumption of a twelve-tone complex does not preclude the existence of tone centers.

Although the term "dodecaphony" is usually restricted to music employing a twelve-tone set, it ought to designate any musical idiom based upon the twelve-tone, or semitonal, scale, including "free" atonality. This term, however, and its equivalent, "twelve-tone music," will be employed here in the customary sense, as having reference to twelve-tone serial composition. Further terminological difficulties arise from the fact that dodecaphonic music is not necessarily strictly atonal, and that it may be "tonal" either in the sense that traditional elements derived from the major-minor system are consistently employed, such as the triadic harmonies of the Berg *Violin Concerto*, or in the general sense indicated at the end of the preceding paragraph.