AN EXPERIMENT IN MUSICAL TEXTURE

By CONSTANT VAUCLAIN

ONLY a musician can understand how completely the ground was cut away from under the feet of the 20th-century composer by the collapse of the worked-out tonal-functional system, and how desperate his need has been to replace it with new means of organizing sounds into art-forms. His predecessor in any period from the Renaissance to the end of the 19th century had at hand organizing means by which he could control the interrelationships of all the pitches in a piece of music: like a sailor unfurling his sail to a prevailing wind he could launch his musical utterances into a known, reliable continuum of roots, keys, and controlled dissonances, sure of its communication with the subjective hearing of his listeners. Cut off abruptly from these means, 20th-century creative musicians have evolved a long series of experimental schemes, some to be found by analysis of works by such seekers as Bartók, others presented by their protagonists bolstered with the intellectual and philosophical arguments of a Zarlino or a Mersenne. The writer's excuse for calling attention here to another such effort does not lie in the fact that the conclusions to be drawn from it so far apparently can be satisfactorily intellectualized: a good many years spent among theoretical treatises of today and yesterday have not left him with much faith in the perennial game of trying to capture the workings of the aural world with the words and numbers of the visual-tactile one. It is based rather on a strong sense of direction that this experiment seemed to take, as soon as begun, at the perceptual level, where it constantly has been felt to negate or affirm whatever trials of ordering its parts were in progress. And while these perceptual qualities have not yet been weighed by the only real arbiter, general audience reaction, everything to be said in this paper in this regard may be taken to represent the consensus of a small group of musicians who have been following this project closely for some time.

For years the writer had been drawn by what seemed to him to be, occurring haphazardly here and there in 20th-century music by composers representing diverse methodologies and points of view, the elusive promise of new aural relationships. Discussions had shown that a number of his colleagues shared this experience in a general way, and at times in relation to the same musical passages. But a long series of attempts to find, by analysis of such music, common organizing elements that might be codified into techniques of composing had consistently failed. Eventually a decision was made to reverse procedures and attempt to produce, by synthesis of what seemed to be established elements of musical organization, examples touching the relationships that, though vague, had by now become an experiential reality. At first glance such an attempt seemed to have a most dismal prognosis, since ten centuries of theory versus practice in music showed the former consistently lagging far behind, making a belated progress by an eventual dim mirroring of the latter's gains. But on the other hand it may be argued that the earlier theorists had little idea of what the organizing elements of music actually were, or towards what results its texture was progressing, while we appear now to have accumulated a large body of known effective practices to build on. We have, too, a strong sense of direction stemming from a dire need of techniques producing aural experiences, more highly organized than those of tonal music, that the listener can share with the composer. Furthermore, if only artistically established elements are used in synthesis, and the results judged solely by perception, then the dangers of rationalization, and of producing empty abstractions by means of abstractions, can be avoided.

It seemed reasonable to begin by seeking bases of a higher organization within the highest achieved up to the end of the 19th century, the tonal-functional system, on the assumption that since this apparently represented the cumulative result of a thousand years of progress through practice and intuition, it could very well contain indispensable elements of music's further growth. Relations of notes to roots and roots to each other appear to be central to this, and so at the very outset of any such search the question arose whether or not to pursue this path and investigate possible new arrangements of root-related sounds. And indeed while most textural experiments of this century are generally divided by writers into two rather unsatisfactorily defined groupings, atonality and polytonality, a good case could be made for dividing them, instead, into textures that do or do not involve root relationships. Since these relationships do not imply any particular tonal scheme but underlie

Renaissance and tonal textures alike, and can already be seen emerging in medieval music, it is arguable that they are a constant factor not only of tonal-functional but of all pre-19th-century Western music. And certainly, earlier in this century, a promising path had appeared to be opening for textures that compounded these relationships. Much was written on the significance of bi- or polytonality or polychords in music's development. The possibility was discussed of music having two or even more tonal-functional streams operating simultaneously, and intellectually this last seemed a particularly logical way of continuing the development of musical textures in a direct line from the 19th century. This writer was never able to find, however, in spite of years of analysis of scores, any works in which there is more than the most rudimentary example of such a continuum, as a V-I in one key against a held sonority in another. A number of composers in the earlier years of this century experimented with such textures only to abandon them, and for the past twenty years there has been little interest in this direction.

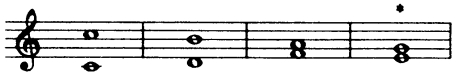
Nevertheless, because root relationships were apparently so vital to the whole edifice of Western music up to the end of the 19th century, there seemed to be a justification at least for investigating them further before discarding such a persistent element of our musical heritage, since no really thorough research into the possibilities of expanding these relationships seems ever to have been made, either theoretically or in practice. With this in mind, after numerous attempts to find a point of entry into such a search, the following procedures were employed.

An initial experiment was set up with continua of opposed root structures in the manner of first-species counterpoint, to try to find what if any inherent perceptual qualities of continuity their combinations possessed, simple continuity having been chosen as the first specific object of these experiments. Here each root system was limited as follows. First, only sequences involving three roots falling in a series of perfect fifths, as would represent IV, I, and V in tonal music, were used, since these should have some continuity in any rearrangement: thus no noncontinuous progressions such as VI-V would occur during the examination of permutations and combinations of the double-rooted sonorities. In other words in the scale of C only the roots of C, F, and G were used in connection with C as a point of reference, and only A, D, and E in reference to A.

Second, for simplicity, each root system was limited to two voices, since two parts in tonal music can be made to establish subjectively for the listener what the root of each sonority would be if categorically

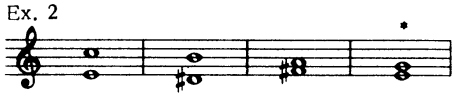
fixed by the addition of a third part completing all the triads. For example, the fourth measure of the following will be felt to express the root of C, not E,

Ex. 1



while in the next example the same pair of notes will express E, not C.

Ex. 2



Third, the statement of any root by the simultaneous use of its root and fifth was eliminated. This was to avoid their inversion into unwanted dissonant fourths in either root system as the investigation of different distributions of the double-rooted sonorities was being made. It seemed likely that two separate bass systems would be operating, each unaffected in this regard by the other, so that even if a fourth occurred between a pair of upper voices in one of the root systems, it would nevertheless be unable to express its root in this way, as in the case of upper voices over a pedal in tonal music.

Fourth, so that the two root systems should be in the least possible danger of losing their own identities and organizing powers and collapsing into atonality or tonality, they were set in scales having as many differing notes as possible. C major and F♯ major were chosen at first as obviously ideal in this respect. They gave a nearly complete separation of the essential notes of these two major keys occurring in their primary triads, as follows:

	I	IV	V
C major	C E G	F A (C)	(G) B D
F♯ major	F♯ A♯ C♯	B D♯ (F♯)	(C♯) E♯ G♯

the only common tones being B and E♯-F.

From the beginning, these experimental sequences showed a definite quality of perceptible continuity. Conversely, as in tonal music, where the interruption of harmonic continuity by the introduction of the wrong root will easily be felt even by a layman, thus demonstrating by negation the existence of the preceding continuity of which he was aware only subconsciously, the alteration of any note in these composite textures produced a noticeable collapse into atonality or tonality. And from this stage of the experiment additional points appeared to emerge quite definitely. First, it was necessary for each system to include all three of

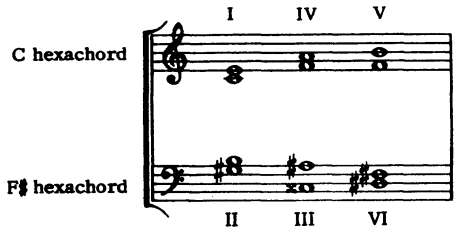
its roots in order to establish the over-all relationship. While the tonic of a key in tonal music can be categorically established by using only its dominant and subdominant, this higher organization seemed to demand complete statement on both sides before the composite context could be established for the listener.

Also, the separation of the notes into two systems depended not simply on the opposition of two tonal keys but on a wider one. This could be traced as that between two Guidonian hexachords, each supplying six possible roots. Ideally these hexachords would be paired so as to have no notes in common, as with one beginning on C and the other transposed to begin on F♯. Then against I IV V of the tonal key of C major in the C hexachord could be placed VI II III of the hexachord of F♯, representing I IV V of D♯ minor, as well as the primary functions of F♯ major. Accordingly, in these experiments henceforth the roots in each system were simply numbered I to VI in its hexachord instead of as two sets of I IV V, one for the major and one for the minor triads.

All such progressions, obviously, can be divided into three groups: those in which similar root patterns parallel each other in the two systems, as I IV V against I IV V or VI II III, those in which they do not, as I IV V against IV V I or II III VI, and those in which root progressions in one system occur against held roots in the other. Groupings in the first category seemed to produce a continuity essentially bland and uneventful, like simple statements of the triads of I, IV, and V in tonal music, but like them able to be the vehicle providing a continuous organization for whatever musical expression is superimposed on them.

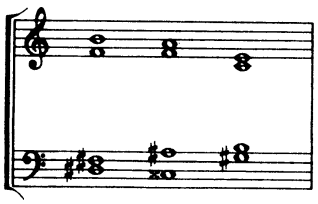
On the other hand, certain groupings in the other two categories showed what seemed to be distinct dynamic characteristics of their own. Some of these groups seemed to be irreversible, like the progression IV-II in tonal music, and to give promise of expressive potential in their inherent directional urges. For example, the following group was felt to have a forward impulse,

Ex. 3



different from its retrograde, which seemed anticlimactic:

Ex. 4



The impulses set up in these groupings are most probably due to the fluctuations in the relationship between the two points of concentration, in contrast to the symmetrical paralleling of the functions in the first group.

Beyond the foregoing, which had so far appeared to be a rudimentary expression of harmonic functions in these sequences, the course of further experimentation, rather surprisingly, categorically repudiated the rest of the apparatus of tonal-functional organization. Attempts to introduce the roots of the second, third, and sixth degrees of the C hexachord as those of secondary triads substituting functionally for IV, V, and I in C major were rejected perceptually. "Secondary dominant" progressions, so common in tonal music, caused only confusion unless extended to include what would represent their subdominants, when they simply became excursions to new hexachords. And as longer sequences of root patterns were spun out into short pieces it seemed more and more evident that no final, or tonic, in either or both systems, was needed at cadences. To summarize, there seemed to be no necessity, as in tonal music, to organize as many notes as possible in a scale as roots of primary and secondary triads in a key with one note as a terminal point, simply because keys were not involved at all.

These textures, then, could properly be called atonal if the word were limited to mean merely that there are no notes of modes or keys as over-all points of reference, and without implying absence of root relationships. And the fact that each system demanded patterns made of groups of three roots lying in a series of fifths differentiated them from modal harmony, except insofar as such patterns commonly appeared at the cadences of later Renaissance music. Their basic organization seemed to be a different expression of the deeper substratum of the hexachordal system itself on which, possibly, all musical organization may be based, and of which the modal and tonal-functional systems may be said to be special cases. This organization could be viewed simply as a chromatic scale made of two hexachords, each of which contained

half of a circle of fifths, giving notes that if rearranged in triads made three major and three minor ones. In spite of the absence of modal or tonal connotations because of the lack of terminal notes, the two end notes of each hexachord seemed able to act as special points of reference, perhaps because of their central positions in the two series of fifths representing the roots of the major and minor triads respectively, and there might be a connection here with the coming into use, in later Renaissance music, of the Ionian and Aeolian modes. Another similarity observed both with tonal minor keys and with cadences of Renaissance and medieval music where the final is approached by step from below, is that the subsemitone often appeared when the fifth note of the hexachord rose to the sixth, as the raised third of III when grouped with II and VI. However, III also occurred quite often with a minor third, atypical of dominants in tonal minor keys, and in general these textures appeared to be free from former patterns. And indeed by their very nature they seemed to repudiate either a single pitch, or a conflict of two pitches, as an over-all cadencing point.

Their loss of tonal-functional organization did not seem a retrogression, however, but merely a different and apparently more natural relationship by fifths of the roots expressed by the notes of the hexachords, IV and V grouped around I, and II and III around VI. The most direct path through them, then, if all the notes in a hexachord were used before modulating to another one, would be III-VI-II-V-I-IV, a pattern that began frequently to appear spontaneously in these experiments when written "by ear," as became possible after some practice, and then analyzed afterward. This is nearly the same as the path found empirically among the 720 possible permutations of these six roots in tonal practices, except that since in the latter I is the terminal point and must come at the end, this sequence is III-VI-IV-II-V-I, the position of IV, which breaks the series of fifths, having been determined by practice.

Once a tentative scheme for a continuum of roots had been worked out as described above, the introduction of dissonance and its control were examined. Here there was found no difficulty in adopting wholesale in each root system the relationships of the seven notes of the diatonic scale precisely as found in both Renaissance and later music: that is, that at each moment one note of a scale or mode is felt as a root, and whichever of the other six notes are present then assume relationships to it from the total potential usually labelled 3, 5, 7, 9, 11, and 13, the remaining pitches of the chromatic scale being treated as variants

of these rather than as independent relationships carrying other numbers. As in pre-20th-century music, 11 and 13 operated here only as unessential or non-harmonic tones, while 7 and less often 9 could be felt either as parts of chords or "essential dissonance," or as unessential tones.

Introduced into these experimental textures, these relationships underlined a clear division between what might be called acoustical and musical dissonances, the latter being those of root relation with its expressive powers of tension and relaxation, and the former the purely vertical arrangements of notes at various moments, the secondary products of the confluence of the two root-streams. In the first-species experiments described above, there were always present vertical intervals associated with dissonance in earlier music, since four-note sonorities were being used, producing sevenths, seconds, and so on, but these intervals occurred between the two root systems rather than in either of them. Hence, as between a pedal and non-related tones in the remaining parts of a tonal texture, there were no note-to-root tensions, in other words none of the expressive impulses of notes towards or away from roots that make up true musical dissonances and their impulses towards relaxation or resolution. Except for the occasional introduction of a mild "essential" or chordal dissonance such as a dominant made of its third and seventh, these sonorities could be called consonances, although more complex than the triads to which consonances are limited in earlier music.

Unlike triads, however, they were not heard as consonant when occurring singly, perhaps because of our long conditioning to triads, but only when in organized groups, and, as described above, it had been found necessary to have at least three before the chain, retroactively to the first, would assume this quality. Providentially, the subjective hearing will wait until a musical sub-organization is sufficiently complete for it to perceive it, and then gather the past and present notes into a meaningful whole: for example we must sometimes listen to several measures of a piece of music before we become aware of the key and rhythmic plan to which they belong.

With musical dissonance thus introduced, the well-spring of musical expression was tapped, and the way opened for actual composition. From a growing accumulation of pieces using these textures a number of tentative statements may be drawn. Offered as illustration is a short composition at the end of this paper, to which references will be made when needed, and for this reason a description of the analysis methodology employed in its examination is given here before going on to further discussion of these textures. The music itself appears on the

left-hand pages. On the opposite right-hand pages is the same music, measure for measure, but split into its two hexachordal systems, each appearing as a continuum of pseudo-voices showing its root-relationships. Here each hexachord is identified by the letter representing its lowest note, and continues until a new letter shows a shift to a new hexachord. Each root is given by a Roman numeral representing its note in its hexachord. Dissonances are shown by the numbers 7, 9, 11, and 13, representing the labels commonly given these root relationships, whether or not the root is actually in the bass, as though an imaginary bass made solely of roots was present as in the case of Rameau's *basse fondementale.* Dissonances so marked are followed by numbers representing the root relations to which they resolve, as 11—3 over the same root, or 7—3 when the root changes. In this way phenomena difficult to show in traditional figured bass, such as upward resolutions, can be clearly represented. Since the root actually will not always be in the bass, but still will not carry a number representing its place in an inversion, it will when necessary be given the number 1. Thus, a ninth resolving down to a root will be shown as 9—1, while a seventh upward to a root will be 7—1. Passing and changing dissonances will generally not be shown by numbers.

To proceed now with some remarks about these textures in general, it was found that their melodies can have the greatest freedom, and that literally any melodic shapes can be introduced into them. Their notes can pass freely back and forth from one hexachord to the other, even in very small and rapid note values, without any confusion. Arpeggiated melodies therefore are not constricted to chordal patterns as they are in tonal music. And since the entire chromatic scale is constantly present as the sum of two opposed diatonic hexachords, all semitones are easily available. Further, a dissonance may be followed by its note of resolution in another octave, provided that the dissonant note also is followed in conjunct motion by a note of the other hexachordal system. (Measures 7, 8.) This obviously gives still more melodic freedom. Cadential points are entirely free from the demands of any tonal system. This, plus the fact that triads or "essential discords" are no longer the only sonorities available for cadences, releases this music from what was probably the worst anachronism of late tonal music, its inability to cadence except in a very few set patterns, so that even the "Tristan chord" was fated to be followed by a very plain dominant seventh.

There evidently are two basses operating independently, the lower voices of the two hexachordal systems. This seems to make possible dis-

tributions of sonorities that would not hold together well in tonal music: that is, with large gaps between inner parts, since in no cases, except the rare ones where three of the four voices are momentarily in one hexachord, will there be, in one root system, an inner voice that in tonal music is commonly kept within an octave of the next upper voice. (Measures 16, 17.) And in general these textures seem to impose no stylistic elements whatever on their music, except the negative one of the absence of triads which they have in common with most contemporary composition.

To proceed to a more specific discussion of the appended example, the top voice was written independently, without any thought of textural organization, up to measure 14. In all of the pieces involved in this experiment a similar procedure has been followed to test the freedom of its melodies from conditioning by its textures. At measure 14, the beginning of the second part of a two-part form, the melody of the first measures was put in the bass, and from then on developed in time-honored sequential fashion.

After experimentation in the first two measures to find an esthetically right "harmonization" of the beginning of the melody, the rest up to measure 14 was written entirely by ear. A growing ability to handle these textures thus had been acquired through writing. The analysis, therefore, may properly be said to be after the fact, for there was no awareness of the single root continua while writing, only the over-all relationships of a complex of interrelated impulses. One might say that the root systems were dictating their own paths together. And the fact that when written by ear these textures, upon analysis, will be found to have this organization seems to give an indication of their authenticity. It might be argued that it should be easy to pick out such root continua in any chromatic four-part complex, but this is emphatically not so. Textures having all the exacting, continuous relationships of so many variables as these do not appear to come about by accident, at least not for any extended length. Conversely, at times in the composition of the experimental pieces by ear it was found that the surface sound had been carried along for a space, as happens in free atonal music, but that the texture had lost its life. Upon investigation these places always proved impossible to analyze into two such root continua.

The path taken by these root systems together in the appended piece seems simple and consistent. The major triads of one hexachord generally lie opposite the minor ones of the other, and in many of these pieces this seemed to be a natural tendency. And if it is true that the

nearest progression in music from one root to another is that of a fifth or its inversion the fourth in either direction, then the movements in each single system from one hexachord to another here are mostly to very closely allied ones, usually as above or to the major second or minor seventh representing two of these steps, and of course this is reflected in the other hexachordal sequence. Here in hexachord 1 the movements from the beginning are from A♭ to E♭ and then B♭, F, C, F, C, G, A, E, and A: only here is a leap to C in what might be called the development of the piece, similar to tonal practices. Such a leap, representing three accidentals, is the most remote possible in these textures, for a greater movement would simply cause the root system to pass over to the other hexachordal complex, and vice versa.

Beyond a simple recountal of elements such as the foregoing, which can be spelled out in written note patterns, language's lack of aural symbols necessarily makes any attempt to verbalize what happens in musical textures a doubtful business at best. However, certain remarks may be made here that perhaps will carry some meaning. First of all, these textures retain, in each individual root-sequence, the same control of the vertical relationships of pitches as pre-20th-century music, and a comparable if different control of those relationships of roots to each other. If it is true that the touchstone of all art lies in the values expressed by the relationships of things rather than in the things themselves, then it may be postulated that the probably accidental discovery by medieval musicians of the beginning of the path leading to these controls is what enabled music to grow at last to take its place alongside the other arts, its existence no longer dependent upon words or bodily movements, but capable of producing complete art forms constructed entirely of musical sounds. Pre-20th-century composers learned to interweave melodic lines in complexes in which there was always such a control and relationship of even the smallest note into an integrated, perceptually meaningful whole, in which sonorities were never passing experiences, but the product of interacting voices. At the center there was always at each moment a nucleus of one note, like the sun of a little solar system around which the other notes took their places, like planets, in an ordered hierarchy of relative intimacy. As this center moved to another note this became in turn a new sun, and the other notes magically shifted to new relationships around it, even making psychological shadings to slightly different pitches. (Perhaps this is why in tonal music repeated notes can escape the redundancy they seem to have in non-root-related textures.)

Composers learned to move this point of concentration in the earlier

music with continuous, constantly renewed, never-broken relationships with all of the notes surrounding it. And these textures may be said to have possessed dynamic qualities that guided the composer's hand, so that he could hear what should be written before writing it. Thus he could rise above a process of manipulating notes and instead hear them as they formed themselves into the supra-rational relationships of art, and catch these in his manuscript. Only in this way could he assume the role of inspired listener, able to hear and write music beyond his direct intellectual grasp, and so able to transcend the tiresome limitations of "craftsmanship" or, even worse, "self-expression." That this can be done by a process of creative selection among the successive possibilities in a highly organized pre-compositional plan was demonstrated by every composer of the Renaissance and tonal periods. And these experimental textures appear to offer the composer a similar control, by aural selection during composition, of expressive sequences of patterns chosen from among a virtually limitless number.

But beyond the retention of these older expressive means there appears to be an additional one, for in these textures there are evidently operating two of these nuclei at the same time. If they are not allowed to merge or become confused it is possible to move both of them concurrently, realizing a further musical relationship between them, roughly analogous perhaps to that between two single voices but operating on a higher organizational plane: expressively fluctuating, buried in the subjective depths of the music, this relationship suffuses the music so far as the perceptual act is concerned with a quality that appears to be unmistakable to all of those few who so far have followed these experiments. Intellectually, without any intention of trying to make a direct comparison of aural with visual phenomena, it might be said to represent what the control of depth in painting may have meant to da Vinci, who called this a necessary ingredient of a good painting—the control of an additional dimension or axis as a means of expanded artistic relationships.

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Notes with broken stems belong to hexachord 1, and solid stemmed notes to hexachord 2.