Twelve-Tone Organizational Strategies:

An Analytical Sampler

by

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Introduction

Some of the greatest pleasures to be derived from listening to music involve those moments in a piece where we realize that we are taking in much more than just the most immediate events, that we are hearing through the surface, as it were, to the deeper, more global processes underlying the overall progress of the music. Such moments might be points of arrival, but they can also be foreshadowings, echoes, departures, or glimpses of as-yet-unattained destinations, to mention just a few possibilities. Whatever their specific qualities, taken as a whole they are part and parcel of our sense that music can be more than just a succession of moments, that it can be a multidimensional world with breadth and depth, into which the heard surface offers an entrance.

In tonal music, our glimpses beyond the horizons of the now are based on a number of factors, including our recognition of motivic transformations, the manipulation of surface textures, and an awareness of stylistic constraints, but above all they depend on our sensitivity to the connectedness of foreground and background structures. Clearly, much of the richness of tonal music arises from the ways surface details reflect and are reflected by structures

unfolding over much longer spans of time, and the hierarchical nature of tonal syntax provides a mechanism by which we can understand that wonderful sense of depth that allows events on the surface resonance with the piece as a whole.[1]

Such a sense need not be limited to tonal music. While tonal syntax provides a particularly powerful means of extending the significance of an event beyond its immediate context, there is a great deal of music not employing the grammar of tonality in which one can hear details as the surface signals of much larger structures, and which leaves the listener with the sense of multidimensionality so cherished in our appreciation of the tonal literature. One body of work I have found particularly rich in these qualities is the twelve-tone music of Arnold Schönberg, as well as the compositions of Milton Babbitt. Their work is at once compelling and satisfying, conveying in very direct ways a great sense of breadth and depth. Their music abounds with the sort of moment in which the details seem to crystalize much vaster stretches of time, where the confluence of a few notes resonates with the piece as a whole. The strong impression their music leaves is what has attracted me to it, and made me want to understand how it works. Coming to grips with the ways details interact with the whole in twelve-tone music, and the role of the twelve-tone row in the process, has held and continues to hold a great fascination for me, both as a listener trying

[1]Virtually the entire theoretical literature concerned with tonal music deals in one way or another with the ways this occurs, in individual pieces or in general.

to understand how I hear, and as a composer wishing to avail myself of the richness of twelve-tone syntax.[2]

In the following paper I shall offer some examples of ways certain moments in twelve-tone compositions accrete to themselves a significance far beyond their local context, and discuss some of the mechanisms used that allow us to hear a longer stretch of music from the perspective of a particular passage. The present observations are by no means comprehensive; rather, they may be taken as a sampler of some of the possibilities available within the twelve-tone system. I have drawn examples from pieces by Schönberg and Babbitt, but I have also included one of my own compositions to illustrate how I have tried to learn from my listening.

Initial Considerations

By far the greatest problem encountered in discussions of twelve-tone music is the role of the row. Various writers have raised the question of whether one can hear a twelve-tone row, and others have objected that the rows in certain compositions are so twisted in their surface projections that a listener would be highly unlikely to follow their tortuous paths.[3] Such objections would be well warranted, if, indeed, hearing the row was the point of listening to

[2]There is a considerable body of literature containing analyses of Schönberg's and Babbitt's music. A number of these works are included in the reference list at the end of the article.

[3]A cogent discussion of the issue of hearing rows may be found in Fred Lerdahl, "Cognitive Constraints on Compositional Systems," in *Generative Processes in Music*, edited by John A. Sloboda (Oxford: Clarendon Press, 1988):182-235.

twelve-tone music. However, if we look at the question from a different angle, this particular problem disappears.

Rather than beginning with the row, I believe it best to start thinking about twelve-tone music at the musical surface itself. The surfaces of many twelve-tone compositions can be thought of as a series of concatenated aggregates. Aggregates are not distinguishable by pitch-class content, but they achieve their individuality through the disposition of their elements, the twelve pitch-classes. The disposition of elements includes--but is not limited to--questions of temporal, registral, and instrumental grouping, as well as groupings provided by dynamics, articulation, and mode of playing. By means of various criteria, aggregates can be linked into larger spans, or compared and contrasted, depending on their interior dispositions. It is the interior dispositions of the aggregates that make up the surface details of a twelve-tone composition, and it is the ways aggregates relate that create our sense of larger spans.[4]

Such a viewpoint raises two important questions. First, we must be able in some sensible way to perceive aggregates. While I shall not deal with that issue here, I think it reasonable to assume that we do so by hearing their boundaries, as signalled by the recurrence of pitch-classes. Our sense of the specificity of a pitch-class collection greatly decreases as nine, ten, or eleven elements are included, but our sense of pitch-class identity does not necessarily weaken. Hearing aggregates simply requires us to reinterpret the

[4]A large body of literature deals with aggregate structure and linkage. Several works of particular note include Morris and Alegant (1988), Peles (1983), Samet (1987) and Swift (1976). Others are listed under "General Works" in the reference section at the end of the article.

significance of certain simple perceptual acts, so that we parse a highly chromatic surface by aggregate boundaries, rather than by collectional content. Nor is the issue one of whether or not we can count to twelve: twelve is simply the largest collectional size that may be constructed without pitch-class repetition. From the perceptual point of view, the absolute number of pitch-classes in an aggregate is not as crucial as is the fact that we cannot readily distinguish among them solely by their abstract intervallic relations, as we can, for example, among the elements of the diatonic collection.[5]

The second question, that of relations among aggregates, is more complex still, and worth a closer look. A useful tool for characterizing the composition of an aggregate is the *mosaic*, the partition of the aggregate into discrete pitch-class collections.[6] A mosaic is an unordered collection of unordered pitch-class collections (although it may also be used for unpitched order numbers, as shown in Mead, 1988). Any given aggregate in a musical surface generally invites multiple superimposed mosaic interpretations, based on different grouping criteria. Working hand in hand with mosaics as a means of characterizing aggregates and establishing their relationships are interval patterns, sequences of intervals ordered in time and/or register.[7]

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[5]For a discussion of place-finding properties in the diatonic collection see Richmond Browne, "Tonal Implications of the Diatonic Set," *In Theory Only* 5, nos. 6 and 7 (1981):3-21.

[6]The term "mosaic" was first used in Martino (1961), and is explored in Morris and Alegant (1988) and Mead (1988).

[7]For an extensive discussion of relations among collections, ordered and unordered, see Morris (1987).

Aggregates may be linked in an enormous variety of ways, based on their mosaic interpretations and their interval patterns. For example, a string of aggregates might possess the same mosaic in one domain, with various other mosaics projected in other domains. The shared mosaic might be constantly reinterpreted by the interval patterns of its constituent collections. Conversely, a string of aggregates might each contain different members of a given mosaic class, all projecting the same interval pattern. Additionally, a string of aggregates might be linked by means of aggregates formed by mosaics spanning them. Each approach may have different musical significance, depending on the context and on the mosaics of interval patterns in question. All such approaches and more interact in myriad ways in the twelve-tone repertoire.[8] We shall see numerous examples below.

How does the notion of the twelve-tone row fit into this view of music based on aggregates? Relationships among and between aggregates can potentially involve all possible collections and interval patterns within the total chromatic universe. This is obviously a huge realm, and becomes even larger when we remember that relations between and among aggregates can entail multiple interpretations of their details. Marshalling relationships into compound and interlocked strategies can further enrich matters. Needless to say, the range of possibilities for creating relationships among aggregates makes the control of those relationships a significant challenge.

[8]Examples of each are detailed in the various articles found in the reference section; Schönberg's works tend to depend on the first two examples, while Babbitt's depend on the last, although there are instances of all sorts in both of their works.

A twelve-tone row class can provide the leverage needed to organize the possibilities inherent in aggregate composition. It provides a perspective on the totality; it gives one a place to stand within the chromatic world.[9] But it does so in ways intimately linked with the means by which its members are used to shape the details of a composition's aggregates. The study of a row class is a study of possibilities; their potential becomes actual only through their emergence in the surface of a composition.

Twelve-tone rows may be defined in two ways, reflecting the dual perspectives of order and collection. One way is to define them as an ordered sequence of eleven directed interval-classes (intervals determined in only one dimension) that traverse the aggregate. The twelve end-points of the intervals represent the twelve pitch-classes. We might notate such a string with interval-class numbers (in italics) preceded by plus or minus signs.[10] Classical transformations yield four strings by reversing the order of the numbers and/or the direction of the signs. This is illustrated in Example 1.

[9]It is not exclusive from this point of view, however: the music of Elliott Carter is similarly dependent on dispositions of the materials of the total chromatic, but his perspectives are frequently determined by distributions of intervals and collection classes among members of his ensembles. See, for example, David Schiff, *The Music of Elliott Carter* (London: Eulenburg Books, New York: Da Capo Press, 1983).

[10]We might also notate this using the twelve interval numbers from 0 through 11, complementing them mod 12 for inversion. Morris (1987) contains a wealth of techniques for dealing with interval patterns in twelve-tone rows.

Example 1:

P:	2	1	A	5	6	4	7	8	3	B	0	9
P:	*-1*	*-3*	*-5*	*+1*	*-2*	*-3*	*+1*	*-5*	*-4*	*+1*	*-3*	
I:	*+1*	*+3*	*+5*	*-1*	*+2*	*+3*	*-1*	*+5*	*+4*	*-1*	*+3*	
R:	*+3*	*-1*	*+4*	*+5*	*-1*	*+3*	*+2*	*-1*	*+5*	*+3*	*+1*	
RI:	*-3*	*+1*	*-4*	*-5*	*+1*	*-3*	*-2*	*+1*	*-5*	*-3*	*-1*	

Seen from this point of view, a row class provides a perspective on all the possible intervallic sequences. Some are obtainable from adjacent intervals, while others are obtained only from sums of intervals. Some sequences may not be obtainable at all from within a row's sequence, or its transformations, and must be drawn from more than one row, either combined or concatenated.[11]

The second way to define a row is as the assignment of the twelve pitch-classes to twelve order numbers.[12] Transformations

[11]Interval patterns, of course, are not interpreted in terms of the musical dimensions: time and register impose two dimensions for ordering, requiring us to use two sets of signs, or else the twelve interval numbers and signs to indicate order in both dimensions. Interesting issues arise from questions of order in register; see John Rahn, "On Pitch or Rhythm: Interpretations of Orderings Of and In Pitch and Time," *Perspectives of New Music* 13, no. 2 (1975):182-203 for a discussion of this issue.

[12]This means of defining the twelve-tone system originates in Babbitt (1960) and is explored in Mead (1988).

can be defined as operations on the pitch-classes and order numbers. In classical practice, the operations include transposition and inversion through all values in the pitch-class domain combined with transposition by 0 and inversion at index number B in the order number domain.[13] Seen from this point of view, a row class becomes the association of the totality of pitch-class collections in the chromatic universe with the totality of order number collections.[14] Members of a given collection class in one domain are associated with various collections in the other domain; how this occurs depends in large part on the ordering of the row. Whichever way it is viewed, a row class will create distinctions among the totality of collection classes and their possible orderings through their placement and availability within its members.

Rows, however, are *abstractions*. *Aggregates* represent musical reality, the heard surface of a piece, and it is their details that create relationships in music. By seeing how the members of a row class can shape the details of aggregates, we begin to understand how twelve-tone rows can control relationships among aggregates. By choosing to use a row class to control aggregate details, one is providing a context for those details. One may use any desired

[13]The term "index number" originates in Milton Babbitt, "Twelve-Tone Rhythmic Structure and the Electronic Medium," *Perspectives of New Music* 1, no. 1 (1962):49-79. In those systems defining inversion Iy(x) as (y-x), y is the index number; in those systems defining TyI(x) as Ty(11x), y is also the index number. In this paper I have used the alphanumerical notation for pitch-classes, with A and B for 10 and 11, respectively.

[14]Discussions of pitch-class collections and their relations may be found in Morris (1987), as well as John Rahn, *Basic Atonal Theory* (New York and London: Longman, 1980). The *locus classicus* of such studies is Allen Forte, *The Structure of Atonal Music* (New Haven and London: Yale University Press, 1973).

collection in any desired order as a detail, but with the use of a row class, its context will be determined by the possible order number locations of that collection in the members of the row class, along with their associated interval patterns. Thus the selection of a twelve-tone ordering, the defining of a row class for a composition, imposes a hierarchy upon the materials of the chromatic universe by defining their various positions with regard to the members of the row class.

By itself, a row class does not determine relations among its members. It is only by specifying partitions of rows that we can establish various invariance relations. Different types of invariance relations will divide up the row class into different groups of families of row. A given row can be related to various other rows by different criteria. While these various different criteria in and of themselves don't create hierarchies within the row class, they provide a mechanism for creating hierarchies in the musical surface. With the proper selection of partitionings, a given row or family of rows can provide us with a particular perspective on the row class, just as the row class itself provides us with a particular perspective on the chromatic universe.[15]

We can now see how a row class can provide the leverage to relate details to larger musical spans in aggregate music. The composition of a row in a musical surface will partition it, frequently in a variety of ways simultaneously, depending on various grouping

[15]Stephen Peles has pursued specific aspects of this in "Steurmann's Tale," an unpublished essay presented in part at the Midwestern Music Theory Conference at the University of Iowa, 1988. I am indebted to Stephen Peles for a number of conversations we have had on this and other issues surrounding twelve-tone music.

criteria.[16] The details of an aggregate, therefore, represent the various partitionings of its underlying row, row segments, or their combinatorial combinations, depending on the context. As relationships among aggregates are based on the various ways we may link or associate their details, the mechanism for controlling them can be the ways the resulting partitions allow us to relate members of the row class. The proper selection of partitionings and their associated relationships can give a certain passage linkages with many others, in myriad ways. In this manner, hierarchies of significance among aggregates can be created, from which can be derived the dramatic strategies that form the overall flow of a piece.

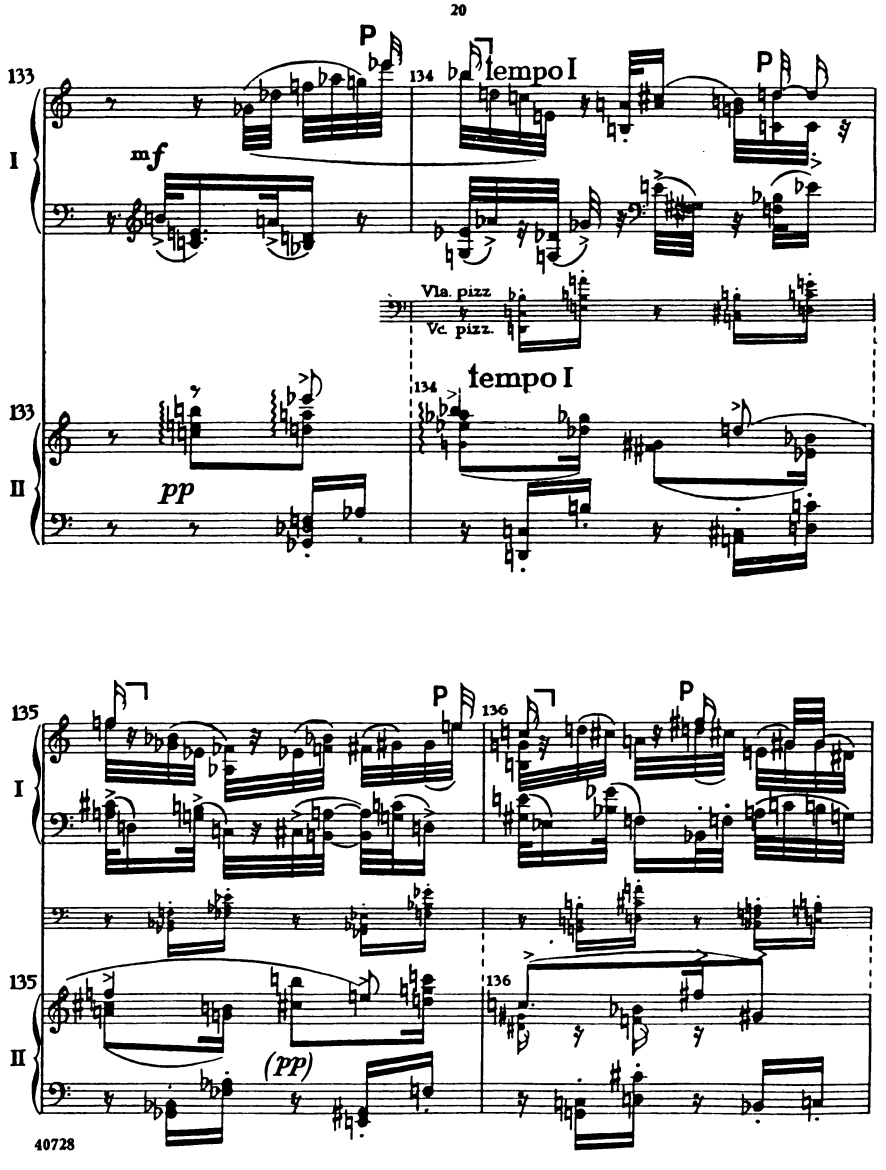
Construed in this manner, twelve-tone music does not demand that we hear "the row," or even that we count to twelve. What we *do* hear are the intricate recombinations of surface detail, both in terms of collection and intervallic pattern, that are controlled by the abstract structure of the row class, and from that perception we are led to understand the farther-flung significance of the particulars of a given moment. The following analyses suggest some of the ways the twelve-tone system allows us to bring this about.

Schönberg: Piano Concerto

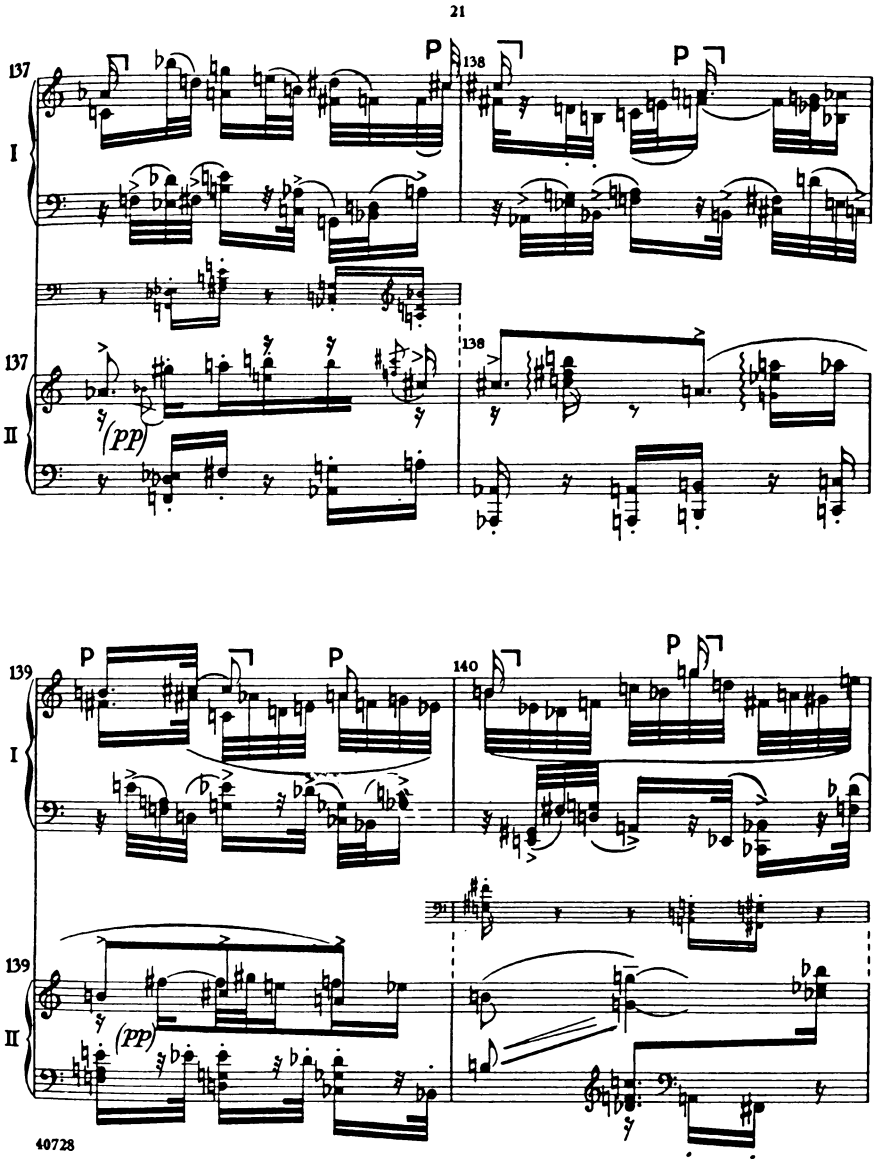
Our first example is drawn from the opening section of Arnold Schönberg's Concerto for Piano and Orchestra, Op. 42. I have chosen it for a number of reasons: its exhaustive use of its row class particularly intensifies the question of how the influence of a single passage might reign over a large span, and its arrangement of

[16] See Peles (1983) and Mead (1985).

Example 2



Example 2



the members of its row class offers the temptation for the sort of analytical observations which, without careful connection to the musical actualities of the piece, invite a justifiable skepticism towards the twelve-tone system as simply an imperceivable tool of generation. Closer scrutiny of this passage, however, suggests that it exemplifies a remarkably successful use of a row class for creating an interaction between details and large-scale structure in an aggregate-based composition.

The reprise, at bar 133, of the work's opening melody in an elaborately figured version is a passage rich in resonance with the music up to that point. Several surface factors draw our attention to the passage, including the profligacy of figuration and luxuriance of detail in both the orchestra and the solo part. The passage is also easily identified as the first moment of return, despite the exuberance of its setting. But surely neither surface dazzle nor enhanced repetition can satisfy our sensibilities as to the source of the passage's significance; there must be something more beneath the surface. Example 2 contains the passage.

A superficial look at the underlying row structure of the movement up to this point can lead to a similar dissatisfaction. The passage marks the first return of members of the row class in the course of the work, and the predominant member is the same as that found at the very outset. In the music preceding bar 133, virtually all of the members of the row class had been used. The observation of "first recurrence" is highly unsatisfying, and is ameliorated only slightly by a closer look at the disposition of rows in the first 132 bars.

The row class, as was Schönberg's general practice in his mature twelve-tone works, is based on an inversionally combinatorial

hexachord type, and so may be discretely partitioned into twelve families of four rows each, each family containing segmentally a particular member of the underlying hexachord's mosaic class.[17] In the body of the section, rows are grouped by combinatorial family, and successive families are transposed by the interval sequence of the form of the row found in the melody at the outset and at bar 133.[18] A member of the row class, its combinatorial family, and the sequence of transpositions of combinatorial families along with bar numbers may be found in Example 3.

This gives a little more edge to the passage, in that it marks the return to the initiation of a large-scale series of transpositions related directly to the interval pattern of the row class, but the abstract nature of the observation can, if taken alone, prompt the criticism that the pattern of transpositions spanning the music up to this point is merely a device for generating material. Without some sort of justification, the duplication of the intervals of the row in the sequence of transpositions of families might remain merely an intellectual conceit, and asserted alone, can create a false sense of security as an example of large- and small-scale connection. If the

[17] See, for example, Lewin (1967) and Babbitt (1961).

[18] This is noted in William Rothstein, "Linear Structure in the Twelve-Tone System: An Analysis of Donald Martino's *Pianississimo*," *Journal of Music Theory* 24 (1980):129-165. By thinking of the row of the initial melody as generated by a string of transposition operators applied to a pitch-class, and the continuation of the music as the same string applied to a different object, the hexachordal mosaic, we can see a parallelism of structure between the opening melody and the body of the section, but this must somehow become a vivid part of our hearing. Such a way of looking at the passage is outlined in Morris (1987), as well as in David Lewin, *Generalized Musical Intervals and Transformations* (New Haven and London: Yale University Press, 1987).

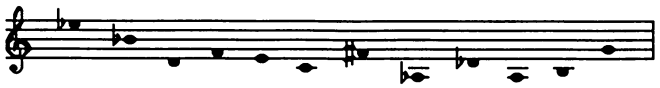
observation is to cut any ice, there must be a more vivid connection between the surface details of the music and the way the rows are deployed. Otherwise, the function of the row class in the music remains opaque to our perception.

We can begin to get an understanding of a more believable connection between the surface and the longer-range structure of the opening section of the Concerto by taking a close look at the opening bars. The opening aggregate of the work is rich in detail. In one way or another, all of its details participate in the progress of the Concerto, usually in a multiplicity of trajectories.[19] The first phrase of the work is found in Example 4.

We may initially observe that, with the exception of a tiny overlap at its end, the extent of the first aggregate matches the first large phrase of a melody found in the right hand. This phrase contains all twelve pitch-classes uniquely fixed in register, with the single interpolation of a repeated ordered segment. It would be misleading simply to say that the melody is a statement of a row. There are many details of rhythm, articulation, reiteration and slurring that are critical to the progress of the piece, and to wipe them out by such a statement would put the analytical cart before the horse. Far better to say that one of the attributes of the melody is that its succession of intervals corresponds with the directed interval-classes of a portion of the row class, and its sequence of pitches duplicates the sequence of pitch-classes of a member of that portion of the row class. (This, of course, is terribly cumbersome,

[19] See Peles (1983) and Samet (1987) for exhaustive accounts of the multiple implications of the openings of movements of works by Schönberg. Peles' presentation, "Steuermann's Tale," provides additional examples.

Example 3

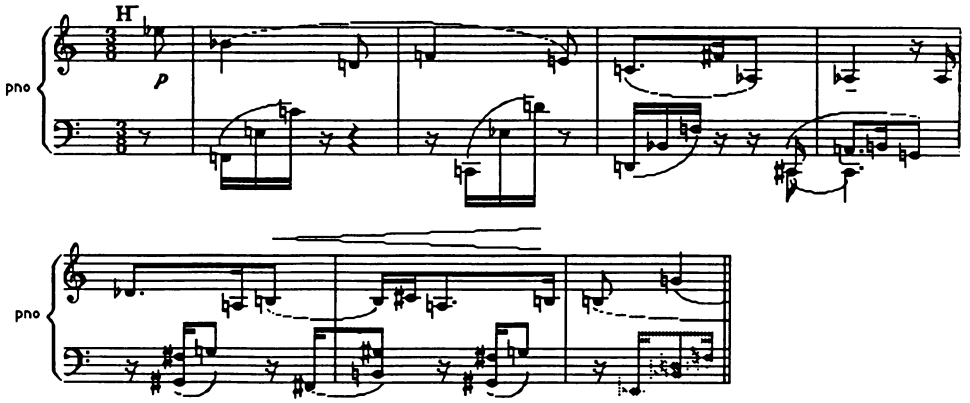


P: 3 A 2 5 4 0 6 8 1 9 B 7
I_BP: 8 1 9 6 7 B 5 3 A 2 0 4

Complex: P, I_BP, RP, RI_BP

T_0 T_7 T_B T_2 T_1 T_9 T_3 T_5 T_A T_6 T_8 T_4 T_0
Bar: 1 46 54 63 74 86 103-6 107 117 122 126 133

Example 4



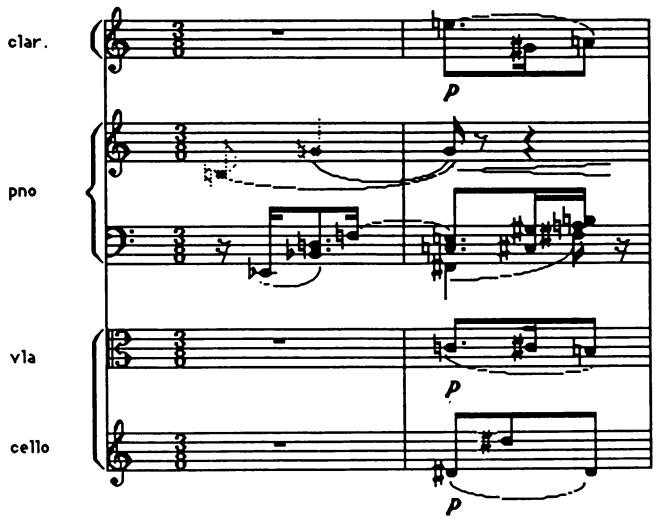
and we shall try to avoid such language, but the point cannot be made too strongly that musical actualities are *not rows*; *rows are abstractions*.)

The large-scale pattern of transpositions used in the movement depends at the very least on our recognition of families of rows grouped by hexachordal content. It is worth looking at the opening aggregate to see how the hexachords fare. The opening melodic phrase is broken into two smaller units, articulated by a break and by the repetition of the note Ab. The division does not correspond to the hexachordal division of the row in question. It does, however, allow each subphrase to open with related interval-class patterns, projected similarly. Although the melody itself does not immediately reflect a hexachordal partition, this particular detail soon reveals its significance with regard to the hexachords in subsequent aggregates employing other members of the combinatorial family.

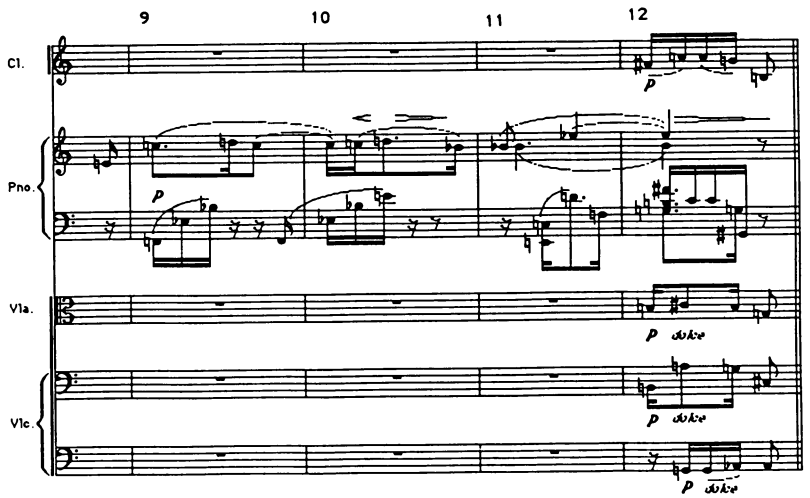
Turning to the musical surface as a whole, we hear a more direct interpretation of hexachords. The initial aggregate is atypical of Schönberg's more familiar practice in that it contains repetitions of pitch-classes in several registers, but what it does maintain is the hexachordal boundary.[20] The use of pitch-classes from the first

[20]Initially it might seem that the Concerto is a contradiction of twelve-tone aggregate practice, given the number of pitch-class repetitions in various roles in the opening aggregates. Indeed, the Concerto is full of aggregates containing octaves, through orchestral doubling or figurative repetition in various registers. Nevertheless, as the opening melody should suggest, with its regular matching of hexachordal and aggregate boundaries with phrase beginnings and endings, the aggregate structure of the Concerto is readily heard just below the surface of octave duplications.

Example 5



Example 6



hexachord in the accompaniment is abandoned at the point in the melody where the hexachordal boundary is crossed (m. 3), and the remainder of the aggregate is given over entirely to the pitch-classes of the complementary hexachord.

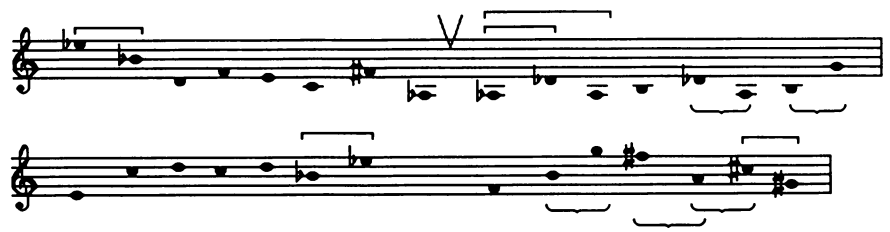
The continuation of the passage picks up several aspects of the first aggregate. The second aggregate, found in bars 7 and 8, includes the first entrance of members of the orchestra, doubling pitch-classes found in the piano whose notes replicate dyads found in the melody of the first aggregate. The instrumental parts, however, produce different configurations whose significance will emerge later in the discussion. The passage is found in Example 5.

The continuation of the melody is initiated in the third aggregate. Several details spring immediately to the ear. First, the melody continues in a second large phrase analogous to the first one, running through all twelve pitch-classes, and articulated into two subphrases. However, the second large phrase--unlike the first--extends over two complete aggregates whose boundary is marked by the break between subphrases. In the third aggregate, as in the first, pitch-classes are duplicated in various registers, but hexachordal boundaries are respected, articulated by the reentrance of the orchestra (m. 12); it is not hard to hear that the hexachordal collections of the third aggregate duplicate those of the first. The hexachordal boundaries in the fourth aggregate are somewhat blurred by the incursion of an extra note in the melody during the first half, and the intrusion of notes from the first hexachord in the second, but these aberrations fall at the ends of the hexachords, which allows us to hear them as additions to the normative hexachordal partition underlying the aggregate. The third and fourth aggregates are found in Example 6.

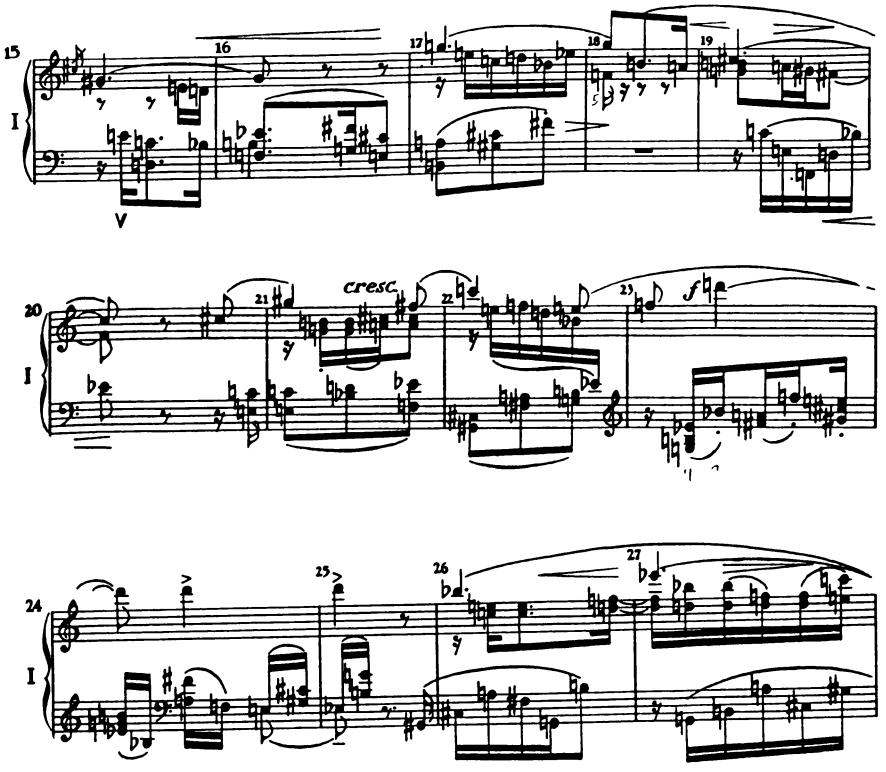
While the composition of the aggregates projects the collectional invariance of the passage, a comparison of the interval sequences of the two large phrases reveals the retrograde-inversion relationship between their two rows. This is made vivid by the careful preservation of most of the registral dispositions of their dyads. The exceptions partake in another connection between the two phrases. It will be recalled that both subphrases of the opening aggregate were initiated by the same interval-class. The second phrase is divided so that its two subphrases close with the same interval-class, and comparison reveals the collectional connection among the four spots. The two discrete exceptions in the registral disposition of dyads also recreate the registral disposition of the same dyadic collections found in the first large phrase. The connections between the two melodic phrases are illustrated in Example 7.

The composition of the details of the first four aggregates makes vivid the hexachordal partition of their underlying rows, and plays out a number of consequences of this division. Both hexachordal collections can project the same ordered interval patterns to within certain simple transformations, and the two interval patterns themselves can each be used to articulate the same subsets in a given hexachordal collection. All of these properties participate in the continuation of the passage. Bar 17 marks the initiation of a third large phrase. Immediately connecting it with the preceding phrase is the conjunction of two discrete dyads marked as exceptions in the previous phrase, found in the same registral disposition. Continuing with the melody, we can see that it represents the retrograde of the pitch-class sequence of the initial phrase, and so must abstractly contain the same hexachordal

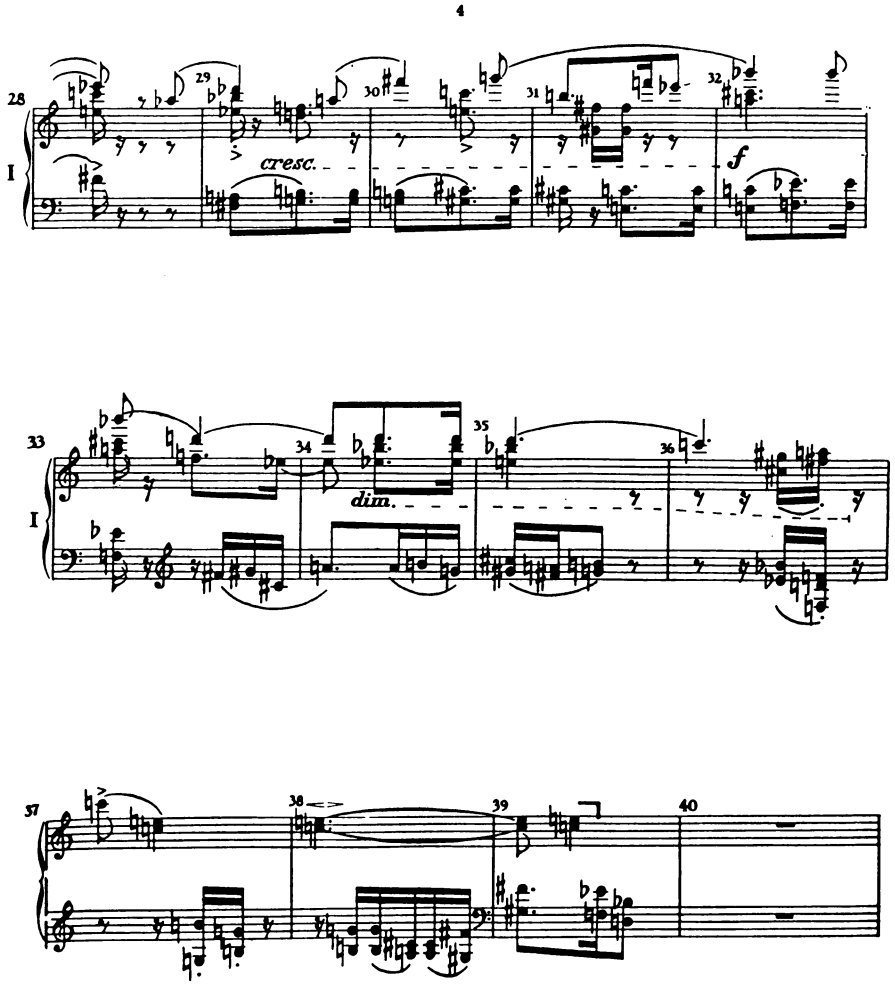
Example 7



Example 8



Example 8



collections. Example 8 contains the melodic continuation of the passage to its close.

It should come as no surprise that a fourth large phrase, beginning in bar 28, represents the retrogression of the pitch-class sequence of the second large phrase, preserving the hexachordal content, and completing a melody based on the four members of a hexachordally invariant family. Such a means of establishing functional families at the outset of a composition occurs frequently in Schönberg's twelve-tone music, and similar passages may be found in the Variations for Orchestra Op. 31 and the first movement of the Fourth String Quartet.[21] However, we must attend to the details of these phrases' registration, rhythm and accompaniment better to understand the musical significance of the abstract family.

It is easy to understand the significance of the last dyad of the third phrase, in light of the previous discussion, and to hear how it operates in conjunction with the fourth phrase as part of a varied reprise of the opening. It is obvious that the fourth phrase returns to the rhythmic pattern of the first phrase, but our sense of return is not based solely upon this detail. The last dyad of the third phrase and the first dyad of the fourth are the two dyads marking the openings and closings of the subphrases of the first two phrases, respectively. Furthermore, the initial trichord of the fourth phrase duplicates both in pitch-class and in intervallic disposition the continuation of the second subphrase of the first phrase, and the three discrete dyads of the beginning of the fourth phrase replicate

[21]This general feature of Schönberg's opening melodies is discussed in Babbitt (1960) and (1961), as well as in his *Words About Music*, edited by Stephen Dembski and Joseph N. Straus (Madison: University of Wisconsin Press, 1987).

in various ways dyads heard at significant junctures in the first three phrases. This is illustrated in Example 9.

While the opening of the fourth phrase forms a synoptic reprise of what has preceded, its continuation helps to close off the initial section of the work. The fourth phrase's continuation varies from that of the first, enabling it to reach the highest point in the melody with the pitch-class Bb, the first metrically accented melodic note of the piece. While this move obscures a second replication of the opening dyadic motive of the piece, it allows the descent from the high point to duplicate a dyad from the opening of the first phrase in a rhythmic pattern associated with the same interval-class at the close of the first phrase. This same pattern is duplicated with the final dyad of the phrase, using the pair of pitch-classes that opened the second large phrase. These points are illustrated in Example 10.

While the completion of the melodic line makes clear the notion of family membership based on hexachordal invariance within the row class, the setting of the third phrase already takes advantage of one of the consequences of both hexachordal collections' abilities to project both interval patterns. The fifth aggregate no longer exhibits temporally the hexachordal partitioning of the first and third, but is formed from both hexachordal collections played simultaneously with the same interval pattern. This, of course, is simply another way of describing hexachordal combinatoriality, but it is interesting to think of it in this instance emerging as an exploited potential of the preceding music. The remainder of the passage takes advantage of the same potential, and draws us into hearing the hexachordal mosaic of the opening aggregate in new orientations,

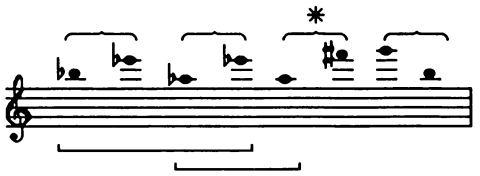
firming up the functional possibilities of using row families based on hexachordal invariance. This is illustrated in Example 11.

Our consideration of the opening is hardly complete, even to describing those details that draw us through it alone. But I hope it helps establish the importance of the composition of the aggregates to create connection and continuity. Although the potential relations among the members of the hexachordal row family made the relations possible, the mere presence of the rows cannot guarantee their actuality.

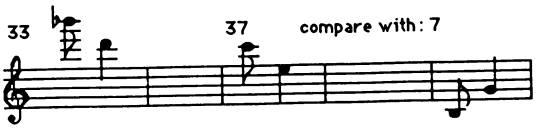
We have seen how the continuation of the opening passage emerges from certain details of the opening aggregate. Let us now turn to the ways the remainder of the Concerto up to bar 133 emerges from the same source. The next major section begins in bar 46. It consists of a recomposition of the four phrases of the opening melody, played in the orchestra with an elaborate piano accompaniment. The four phrases, however, are each at different transposition levels, and each represent a different hexachordal family. The families represent transpositions determined by the interval pattern of the initial melodic phrase. In the opening melody, the four notes following the initial Eb are slurred together, just as the four transpositional areas work together as a unit in the second major section. Thus a particular detail of the opening aggregate foreshadows the specific compositional grouping of the more abstract background pattern.

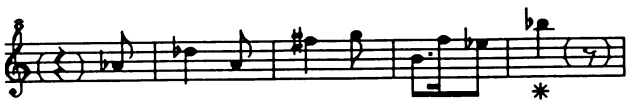
More critical to our hearing the connection, however, is the way the pitch-class Bb, which initiates the new section, has been given special attention throughout the first part of the piece. Not only has it been constantly connected with Eb, the initial pitch-class of the piece, but it is the pitch-class of the highest note of the entire

Example 9 (See Example 7)

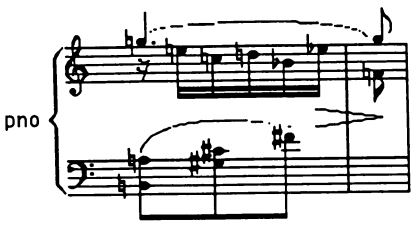


Example 10





Example 11



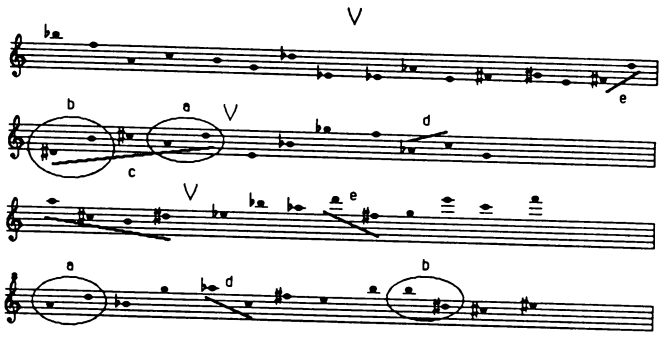
PC:	RI_BP	4 0 2 A 3 5
D.IC:		-4 +2 -4 +5 +2
D.IC:		+4 -2 +4 -5 -2
	RP	7 B 9 1 8 6

melody, in the last phrase. Its acquisition of Eb's role at the beginning of the second section is readily noted, and facilitates our apprehension of the relationship between the notes of the work's initial dyad and the first major juncture of the piece.

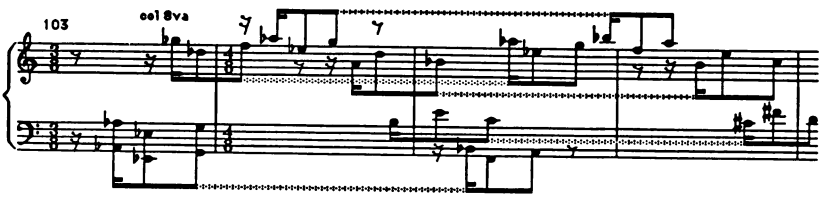
Thus being clued into the initial transpositional difference between the first phrases of the two statements of the melody, we can become sensitive to the intervals of transposition between the individual phrases of the second statement thereof as compared with their relationships in the first, and so become aware of the larger transpositional scheme of the work by way of its details. It is interesting to note how the various transpositions of the individual phrases of the second melodic statement shift the balance of connections between phrases made by dyadic invariance in striking ways: the moments that drew our attention in the first section now create a new network spanning the recomposed melody. A few strands of this network are shown in Example 12.

We have observed how one detail of slurring in the initial aggregate is echoed in the progress of the piece, but this is by no means all that is prepared in the compositional disposition of the opening phrase. The rhythm of the opening passage groups pitch-classes into pairs in ways that contradict the slurring. These dyads and their associated intervals will be seen to have great significance in our discussion of the passage at bar 133, but one aspect of the rhythm holds considerable significance for the general unfolding of the music up to that passage. For the moment, we shall skip over the pitch-class C, the next note following the four slurred together. The following pair of pitch-classes in the opening line, F# and Ab, signal an aspect of the large-scale form by their rhythmic disposition. Up to this point in the opening melodic line, pairs of pitch-classes

Example 12



Example 13 Excerpted and reduced



6 1 5 8 7 3 9 B 4 0 2 A
8 3 7 A 9 5 B 1 6 2 4 0
B 4 0 9 A 2 8 6 1 5 3 7
1 6 2 B 0 4 A 8 3 7 5 9

have been grouped similarly, but at this point, the two notes are played in more rapid succession, jamming them together. This effect is echoed at the portion of the piece using the two transpositional levels analogous to the two notes, bar 103 and following, and the structure of the passage takes advantage of a particular invariance relationship between two rows related by T2. The first hexachord of a row related to that of the opening by transposition may be partitioned into two discrete members of the same trichordal set-class, [0,1,5], related by T2. Thus the second trichord of a given row will be found as the first trichord of T2 of that row, the relationships between the two areas in question. Schönberg composes the passage to overlap the two areas, and to animate the invariance: just as the two elements of the initial aggregate are compressed together rhythmically, the passage to which they correspond comingles its underlying combinatorial families, thereby highlighting just that invariance relating them.[22] This is illustrated in Example 13.

The passage at bar 103 also corresponds to the hexachordal boundary of the row embodied at the outset, which was respected in the opening aggregate. By analogy, bar 103 marks the initiation of the first extended orchestral passage without the soloist, who remains silent until the last transpositional area.

And what about the passage that corresponds to the preceding element of the opening line, the pitch-class C? How does its placement in the passage as a whole reflect details of the initial

[22]The implicit importance of trichordal mosaics suggested here has been pursued in detail in an analysis of the cadenza of the Concerto in Brian Alegant's presentation to the Society for Music Theory, 1988, in Baltimore, entitled "Toward the Seventy-Seven Partitions of the Aggregate." He is now at work on a dissertation which contains an analysis of the Concerto in terms of generalized partitions.

phrase? The note in the melody is associated differently by different criteria. It is articulated from the preceding four notes and associated with the following two by slurring, but the rhythm of the line creates the opposite reading. The passage in question, found at bar 86, offers similar dual interpretations, based on textural and motivic criteria. The passage is clearly articulated from the preceding music by nearly four bars of solo piano, and the music following at bar 103 can be heard as an extension of a motive in the passage, but the piano's departure at bar 103 and the recurrence of a version of the work's opening phrase in the passage permit a secondary interpretation linking it to the preceding music, while separating it from what follows.[23] This secondary interpretation is underlined by an echo of the climax of the composition's initial melody. It will be remembered that the fourth phrase of the melody duplicates the rhythm of the opening while altering slightly the association of elements of the row with the series of attacks, in order to place Bb at the climactic point of the line. In the passage in question, Schönberg performs the same feat with T9 of the initial row, to great effect. The row in question is related by I8 with the row embodied in the fourth phrase of the opening melody, so that Bb is held invariant at the same order number in both rows.[24] This is illustrated in Example 14.

[23]Additionally, a prominent aspect of the orchestral surface in the passage is a motive that first appeared as an accompaniment to the melody in the second major section.

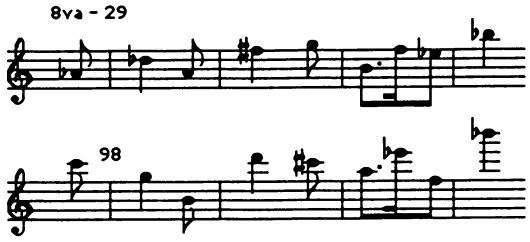
[24]Schönberg plays a similar game with an invariant pitch-class at a particular order number in a passage near the opening of the second movement of the Violin Concerto, Op. 36.

The remainder of the first part of the Concerto, from bar 107 until the reprise at bar 133, continues to exhibit qualities that allow us to relate the music to the opening of the work. Superficially, the change of texture at bar 107, along with the reentrance of the piano at bar 126, groups together the three transpositional areas that correspond to the three repeated elements of the opening melodic line. Motivically, the passage echoes the third large phrase of the opening section. But it is the invariance relationship prepared in the preceding passage that allows Schönberg to make a strong connection with the very opening of the piece. The relationship between the hexachordal area at bar 107 and the opening is the same as that found between the two areas overlapped in the preceding passage, and this allows the opening trichord's collection to emerge in the musical surface at 108 and following. To drive the point home, the same relationship is maintained between the remaining two transpositional areas of the passage, and is articulated in the surface in a way that echoes the motivic disposition of the opening trichord of the piece.[25] This is all illustrated in Example 15.

With such a wealth of relationships linking the opening melodic statement with the progress of the music, it should come as no surprise that the return of that opening melody would be freighted with resonance, but Schönberg has further elaborated the setting to reveal still more connections between the specific composition of the initial aggregate and the structures guiding the

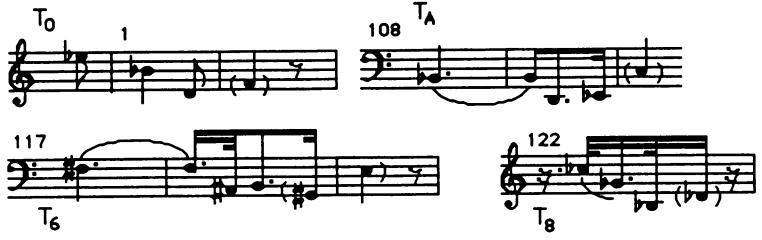
[25]Such relationships, based on parallel relationships between pairs of collections or rows, are directly analogous to dyads of like interval-class found at various sets of order numbers within a row, and thus are subject to the same sorts of manipulation. This point is made and examined in great depth in Chapter Four of Morris (1987).

Example 14



8 1 9 6 7 B 5 3 A 2 0 4
0 7 B 2 1 9 3 5 A 6 8 4

Example 15



T_0 : 3 A 2 5 4 0 ...
RT_A : ... A 2 3 0 8 1
RT_6 : ... 6 A B 8 4 9
T_8 : ... B 6 A 1 0 8

entire passage. The figuration surrounding the return of the opening phrase reveals yet another aspect of the rhythmic disposition of the first aggregate: each of the first three discrete dyads of the melody are figured with statements of complete combinatorial pairs in the piano, doubled in the orchestra. The dyads are formed from the end elements of ordered segmental hexachords, and represent the three interval-classes available from non-adjacent hexachord-ends in the row class. The first deviation from the rhythm of the dyads is with the pair F# and Ab, as we noted in our discussion of the passage at bar 103. However, this is also the first of the discrete dyads of the melody whose interval cannot be formed in the manner described. Their setting is derived from within a single hexachord, matching their shorter overall duration. The setting also reflects the source of the invariance relationship exploited at bars 103-106 in that the two notes are the same elements of two T2-related [015] collections. The remainder of the melody also conforms to the setting of the initial three dyads. The repetition of the Ab allows it to be linked with C#, yielding one of the usable interval-classes, as does the reiteration of C# allow it to be connected with A. The final B and G also provide an available interval-class, but it is the interpolated fragment, B, C#, and A, that in conjunction with this last dyad allow an echo of the final two transpositional areas preceding the reprise. The underlying structure of the figuration in the return of the melody is found illustrated in Example 16; it may be compared with Example 2.[26]

The passage is rife with references to the preceding music, by collection, mosaic and motive. I shall leave these for the most

[26] A briefer account of some of these points is found in Mead (1985).

Example 16

T_3 (of Combinatorial Family) T_9 T_9

6 1 5 8 7 ③ | Ⓐ 2 0 4 B 9 || 1 9 B 7 0 ② | ⑤ A 6 3 4 8 || 3 5 A 6 8 ④ | ⓪ 7 B 2 1 9 ||

B 4 0 9 A 2 | 3 7 8 5 1 6 || 4 8 6 A 5 3 | 9 1 2 B 7 0 || 1 9 B 7 0 2 | 8 4 3 6 A 5 ||

//

T_7 T_1 T_5

⑥ 2 1 4 ⑧ 3 || ⑧ 0 A 2 9 7 | 4 B 3 6 5 ① || ① 6 2 B 0 4 | ⑨ 5 7 3 8 A ||

A 5 9 0 B 7 || 5 1 3 B 4 6 | 0 8 7 A 2 9 || 8 3 7 A 9 5 | B 1 6 2 4 0 ||

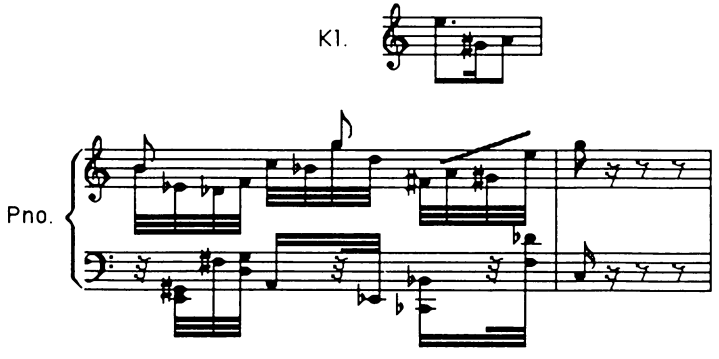
//

T_8 T_4

Ⓑ 6 A ① 0 8 | 2 4 ⑨ 5 7 3 || Ⓑ 3 1 5 0 A | ⑦ 2 6 9 8 4 ||

4 9 5 2 3 7 | 1 B 6 A 8 0 || 8 4 6 2 7 9 | 3 B A 1 5 0 ||

Example 17



part to the reader's delectation, but I must point out one particular favorite. A small but particularly nice detail reveals a connection with the opening setting and the first orchestral entrance. In the first orchestral entrance, the clarinet, the top voice, played a three-note fragment drawn from non-adjacencies in the row employed. It is a trichord that may be found segmentally in the row used to project the final dyad of the phrase, and the piano part contains it in the same register as its initial appearance, in the same context, the end of the phrase. The two moments are juxtaposed in Example 17.

The preceding begins to demonstrate the ways details can reflect and be reflected by long-range processes in aggregate music. It also suggests how a given moment can become the focus of a wider span of music. The return of the opening passage at bar 133 is special not solely for its surface qualities, attractive as they are. Nor does the sheer abstract progression of hexachordal areas guarantee the passage its significance. It is the specific ways that the opening aggregate is composed, and the ways that its composition is then reflected in the emerging details of the long-range process, that make the reemergence of the opening melody at bar 133 so potent. The control of those connections is afforded by the relationships among members of the row class, which are themselves determined by its underlying ordering, but the hierarchies of the music arise from the dialectic between the composition of details and the resulting relational possibilities. The use of rows does not guarantee such a richness of connection, nor is it strictly speaking the only way one could structure aggregates; but the use of a row class provides a very powerful lever for creating relations in aggregate music.

Babbitt: Woodwind Quartet

Our second example is drawn from Milton Babbitt's Woodwind Quartet of 1953.[27] The work is played without a break, but is divided into six major sections framed and interspersed with four brief synoptic passages. The general outline of the composition is illustrated in Example 18.

Once again, the focus of our discussion concerns the role of a special moment in the work. The moment in question is the Cadenza for solo oboe that opens the fifth major section. As in Schönberg's Concerto, many features of the music conspire to make this moment stand out: it is the first and only passage where a single instrument has an extended solo; it is the fourth in the central series of sections featuring in turn each of the work's instruments; and the succession of sections creates a gradual change in the way the ensemble is used, from a balanced quartet to a solo instrument accompanied by a trio, to a series of trios, a series of duos, and finally a solo. Even surface details echo the purely instrumental progress of the music: the very first aggregate of the work introduces the instruments in the same order in which they are subsequently featured in their own sections.[28] This is illustrated in Example 19.

However, just as the reprise of the opening melody in Schönberg's work derives its significance from a great deal more than its surface features, so does the Cadenza in Babbitt's piece mark much more than the culmination of a pattern of

[27] Certain aspects about the composition of this work are addressed in Swift (1976).

[28] This pattern is also echoed in the composition of the aggregates of the Introduction, over two distinct spans.

Example 18

| Syn. | - Introduction (Four equal ints) | Canons for Clarinet (Clarinet acc. by trio) | Syn. | Trios for Flute (Flute acc. by duo) | Syn. |

//

| Duets for Bassoon (Bassoon + each inst.) | Cadenza and Recitative for Oboe (Solo, unacc. and acc.) | Finale | Syn. | |

Finale * = Row

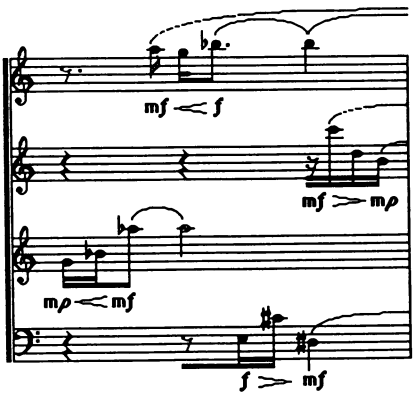
Row in Octaves	Row in Oct. Deriv. in Oct.	Der. Der./Oct Row tet.	Der. Der. Der. Row 013 & 014	Three-Part Array	Two-Part Array
Fl, Cl*	Ob, Bsn* Fl, Cl	Cl* Fl Ob, Bsn	Fl Ob Cl Bsn*	Fl* Cl* Bsn*	 Ob* Bsn*
Ob, Cl*	Fl, Bsn* Ob, Cl	Ob* Cl Fl, Bsn	Fl* Ob Cl Bsn	 Ob* Cl* Bsn*	Fl* Bsn*
Cl, Bsn	Fl, Ob* Cl, Bsn	Bsn* Cl Fl, Ob	Fl Ob* Cl Bsn	Fl* Ob* Cl*	Fl* Ob*
Ob, Bsn	Fl, Cl* Ob, Bsn	Ob* Bsn Fl, Cl	Fl Ob Cl* Bsn	Fl* Ob* Bsn*	Fl* Cl*

Sample of 3-Part Array

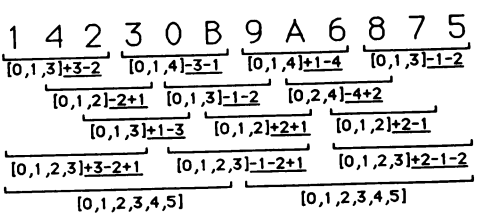
Fl.	7	A	8	9	6	5	3	4	0	2	1	B					
Cl.					B	2	0	1	A	9	7	8	4	6	5	3	
Bsn.									6	3	5	4	7	8	A	9	1	B	0	2

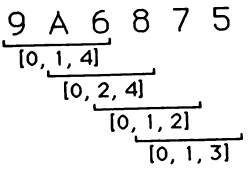
[Cont.]

Example 19



Example 20





instrumentation. A look at the underlying structural strategies of the work's aggregates up to this point and after it reveals the Cadenza's synoptic nature, and shows how it acts as a nexus for the materials and procedures of the entire composition.

Schönberg used the composition of a specific aggregate at the outset of his work to provide a particular perspective on relationships ranging across the entire row class of his Concerto. Babbitt uses a somewhat different approach, but one which is related to Schönberg's in that it involves a dialectical interaction between certain surface details and their availability from his rows to create a perspective from which to hear relationships in his row class. A member of the row class is illustrated and analyzed in Example 20.[29]

A look at Example 20 reveals several points. The row's segmental hexachords are members of the [0,1,2,3,4,5] type A all-combinatorial collection class. These in turn are each partitioned into a member of [0,1,3] and a member of [0,1,4], trichords with the special property that while in combination they may form A-type hexachords, they may also individually generate the same hexachord type.[30] Their dual relationship with the chromatic hexachord is one of the underlying mechanisms of the piece. Looking still further at the segmental trichords of the row, we can see that they may all generate chromatic hexachords (in fact, the second segmental hexachord of the row is that unique ordering of the chromatic

[29]The row and a number of its features are discussed in Milton Babbitt, "Responses: A First Approximation," *Perspectives of New Music* 14, no. 2 and 15, no. 1 (1976):3-23.

[30]Discussions of trichordal generation may be found in Martino (1961) and Babbitt (1973-74) and (1987).

hexachord that conjoins all of its generators).[31] One final point should be noted before we discuss the uses of the row's features. The discrete segmental tetrachordal collections are themselves all members of the chromatic all-combinatorial tetrachord class, [0,1,2,3], each identified by a different interval pattern.[32]

A principal structural feature of most of Babbitt's music from the 1950's is the trichordal array, and the Woodwind Quartet is no exception.[33] In general, trichordal arrays consist of four lynes arranged in two hexachordally combinatorial pairs, in which each lyne contains two complete aggregates. The two pairs of lynes are combined so that each successive aggregate in the array contains a trichord from each lyne. The generation of the aggregates in the lynes is usually by means of two complete sets of transformations of an ordered trichord, and combinatorial pairs of lynes employ members of the same trichord collection class, although not always with the same interval pattern.[34] A critical aspect of trichordal arrays is the way trichords can be combined to form hexachords in the lynes and columns of the array. The various ways trichords may be compounded into mosaics underlie the structural possibilities of

[31] Babbitt discusses this ordering of the chromatic hexachord in (1987).

[32] Such tetrachords are listed in Martino (1961), among other places.

[33] Discussions of trichordal arrays may be found in Babbitt (1973-74) and (1987), as well as in Morris and Alegant (1988) and Zuckerman (1976).

[34] In arrays in which lyne pairs are made of the same trichordal orderings, the four derived rows of a lyne pair will generally represent the four classical twelve-tone transformations.

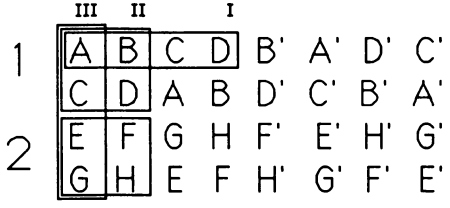
trichordal arrays.[35] Example 21 illustrates a number of points made about trichordal arrays.[36]

As in Schönberg's music, the row class in Babbitt's music is a repository of possible attributes that may be used to identify and relate aggregates on the musical surface. While an aggregate can feature attributes from the full extent of a row's interval pattern, hexachordal combinatoriality allows an aggregate to feature two instances of half of the interval pattern (in addition to patterns of intervals between them). This practice, familiar from much of Schönberg's work, pushes the complete interval pattern of a row class away from the musical surface. In Schönberg's practice, the

[35]The [0,1,4]'s ability to be combined into both A-type hexachords and E-type hexachords ([0,1,4,5,8,9]) allows the construction of trichordal arrays made only of this trichord in which the lynes contain E-type hexachords or A-type hexachords; the non-0 transpositional invariance of the E-type hexachord further allows differentiation of trichordal areas within lynes or lyne pairs with the preservation of hexachordal areas. Similar arrays constructed with [0,1,3] type trichords do not permit the same flexibility, as the shared all-combinatorial hexachord types, A and B ([0,2,3,4,5,7]), are both first order. Thus, the very choice of collectional types creates diversity in the structural potential of trichordal arrays.

[36]A critical point about Babbitt's trichordal arrays that is not germaine to the present topic is his constantly recurring use of the eight partitions of four distinct elements into two or fewer parts to produce an initial composition of the trichords in the eight aggregates of his arrays. This sort of partition scheme, manifest, for example, in the Introduction of the Wind Quartet, has ramifications throughout Babbitt's entire compositional oeuvre, applied on many levels and to many musical dimensions. The classic example of this is its application to the ensemble of the Composition for Four Instruments, noted in Dubiel (forthcoming) and Gary E. Wittlich et alia, *Aspects of 20th Centruy Music*, Ed. Gary Wittlich (Englewood Cliffs, NJ: Prentice Halll, 1975). A discussion of the pattern and its relationship to the underlying arrays of the sections of the ensemble of the Composition for Four Instruments may be found in Mead (1987).

Example 21



1, 2 = Combinatorial lyne pairs
I, II, III = Sample trichordal mosaics
A B C D are usually of a simple collection class
E F G H are usually of a simple collection class, sometimes the same.
A and C are usually inversionally related, as are B and D and A and B; the same applies in the lower pair.
The second half is usually a retrograde of the 1st half.
When lyne pairs 1 and 2 are made of the same collection class, A = F, B = E, C = H, D = G in content.

continuation of interval patterns from a pair of combined hexachords in one aggregate is usually found in the subsequent aggregate. However, it is a simple step to allow a section of a composition to concentrate solely on the attributes of a particular portion or partition of members of a row class, allowing other portions or partitions to be dealt with elsewhere. After all, it is the aggregates and their identifying features, not the completion of rows, that we follow in this music. The effect of such a step is to push the row into an even more background role in the composition.

This is precisely the approach taken by Babbitt in his trichordal compositions, using a variety of strategies for creating the overall progress of his works. For the purposes of the present discussion, we are concerned only with the Woodwind Quartet, but it is worth noting that this is a composition whose individuality can be even more richly enjoyed in the context of a larger body of music.[37]

The overall strategy of the Woodwind Quartet is to reveal features of different sets of partitions of its underlying interval pattern, ultimately divulging their common source, the complete interval pattern of the row class.[38] Not surprisingly, this moment occurs at the oboe's Cadenza. The following Finale synecdochically recapitulates all of the earlier music in light of its revealed common

[37]For example, the Composition for Four Instruments also deals with two orderings of the same two trichordal collection classes, but they are used individually to generate the chromatic hexachord. There is a climactic passage in which their combination generating a chromatic hexachord emerges several times from the counterpoint of lynes, but the apotheosis of the work is the final section in which all four trichords are used in the trichordal array, one lyne for each. Interestingly, it is with just such an array that the Woodwind Quartet *begins*, suggesting a very different strategic approach to the same materials.

[38]This is noted in Babbitt (1976).

source. Before looking at the work in closer detail it is worth noting that its strategy of examining different partitions of the entire interval pattern differs dramatically from strategies found in other works of this period, which tend to employ only one or two segments of their interval patterns per section.[39]

As we noted above, all of the segmental trichords of the row can generate the chromatic hexachord, the type of hexachord found segmentally in the row. This fact has an enormous impact on those portions of the piece using trichordal arrays, as it will guarantee that, as the commonly generated hexachord type, the chromatic hexachord will appear ubiquitously as a product of the trichordal mosaics in aggregates of the arrays. Because the chromatic hexachord is the mechanism whereby pairs of trichordal lynes are combined with each other, the hexachord type will tend not to arise in the lynes *per se*.

A controlling influence spanning the composition is the fact that the chromatic hexachord mosaic found throughout the work is always maintained at a particular transposition level. The fixed transposition level of the chromatic hexachords provides a particular perspective on the row class, elevating those rows containing those collections segmentally, and forcing us to construe the remaining rows in terms of the ways their various segmental trichords can be combined to generate the specific pair of hexachordal collections. As we shall see, one of the strategies of the work is the gradual change of the instrumental placement of the fixed pair of chromatic

[39] See, for example, the discussion of the Second String Quartet in Zuckerman (1976), or Babbitt's own remarks on *Partitions* in Babbitt (1987).

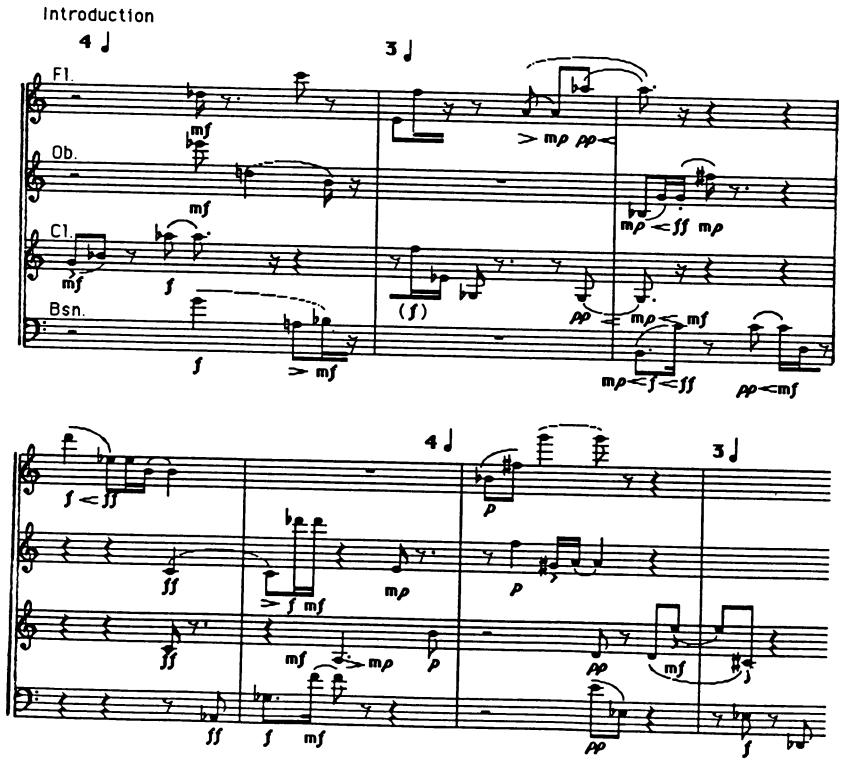
hexachords, and the concomitant gradual emergence of the complete interval pattern of the row class associated with them.

The first major section of the piece, labelled Introduction, contains a series of four trichordal arrays in which each lyne is generated by one of the four discrete ordered trichords of the row. The two [0,1,3]s and two [0,1,4]s in the columnar mosaics are compounded so that each pair of like types forms an A-type hexachord, in the referential transpositions. In this section, each instrument projects a lyne of the array, and each instrument moves through all four ordered trichord types. A portion of the section is found in Example 22.

The second section of the piece, Canons for Clarinet, also employs trichordal arrays, but they differ from the first section by trichord content and means of projection. The trichords employed are the remaining segmental trichords of the interval pattern. One of these, the [0,2,4], emerges in a special way. It is used as the basis for a two-part composite lyne whose counterpoint produces the fourth trichordal lyne of the array. In this section, the clarinet always projects two lynes, while the remaining lyne and the two parts of the composite lyne are variously distributed among the three other instruments.[40] We can hear that the change of the ensemble between the first and second sections reflects a change in orientation to the underlying material. One interesting by-product of the structure of the second section of the piece is that the referential transpositions of the chromatic hexachord are now found in a single instrument, the clarinet, although derived from more than one lyne.

[40] The unusual use of dynamics to distinguish lynes within the clarinet at certain points of the section is pointed out in Swift (1976).

Example 22

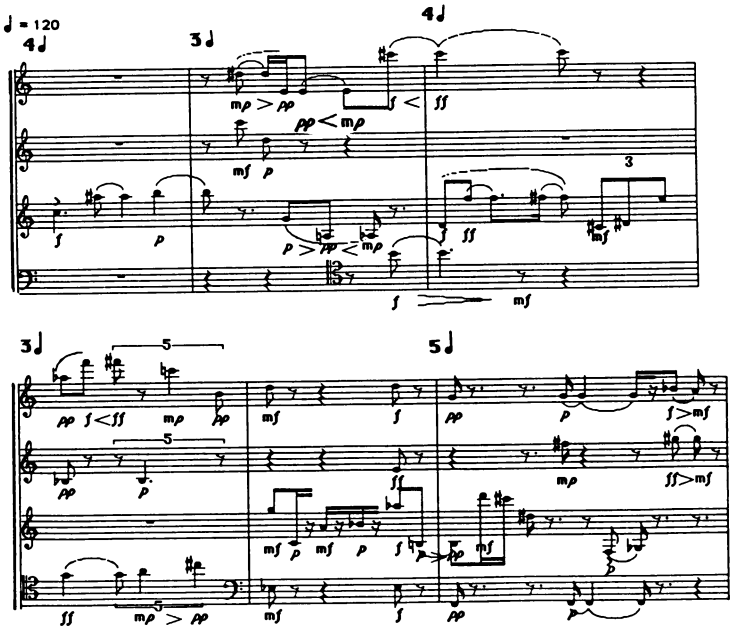


Fl.	104	598	23B	A67
Ob.	32B	A76	014	589
Cl.	586	314	A79	02B
Bsn.	79A	B02	865	431

A → E: [0,1,4] -1+4, -1-3
A → B: [0,1,3] +3-2, +2+1

Example 23

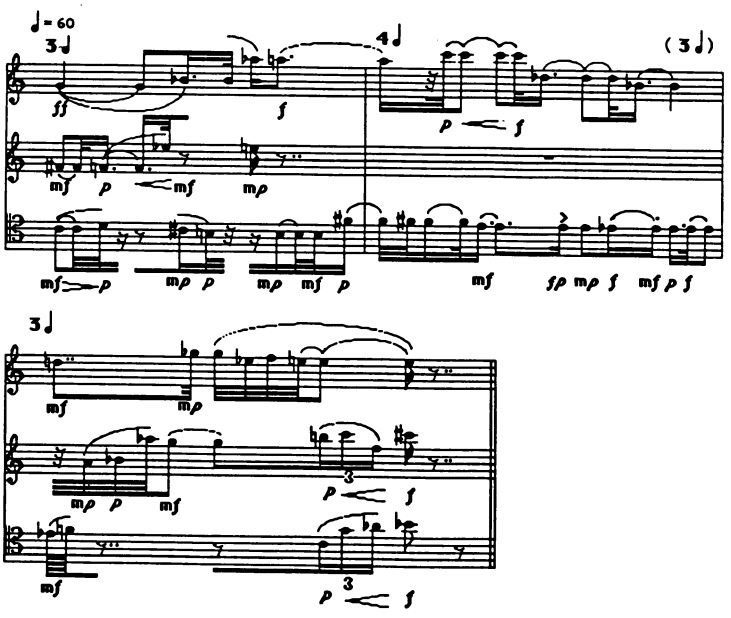
Canons for Clarinet



	by register		by dynamic		
Cl.	A89	342	576	0B1	→ D [0,1,2]
	576	0B1	A89	342	A
Fl.	341	856	0B2	7A9	
Ob.	02	A	4	68	[0,1,3] → B
Bsn.	B	79	13	5	

[0,2,4] / [0,2,4] = [0,1,3]

Example 24



Fl	7 A 8 9	0 1 B 2		6 3 5 4
Ob	6 5 3 4		9 A 8 7	B 0 2 1
Bsn	0 2 1 B	6 4 3 5		(9)7 8 A

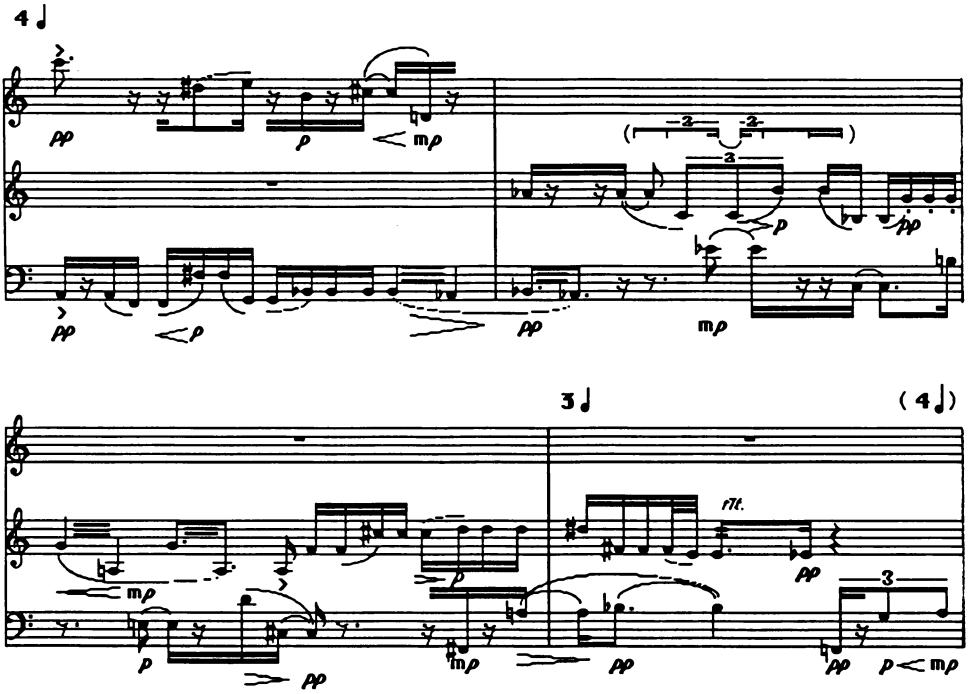
In some places in the array, the counterpoint of the lynes has been composed to yield hexachords that may be partitioned into trichordal collections in the same manner as found in the work's row class. This is an early intimation of the dual roles played in the piece by the trichord types [0,1,3] and [0,1,4] with regard to the chromatic hexachord type. A portion of the passage is illustrated in Example 23.

The third section of the piece, Trios for Flute, marks the greatest change so far, both in terms of ensemble and in terms of underlying material. In this portion of the work, the underlying interval pattern is partitioned into its three discrete ordered all-combinatorial tetrachords, which are compounded into three-part arrays. For the time being, the transposition level for the tetrachordal mosaic dominates the passage. As we shall see, this too becomes a critical part of the oboe Cadenza. The opening of this section is found in Example 24.

The fourth large section, Duets for Bassoon, reduces the ensemble still further, but returns to the trichordal material of the Introduction. Here, however, the four ordered trichord types are combined in a different class of mosaic, in which chromatic hexachords are yielded from the combination of one of each of the trichord collection types. While the resulting hexachords, found in the instrumental parts, reflect the combination of trichords found in the row, they do not for the most part reproduce the overall interval patterns of the row's hexachords. The passage returns to the referential transposition of the pair of chromatic hexachords, and is the first of the extended sections of the work to project these hexachords in all of the instrumental parts. A portion is illustrated in Example 25.

Example 25
Duets for Bassoon

♩ = 96

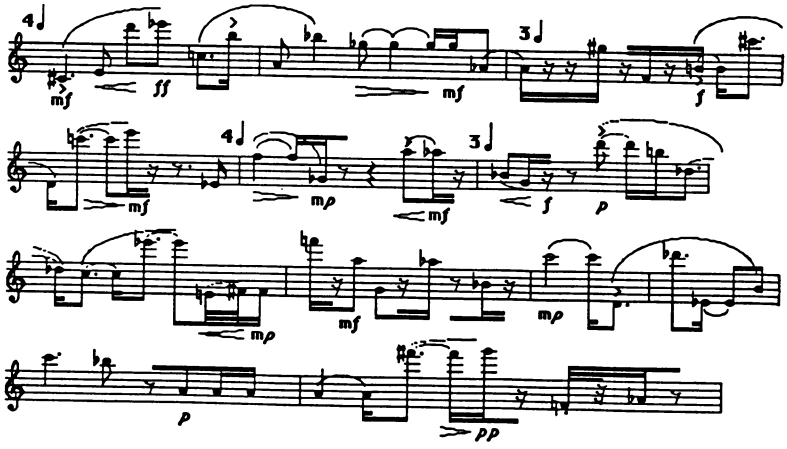


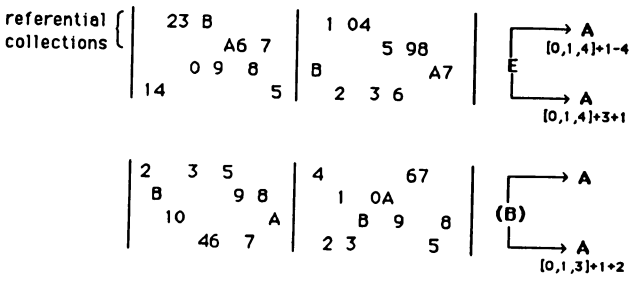
It is in the oboe's Cadenza that we finally hear the attributes of all the previous sections combined. The overall ordering of the oboe's melody incorporates all of the shorter interval patterns compounded in the lynes of the preceding music's various sections, and details of articulation and slurring make these invocations vivid. The collectional mosaics also reflect the earlier sections: the segmental hexachords are in the fixed transpositions found in the first, second and fourth sections, while the middle two aggregates offer the fixed tetrachordal mosaic that underlies the third section of the work. Lastly, the registral disposition of the melodic line permits us to hear, unfolded across the span of the solo, two trichordal mosaics each based on one of the two trichordal collection classes found in the discrete trichords of the row, in one instance in the transposition levels found in the lynes of the array of the opening of the piece. The passage and its analysis are found in Example 26.

The following Finale compounds the complete interval pattern with portions of itself in arrays that echo those of the preceding sections, in effect confirming its underlying importance by revealing it at the surface in a kaleidescopic run through all the duos and trios of the ensemble. Example 27 is a synopsis of the Finale, with selected analyses illustrating connections with the earlier portions of the composition.

The foregoing in no way pretends to be a complete analysis of the piece. I have simply hoped to show how the overall structure can be read in terms of a particularly striking moment. One feature of the piece I have deliberately ignored is the set of brief synoptic passages found framing the work, and interspersed between major sections. Readers familiar with the work will realize that the second and third of these passages contain complete row statements within

Example 26


4
mf
ff
mf
3
f
4
mp
mf
3
f
p
mp
mf
mp
p
pp


referential collections
23 B
A6 7
0 9 8
14 5
1 04
5 98
B A7
2 3 6
E
A
[0,1,4]+1-4
A
[0,1,4]+3+1
2 3 5
B 9 8
10 A
46 7
4 67
1 0A
B 9 8
2 3 5
(B)
A
A
[0,1,3]+1+2

instruments, so that the oboe's solo statement at the Cadenza is not the first place in which a complete unfolding of the interval pattern occurs. However, in these brief passages, the statements are spread out over more than one aggregate, and so they can also be incorporated into a narrative that would climax at the Cadenza.[41] The particular significance of the oboe's Cadenza is also signalled in the last synoptic passage by means of an echo in the final bar of the work, in which that instrument repeats the opening line of its solo as part of the music's last utterance.[42] This is illustrated in Example 28.

Mead: Chamber Symphony

Our final example is drawn from one of my own compositions, a chamber symphony for oboe, bass clarinet, viola,

[41]Still another aspect of the synoptic passages should be mentioned, although it is less directly part of our perspective. The first synoptic passage effectively stands the trichordal mosaics of the Introduction of their sides, so that each instrument runs through an aggregate containing each of the four segmental ordered trichord types, but not compounded into rows of the piece. However, the order of instruments and their associated trichords in the first aggregate presents the order not only of the way instruments are featured in the sections of the composition, but also the order of their initial trichordal statements (including their content!) in the four arrays of the Introduction.

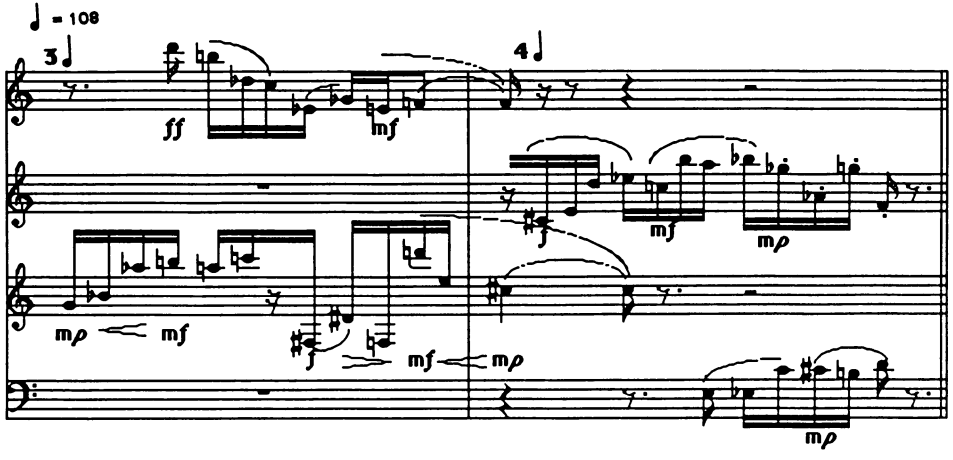
[42]As one might imagine, this is not the only important aspect of the last synoptic passage, and every instrument creates echoes of its own participation in the work; their entrances also reflect their order of appearance in the featured sections of the composition.

Example 27

Revised 4-Part Array:

Fl.	9 6 5	7 A 8	2 1 B	3 4 0
Ob.	0 B 3	1 2 4	8 5 7	6 9 A
Cl.	2 4 1	B 0 3	6 A 9	5 7 8
*Bsn.	A 8 7	9 5 6	4 3 0	1 B 2

Example 28



bass, percussion and piano.[43] The discussion examines the ways the changing settings of a certain recurring melodic fragment arise from its various modes of derivation, and briefly suggests some of the ways those passages in which it appears relate to the local and global processes of the music.

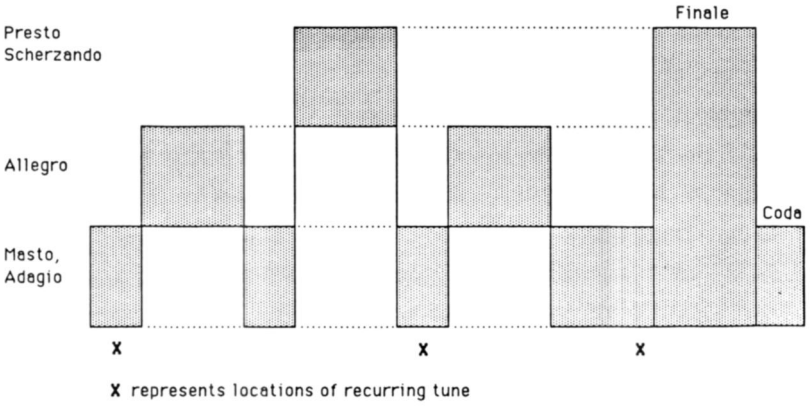
The piece is played without a break, but may be broken down into several sections, representing a pattern of intercut movements modelled on that of Schönberg's *Chamber Symphony* No. 1. Each of the movements to varying degrees mimics the strategy of intercutting that underlies the piece itself, with the finale constructed of densely intercut varied recapitulations of the preceding movements. Example 29 is a diagram of the major sections. We shall examine a set of three passages that are part of the slowest movement's layer, but that also serve other local functions.

The different sections of the piece are distinguished in a number of ways, including the number of parts in their underlying arrays and ways lynes are projected. However, another more fundamental difference arises from the nature of the row class itself: the piece employs an extended row class generated by adding all possible order number transpositions and inversions to a classical row class, yielding a grand row class of 576 rows.[44] The different

[43]This was written in the winter of 1984-85, and premiered at the University of Michigan by the Michigan Chamber Players, featuring Harry Sargous, for whom the piece was written.

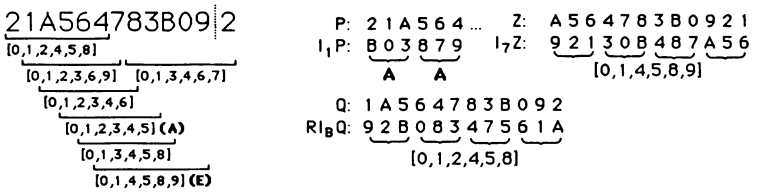
[44]Such rows are discussed in Michael Stanfield, "Some Exchange Operations in Twelve-Tone Theory," *Perspectives of New Music* 23, no. 1 (1984):258-277; 24, no. 1 (1985):72-95. They have their origins in Schönberg's Wind Quintet, Op. 26, the first

Example 29



X represents locations of recurring tune

Example 30



Example 31

P:	564783B0921A	Q:	1094536 72AB8
I_BP:	657438 0B29A1	I_BQ:	AB27685491 03

rotations of the row produce a series of six different sets of segmental hexachordal collections, each with different kinds of combinatorial possibilities. Different sections of the piece use different regions of the row class determined by hexachordal type, in addition to distinctions of transpositional areas within types. Connections between hexachord types are made variously, but one technique I have used is to generate hexachord types through the combinations of segments of combinatorial rows. Example 30 contains a member of the row class, analyzed to show its various hexachordal interpretations, and some instances of the various hexachord types arising combinatorially.

One other feature of the row structure is worth noting for the following discussion. One of the two sets of discrete segmental dyads is equivalent to the set of dyads generated in the total chromatic by a particular index number of inversion. Thus, certain rotations may be inverted onto themselves so that all their discrete dyads are mapped onto themselves or each other, and each inversionally combinatorial pair of rows invokes the segmental dyads of other rows by means of the dyads formed between them at fixed order numbers.[45] This is illustrated in Example 31.

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large-scale twelve-tone composition. For a discussion of this work, see Mead (1985) and (1987).

[45]Other examples of dyadic invariance may be found in Schönberg's Third String Quartet, as detailed in Peles (1983); rows containing dyadic invariance based on the sets of dyads of an index number are used in Babbitt's *Concerti* for solo violin, orchestra and prerecorded tape, as well as *Morephonemena*. The dual role of such dyads can be heard prominently featured in his *Reflections* and *A Solo Requiem*.

The melodic fragment we shall pursue is found in the oboe part in the first two aggregates of the piece. This, along with the following phrase, is found in Example 32.[46]

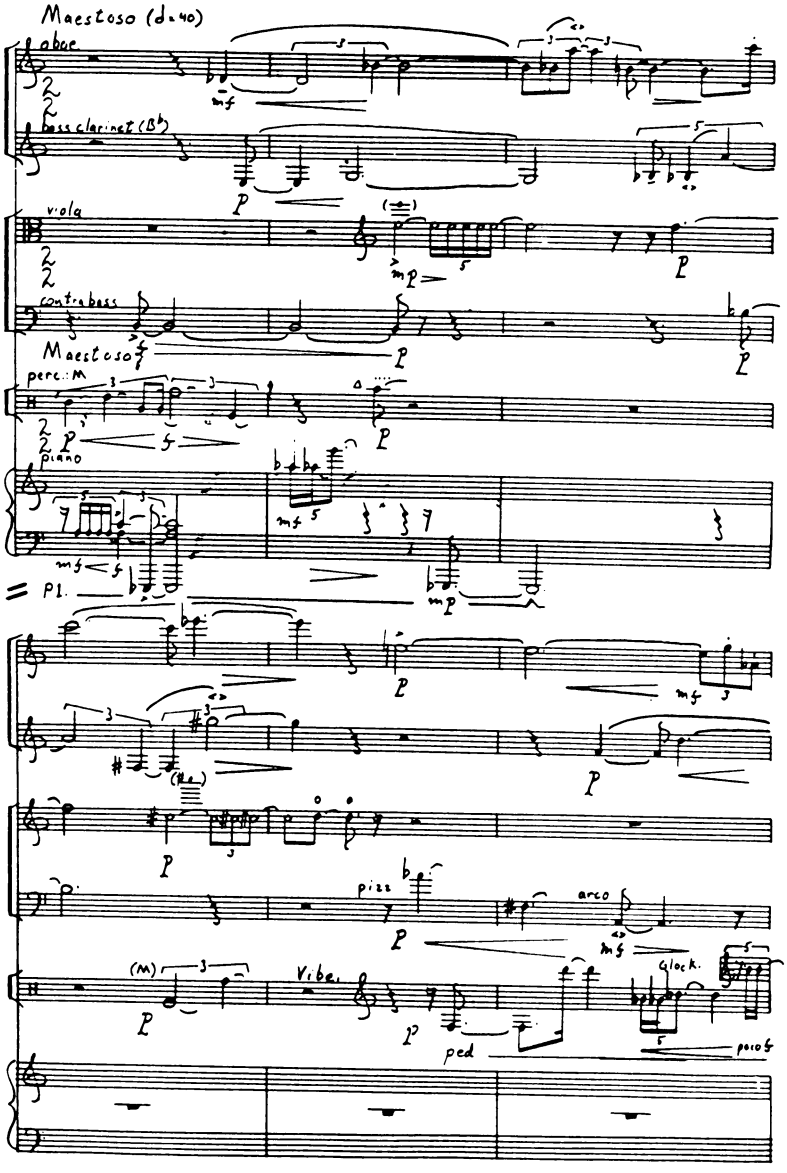
There are a number of things we can observe about the composition of this opening passage. The two wind instruments each play aggregates containing members of the [0,1,2,3,4,6] collection class, but in different orders. This same collection class is represented in the overall temporal unfolding of the four aggregates, in still more interval patterns. This is one of the hexachord types found segmentally under rotation, but the various orderings suggest this is not the local source of these collections. The various hexachords are indicated in Example 32.

A look at the other instrumental parts yields a pair of chromatic hexachords in the two strings, and a pair of Z-related hexachords of the types found segmentally in the piano and percussion, but, once again, they are not ordered in the patterns from the row class. However, the different degrees of instrumental participation might suggest hearing the ensemble divided into a duo and a quartet. An inspection of the composite lines of each of these yields a simple transformation of the interval pattern of the row class, combined in a two-part array. This is illustrated in Example 33.

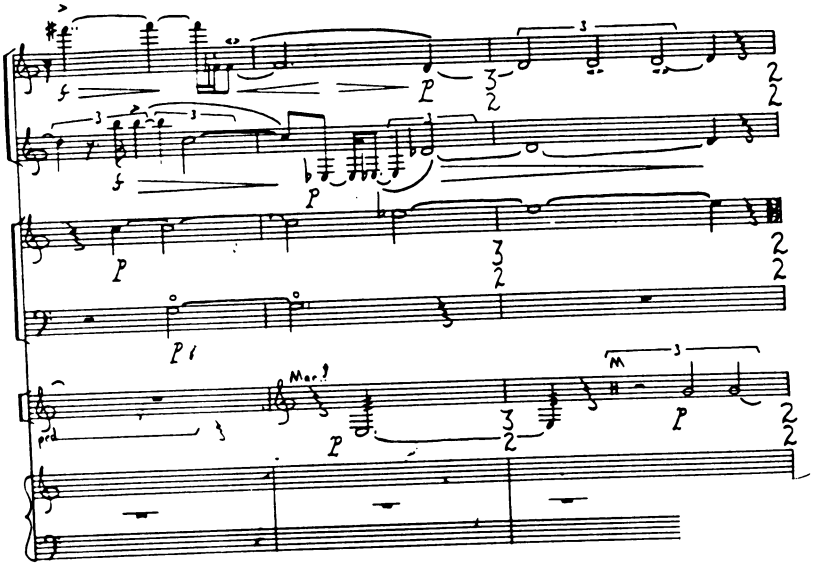
Our topic here is not how these various details of the opening are taken up in the body of the music, nor is it an attempt to describe the various strategies of the piece: we are simply looking at the changing contexts of a recurring tune and their connection with

[46]All examples from the chamber symphony are drawn from a transposed score; the bass clarinet (in Bb) sounds a major ninth below what is written.

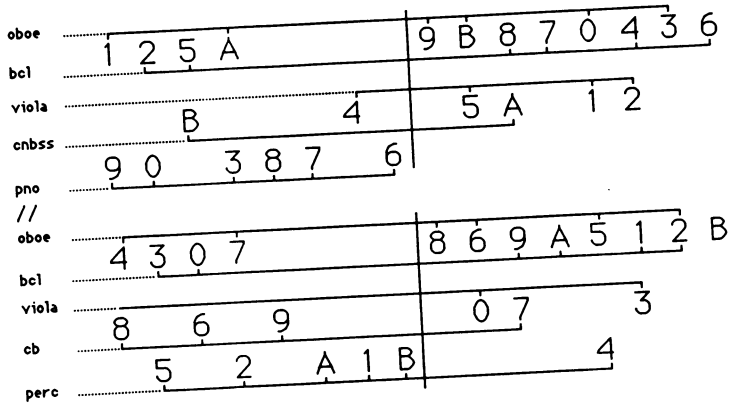
Example 32


Maestoso (d.=40)
oboe
bass clarinet (B♭)
viola
contrabass
Maestoso
perc.: M
piano
Pl.
(M)
Vibe.
ped
pizz
arco
glock.

Example 32



Example 33



the row class, but in order to establish a degree of credibility with the reader, I feel compelled to show a couple of the ways the details we have noted are more than merely local manifestations. Of immediate local consequence is the partition of rows into pairs of [0,1,2,3,4,6] hexachords in the winds. The remainder of the introduction continues this pattern, using two more partition schemes and the fixed hexachordal mosaic of the opening. A more general example involves the following Allegro. It is based on four-part arrays using the rotations of the row featuring A-type segmental hexachords, vaguely foreshadowed by the strings at the outset. The passage intercuts arrays associated with the bass clarinet and the oboe in which each wind instrument uses its own fixed mosaic of the chromatic hexachord, association that recurs in various ways through the whole piece. In a more vivid echo of the opening the rows associated with the oboe's mosaic contain segmentally that instrument's initial dyad from the first aggregate, while the bass clarinet's transpositional area is formed at the end of the introduction in an aggregate that both reflects the opening and points to the continuation of the music. This is illustrated in Example 34.

More anecdotally, specific notes in specific instruments and collections ordered in time or register from the first aggregate keep cropping up at pivotal spots in the piece; we are, in fact, tracking one of these, the oboe's initial line, but others occur, such as the low Eb in the piano, or the E harmonic in the viola, or the oboe's initial dyad. Example 35 illustrates a couple of these.

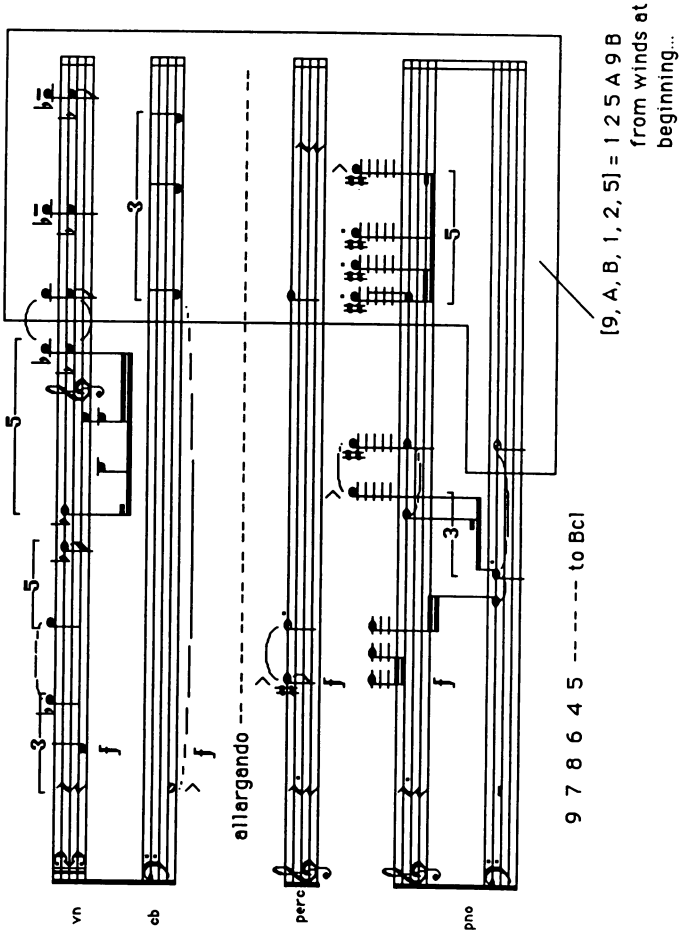
The first return of the oboe's melody that we shall examine occurs at the juncture between the Scherzo and a resumption of the tempo that followed the Introduction. While the setting of the

melody is different, several details in addition to the presence of the melody itself invoke the opening, including the low D in the bass clarinet, the low B in the contrabass and the E harmonic in the viola. The passage and its continuation are found in Example 36.

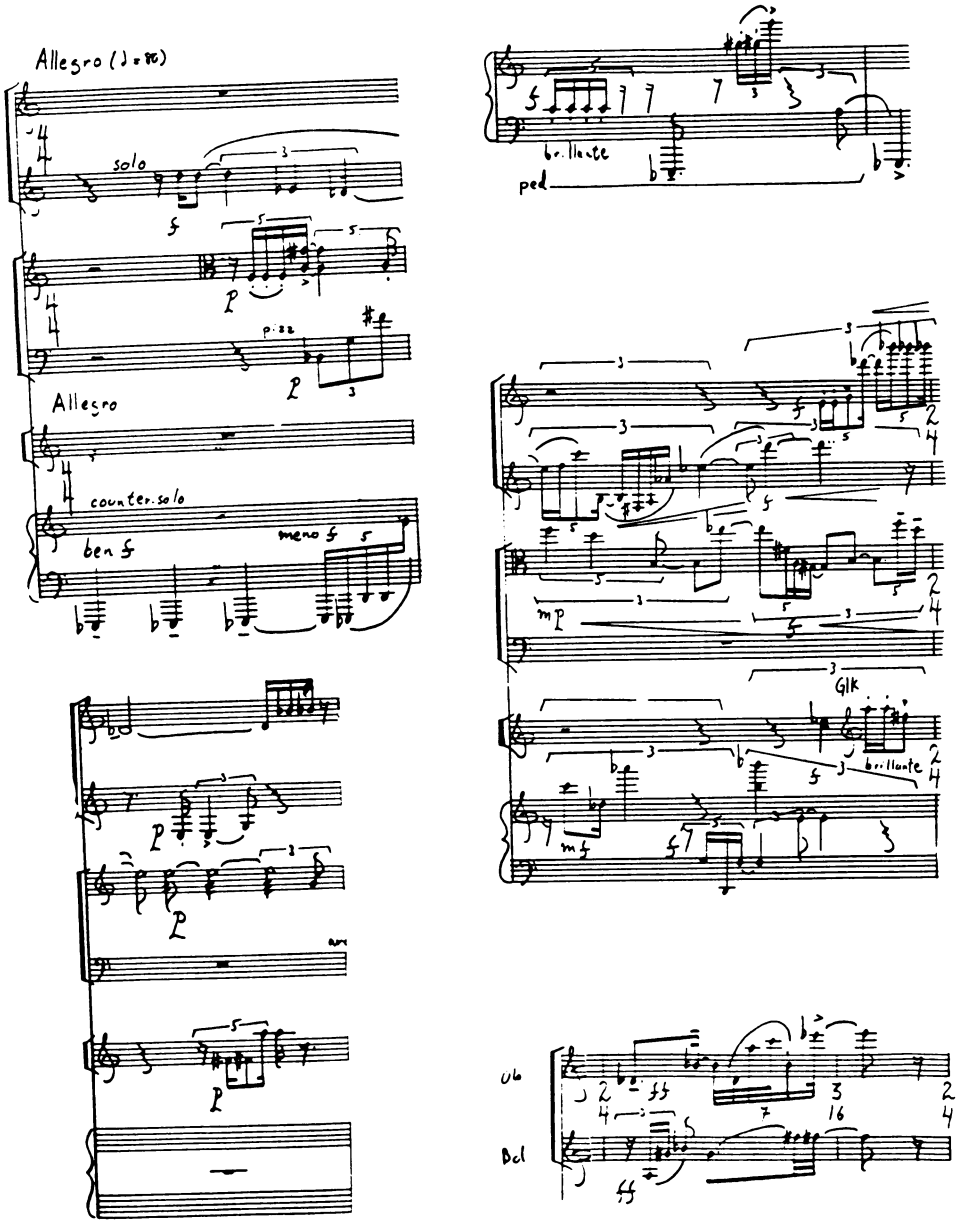
A closer look at the passage's derivation reveals still more associations with the opening. The bass clarinet line taken alone reveals a series of members of the [0,1,4] type trichord, forming three members of the [0,1,2,3,4,6] type hexachord. The trichordal mosaic formed by the oboe's initial trichord and the first three in the bass clarinet reproduces the one found spanning the first four aggregates in the oboe at the outset. Finally, when the two parts are taken together, we can hear that they represent a pair of partitions of two rows, themselves retrogrades of two of the four rows underlying the four opening aggregates of the work. Thus a number of features of the passage, both at the surface and beneath the surface, reflect variations of aspects of the opening of the piece. This is illustrated in Example 37.

Some sense of the ways the passage is tied into its local context can be heard by its immediate continuation. As may be seen in Example 36, the viola's line echoes in part the continuation of the oboe's melody at the beginning, but is derived from a rotation of the row whose segmental hexachords are members of the [0,1,2,3,4,6] hexachord type. But one effect of the passage, to drag us back to a version of the continuity of the opening and its consequence, emerges when we look at the beginning of the preceding Scherzo. The bars in question are found in Example 38. As may be seen, the Scherzo in its own way echoes the opening aggregate, but in a new tempo and character, so that the return of the opening Maestoso

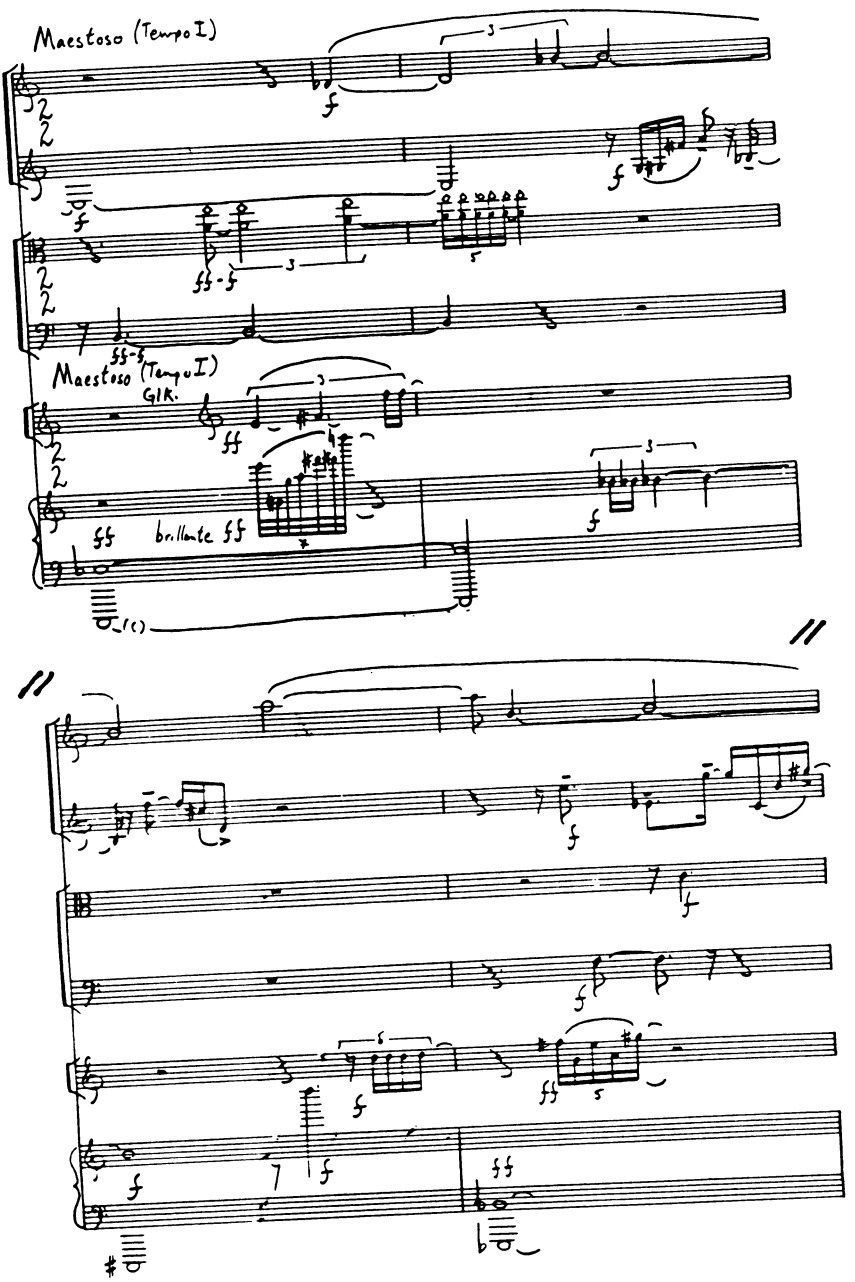
Example 34


vn
cb
perc
pno
allargando
f
9 7 8 6 4 5 ---- to Bcl
[9, A, B, 1, 2, 5] = 1 2 5 A 9 B
from winds at
beginning...

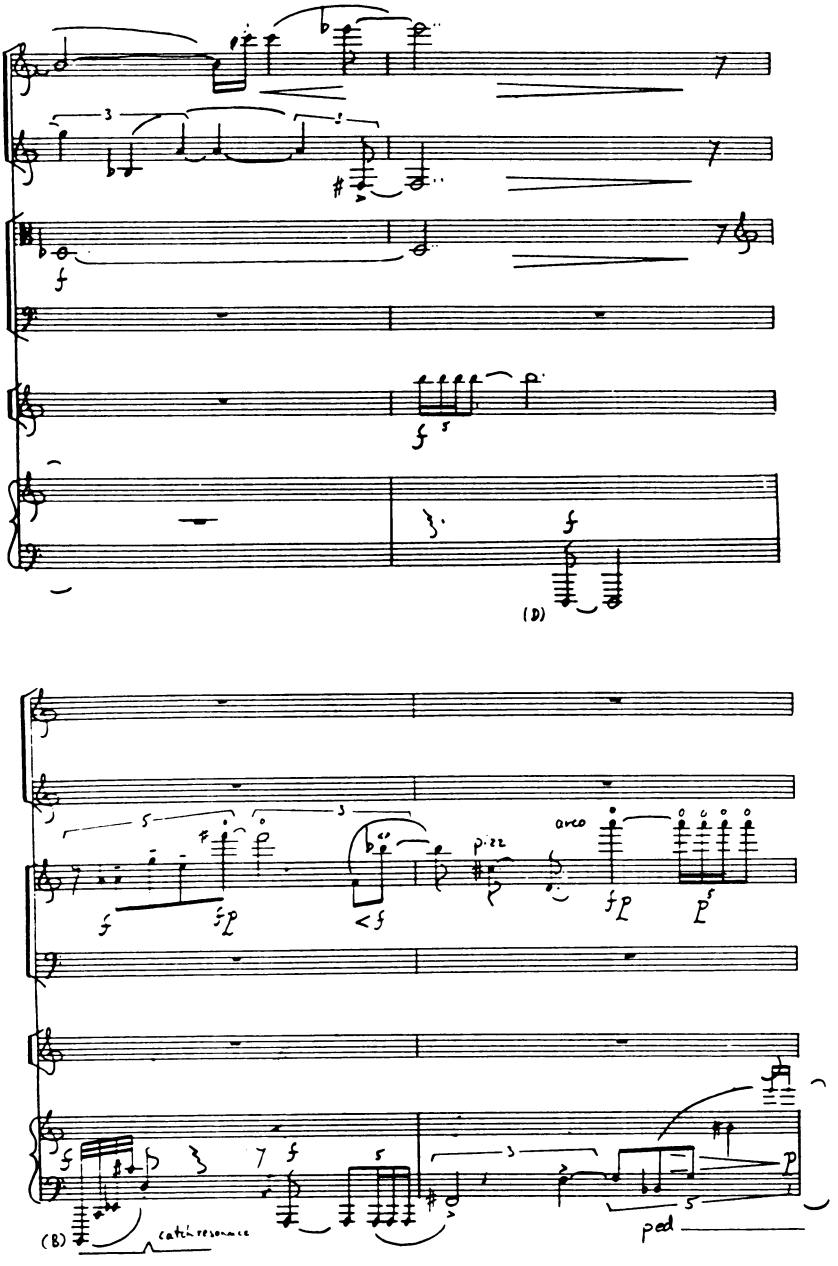
Example 35


Allegro (♩= 80)
solo
Allegro
counter. solo
ben
meno
brillante
ped
mp
Glk
ob
Bcl

Example 36



Example 36

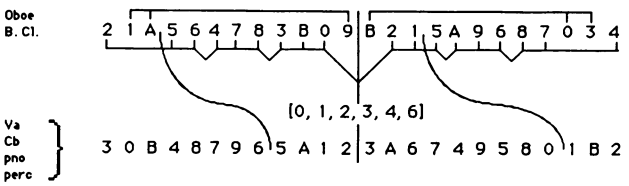


might be heard as a way of fulfilling a deflected promise of return made by the preceding music.

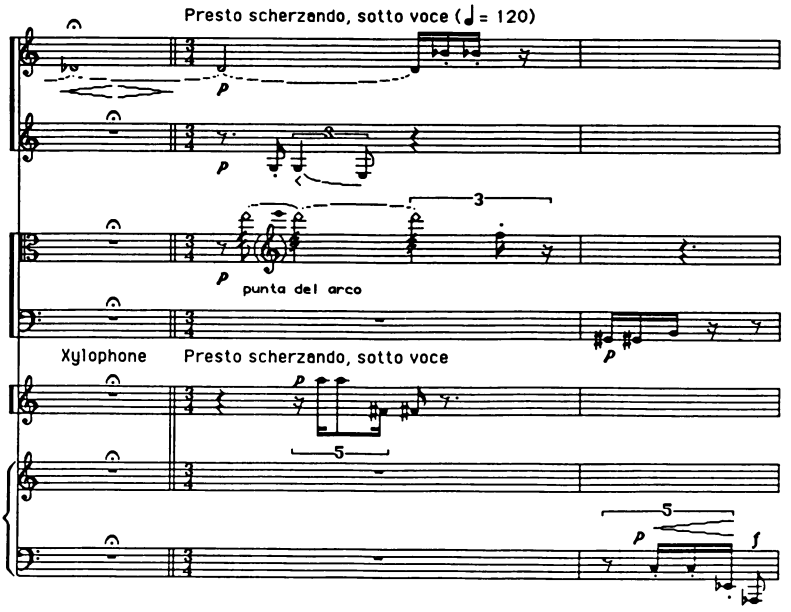
The final passage we shall examine falls at the very end of the Adagio. It is illustrated in Example 39, and the reader will readily recognize the oboe's melody from the opening, as well as the numerous echoes of the setting of the first aggregate. In this passage, however, the successive dyads of the melody are themselves the end points of complete row statements, partitioned among the remaining instruments. Of particular note is the rotation used to from the first aggregate of the passage, the reference to the opening. The segmental hexachords formed are members of the [0,1,2,3,4,6] type, and represent the same mosaic found over time in the first aggregate of the piece. Thus, the hexachord type that permeated the settings of the previous two instances of the melody has finally emerged in the controlling disposition of the interval pattern of the underlying local row.

Once again, however, the passage functions in a local context in addition to its invocation of the opening. The last portion of the preceding Adagio is a long ornamented melody featuring the inversionally invariant dyads of the oboe's referential chromatic hexachordal mosaic. They are drawn from a pair of concatenated rows in the rotational orientation found at the opening of the work, which are themselves related by the inversion which preserves the dyads. Those dyads are in turn ornamented with embedded rows, so that the elements of each dyad form the ends of various rotations of the row class's underlying ordering. Thus the setting of the dyads in the passage in question, the recurrence of the opening melody, is a continuation, articulated by the entire ensemble, of the strategy underlying the preceding passage. The initial dyad, as we noted

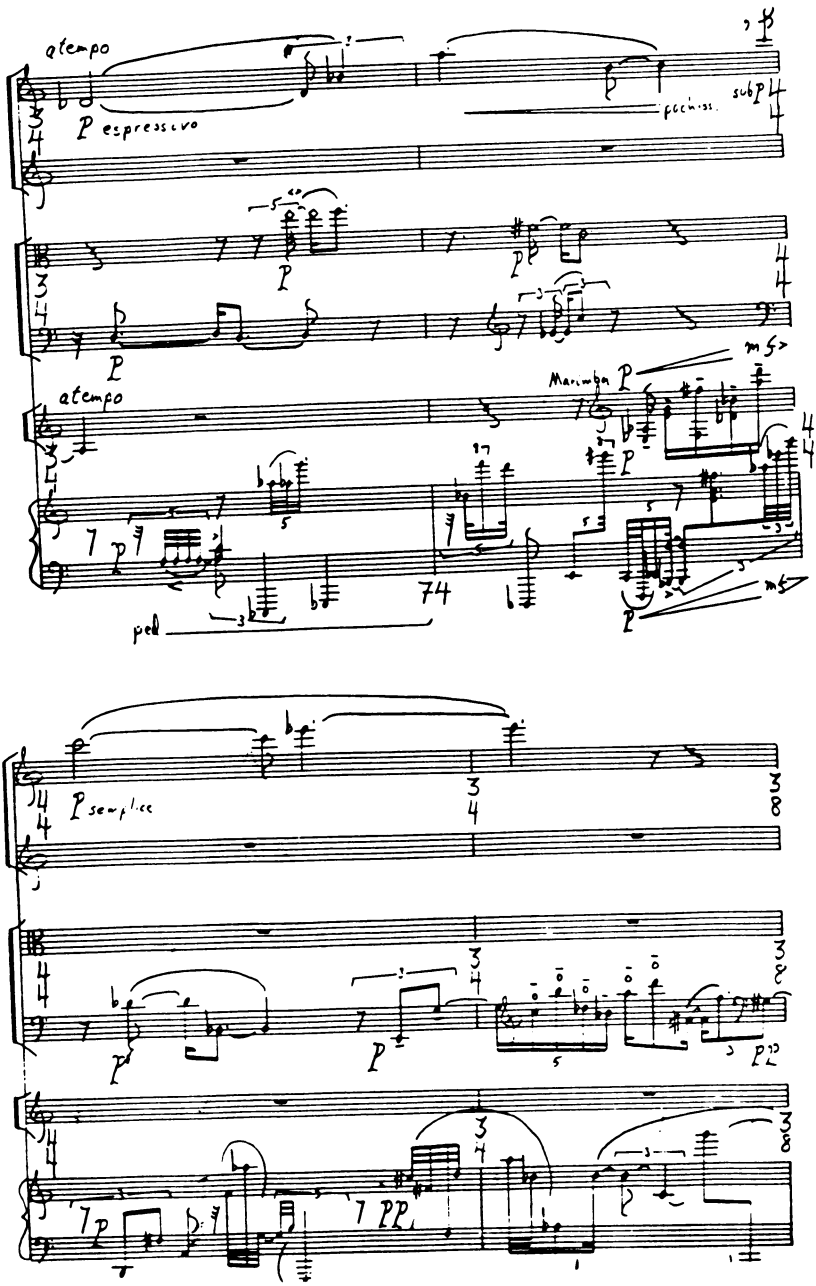
Example 37



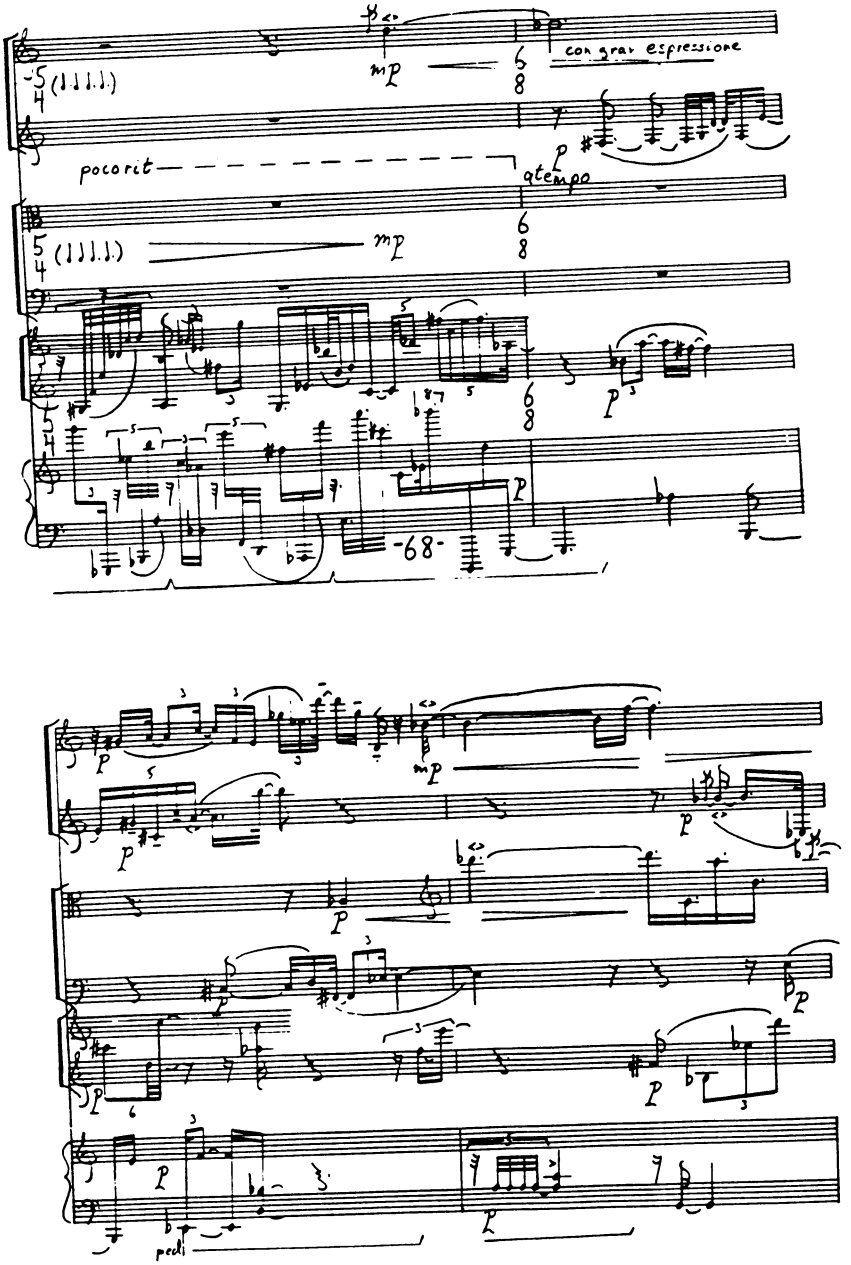
Example 38



Example 39


atempo
p espressivo
poco a poco
subp
atempo
Marimba
mf
ped
p semplice
pp

Example 40



above, is part of the oboe's referential mosaic, which can help one hear this return of the opening melody as a codetta to the preceding passage. Example 40 illustrates the opening of the Adagio's melody, a passage ornamenting the dyad Db-Bb, the one in question.[46]

Closing Remarks

In the preceding discussion I have tried to illustrate some of the strategies by which the twelve-tone system can provide a framework for local and long-range organization in a composition. I have done so from a particular perspective, by picking moments I find striking in a composition, and examining the ways their particular qualities in the piece or passage arise from more than just their superficial aspects. In the case of Schönberg's Piano Concerto, I tried to intimate the ways that successive sections of the first portion of that work played out aspects of its initial aggregate, so that the return of the opening melody at the end of the first major section marked a culmination of a larger background pattern enlivened by its orientation to a specific foreground configuration. In the Babbitt work, I concentrated less on the wealth of surface detail, but examined the background structures more closely to illustrate a radically different approach to overall organization. Nevertheless, the consequences of that organization on the surface of the music make it easy to hear the oboe's Cadenza as a culmination of the processes of the piece.

[47]Readers will note that the embedded row in the oboe is rotated to yield E-type hexachords, while the accompanying bass clarinet part employs the rotations featuring [0,1,2,3,4,6] type hexachords. The orientation of the row underlying the second aggregate of the return of the oboe's tune also features E-type hexachords.

In contrast to Schönberg's approach, Babbitt's organizational strategy reveals retrospectively the unifying perspective of his composition. In a sense, the return of the opening melody in the Schönberg work is a form of celebration, while the Cadenza in the Babbitt piece is a revelation. However, good music is always richer than its description, and there are revelatory elements in the Schönberg passage, in the form of the relationship between the melody's rhythm and its ornamentation, just as there are aspects of reflective celebration in Babbitt's Cadenza, in the form of the registral counterpoint echoing the Introduction's trichordal array structure.[48]

My intentions in talking about my own piece were more modest. In that discussion I merely wished to demonstrate another twelve-tone mechanism, the extended row class, whereby one could achieve different kinds of connection, both local and global. In order to do this I picked a set of repetitions of a given melody, what I hope is an obvious device inviting comparison of the passages in question. By following a series of varied repetitions, I tried to show how different rotational orientations within the row class could be

[48]Still another detail at the end of the Cadenza celebrates an aspect of the first synoptic passage, as well as Babbitt's heritage as a twelve-tone composer. The compounding of trichords in the instrumental parts of the opening produces hexachords of the [0,1,4,5,6,8] type. When the rest of the ensemble returns at the end of the Cadenza to accompany the oboe's recitative, the setting of the melody and its accompaniment mimic the setting of the opening of Schönberg's Fourth String Quartet. The hexachordal collection formed between the oboe and the flute at this point is also of the type found in the parts of the opening. It is wonderful to note that this same sort of relationship is exploited in Schönberg's work, a point celebrated by Babbitt himself in Babbitt (1987), and employing the same type of hexachord!

put into a particular perspective by means of the composition of the surface details.

The preceding is by no means comprehensive as a survey of twelve-tone organizational strategies, but I hope that it might stimulate readers towards their own examination of the question, whether it be by playing, listening or composing. If nothing else, I hope I have suggested there is still much joy to be derived from venturing forth through the chromatic universe.

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