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## VARIED AIR AND VARIATIONS: A Look at Ives's Ironic Wit

Dan Beaty, Stephen F. Austin State University

Varied Air and Variations (or, if H. Wiley Hitchcock's punning estimation is correct--"Very Darin' Variations") is reckoned by John Kirkpatrick to have been composed around 1923. The subtitle "Study #2" would seem to place it with the earlier (1900-14/15) group of more well-known studies, but Mr. Kirkpatrick thinks it to be possibly one of a second series of similar pieces; The One Way comes to mind.

In its broadest dimensions the V.A. & V. strikes one as being related to the mid-to-late Baroque organ "Chorale-partita" or, if one views Variations 1, as such, the Chorale fantasia." Both classifications would go some way in clarifying the use Ives makes of the omnipresent "Air" which is entitled "Line of Rocks" and is explained as being "the old stone wall around the orchard--none of those stone eggs are the same size." Each variation incorporates the pitches of the "Air" in exact order but only Variation 1 and the first part of Variation 5 (A repetition) duplicate its rhythm. Each variation is contrasted harmonically except as Variation 5 repeats parts of other variations. Texturally, each variation (excepting Variations 2 and 3) differs radically from the others and harmonic and dynamic elements play the biggest part in determining these textural shifts.

The 46-tone "Air" (theme) is built in alternating 6/4, 4/4 measures, each of which is divisible into two equal parts, none of which are alike ("none of those stone eggs are the same size").

The gradually increasing rhythmic complexity of the "rock Line" is accomplished by the inclusion of more rapid note groups as the theme progresses. This rush to the end is also characteristic of each variation and aids in demonstrating the "Man's" sense of fulfillment or frustration--depending on the variation. The single-line rhythmic activity (in three octaves apart) warns the listener early on of the amount of "aural and mental exercise!!" expected of him.

Consider, too, in this light, the line's pitch content. The basically E-minor (as we learn in Variation 4) line stretches any diatonic point to be made by its wide spacing and references to its Sub-dominant (G#/A $\flat$ ) and Dominant (A $\sharp$ /B $\flat$ ) leading tones. "Proper" voice leading is also absent, but the theme's greatest amazement lies in its interior tone-row arrangements. In order to demonstrate Ives's arrangement, I have divided the row into two parts.

Part I includes three complete 12-tone rows beginning on tones 7, 8, and 23. The stacking of the rows on 7 and 8 precludes the more complex arrangement of Part II rows. Note that those rows beginning on tones 25, 26, 28, 30, 32, and 33 are beginning within the space of nine tones. I have used the term "stacked rows" to denote this unique ordering of the twelve tones of the chromatic scale. Ives makes no attempt to develop the row serially of course.

The variations are begun, ended, and interspersed by brief sections labeled respectively as "First Protest from 'boxbelles' when Man comes on stage" / "Protest by a moan sissy" / "Protest" / "Protest" / "Applause (non protest)" / "Protest". Protests 1, 2, and 6 are played *pp* and are also harmonically identical. Protests



The image shows a handwritten musical score on a single staff. The staff is divided into two sections by dashed lines: 'PART 1' (measures 1-18) and 'PART 2' (measures 19-46). The notes are numbered 1 through 46. The key signature has one sharp (F#). The notation includes various note values, rests, and dynamic markings like 'p' and 'f'. The score is written in a somewhat sketchy, handwritten style.

3 and 4 should be played *f* at least, I think, and the 'Applause' is marked *ffffffffff*. Rhythm differs in notation and somehow, "mood" between Protest 1 and Protests 2 and 6. For some reason, due probably to the greater number of ties in 1, one tends to play 2 and 6 a bit faster. The Protests aid directly in enhancing the sense of irony which Ives is conveying. This "play within a play (within a playing?!)" is theatrical in the extreme shows Ives at this dramatic best. Who is Ives satirizing: the "boxbelles" (Rollos, Eddies, Lizzies, etc.) who'll never even attempt to understand the music? The "man" who would dare to play (improvise) such as this to an audience he obviously knows is going to be unreceptive (after all, they moan when he walks out on stage!)? Ives himself as the dramatis arbirer, composer of such or similar outrageous material (maybe he is the "Man", and as this "Man he can satirize his own fears of performance or non-acceptance)? Or perhaps the on-stage performer?

Variation 1 employs the theme with shadow harmonies characterized as "things and sounds in the distance". These are defined by the outside interval of a ninth predominantly, just as the Protest chords. Is the Man attempting to ameliorate the harshness of the Rock Line with this harmonization or does he merely add to the theme's complexity? We can see an answer in Ives's use of "drum-type" (piano drumming) chords with which he had experienced as a child and continued to use extensively. These typically Ivesian harmonies are set against the not-so-typically Ivesian theme and may be interpreted as making the Man's mental and aural exercise more palatable.

Variations 2 and 3 are canons. The Man probably thinks if he can't inspire his audience, he can at least teach them with well-accepted "canon d'ecole" exercises. Variation 2 is a mirror canon, with the rock line (R.H.) played *p* and



its inversion (L.H.) played  $\frac{3}{4}$  (the only instance of the theme not being marked louder or equal to its accompaniment). The tempo marking "March time or faster" demands a strict 4/4 signature and the formerly wide-spaced line is compressed both rhythmically and tonally. One can now hear the predominant 4th & 5th intervals both horizontally and vertically. E-B and B-E occur 14 times, and B $\flat$ -F F-B $\flat$ , a tri-tone away from the "tonic" E, occur 13 times providing that lopsided TON/DOM relationship of which Ives is so fond in many of the songs and other more tonally-oriented pieces.

Variation 3 is an easier to hear canon at the lower 5th divorced by two beats. Perhaps the Man is trying to get closer to the level of his audience by separating the lines. Indeed, things are easier to think and hear, and the new Protest at the end of Variation 2 might have just turned him more sympathetic. The chords are crashing 8/10-note structures played, as I interpret them,  $\frac{3}{4}$  or  $\frac{5}{8}$  instead of *pp* as before. But his efforts are in vain for Variation 3 is greeted in the same manner as Variation 3. Both variations gradually become more frantic rhythmically and each ends with a chord that leads one to think the "Man" is trying for all 46 tones of the rock line at one. Note the palm smashed marked "all".

Variation 4 is the most directly amusing ironic twisting of the rock line of the lot. "All right, Ladies," says the Man, "I'll play the rock line again and harmonize it nice and proper." It is written in 4/4 meter (Adagio or Allegro moderato) and labeled as "16 nice measures. E-minor just as much as possible!" The whole of late German Romanticism comes in for some heavy ribbing here. One hears--although it's doubtful Ives had--harmonies in mm. 65-67 that are distinctly reminiscent of the Berg Sonata. He had heard Richard Strauss though. After the first four measures of Variation 4 things go askew as far as "niceness" is concerned and the Man is approaching his old tricks. It would seem that he just can't leave 7ths and 9ths alone and the tortuous return to E-minor in mm. 70ff reminds one of those "use two diminished-7th chords, three augmented-6th ones, two modulations, etc." kinds of exercises we still demand of our more advanced harmony students. The results bear an excruciating sameness! No matter though, the audience greets this attempt with an absurd amount of "Applause (non protest)": three measures of C-major triad played  $\frac{3}{4}$ .

This drives the man into a frenzy--he loses control, "gets mad at them and starts to throw things at them again" as he barrels into Variation 5 playing "faster than ever or possible! Presto or so!" (Ives wryly notes that "he ought to be polite for he will not be engaged and paid at the next nice afternoon TEA concert!").

It is interesting to hear that the stark "line of rocks" theme with all its mental/aural correlates is finally totally obscured. One truly regrets the loss and feels a certain pity for the "Man", but his childish temper-tantrum still provokes at least a smile, albeit somewhat embarrassed. Ives's sense of the irony of the situation is achieved though and we can appreciate his accomplishment fully. He has led us from the three-octave-apart presentation of the theme, through Protests, to a fine Variation 1; two questionably effective didactic canons; a molly-coddling, tongue-in-cheek stretching of an imaginary E-minor as tonic Variation 4--well greeted as the man knew it would be--to this final outburst. The ending Protest puts him, us, and them exactly back to where we began. The piece remains a well-rounded form--delightful in its deliberate



disintegration.

A few other observations should be made--foremost among them concerns the first variation's relationship (probably only indirectly suggested by Ives to himself) to his concepts of the "Universe Symphony." He refers in the Scrapbook (Memos, p. 106) to a "musical piece in two parts, but played at the same time" with bass instruments "working out something representing the earth, and listening to that primarily" and treble instruments "reflecting the skies and Heavens" and specifying "that the piece be played twice, first when the listener focuses his ears on the lower (the "line of rocks") or earth music, and the next time on the upper or Heaven music (Ives's accompaniment in Variation 1?)". In the six-fold presentation of the Air only Variation 1 could be conceived of as representing the "earth" hearing since it is obviously a "Musical piece in two (contiguous) parts"; no subsequent representation of the Air would allow a second thoughtful audition--a "Heavens" hearing.

Ives also refers ("Scrapbook", Memos, p. 107) to a "vacant space of four whole tones (sic) between B-natural and E-natural"--the first interval of the Rock Line and the tonic and dominant tones of Variation 4. He also says that "...the Heavens has its own chord system, but its counterpoint is chordal." One is reminded of Variation 1 with its "piano-drumming" chords and the open fifths/octaves doubling of the Rock Line.

If one can see the stacked rows as immediately ecliptic, then maybe "these two main groups (do) come into relation harmonically only in cycles:..that is, his statement that "they go around their own orbit, and come to meet each other where their circles eclipse" would go some way in supporting my analogic interpretation if one is willing to see Ives as ironically forcing both the orbit and its eclipse. (Compare, as an example, Larry Austin's original and interpolated sections in his Phantasmagoria--a realization of Ives's sketches for the Universe Symphony.) If so, maybe one can see Ives as the Man and the Man's frustrations as his own.

Similarly, his bitterness (If one can indeed call it that) might be seen as a turning from an essential striving for a musical expression of his lofty transcendental pantheistic urge into one of the most remarkable pieces of fun-poking introspection ever recorded. Depending on the moment of perception, one may see the man's bitterness and/or humor conquering, merging, fading, re-emerging circularly.

A Zen Master would say that "if it cannot be funny, it cannot be Tao." Ives would give him the V.A. & V. in agreement, demonstrating, as John Kirkpatrick has said, the "ability...to get some fun out of the things one regards most reverently."



GERMAN PEDAGOGICAL TRADITIONS USED AND DEVELOPED  
IN AMERICAN COLLEGE HARMONY TEXTBOOKS

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American authors of the late nineteenth and early twentieth centuries relied heavily on pedagogical traditions developed in European harmony texts. But new ideas appeared in American texts of this period. Often these new ideas were treated in a superficial manner which caused them to be completely overlooked by an author's contemporaries. It is well to examine several of these new ideas before looking at individual texts.

(1) Usage organization as a method of harmony.-When Bussler moved the presentation of cadence from near the end of his harmony text to near the beginning, he began an immensely important trend which was continued by American authors. This repositioning of compositional materials from near the end of the harmony text to near the beginning signals an early effort at moving from a "logical" organization to a "usage" organization. In a "usage" organization the materials most frequently used in musical literature are presented near the front of the harmony text. The "usage" organization text does not clearly separate from the "logical" organization text until well into the twentieth century.

(2) Less dogmatic attitudes.-American authors tended to treat harmony in a less dogmatic manner than their European counterparts. This change in philosophy grew from the emerging realization that harmony was an elementary form of composition and that broader possibilities of composition had to be incorporated into the harmony text. This emerging realization is not obvious, instead only brief suggestions intimate the embryonic form of the idea.

(3) Variety of exercises and examples.-The universal belief that all instrumental and vocal compositions could be reduced to four parts continued to be observed. To this tradition was added assignments using a piano-style of writing. Although these new exercises appeared to be totally different, they were actually elaborations of the basic four-part writing style.

(4) Emergence of inductive reasoning.-In harmony texts examples composed by the authors were replaced in part by excerpts taken from the musical literature, thus a basis had been established from which inductive reasoning could grow. At first these examples were used to support deductive reasoning, but slowly authors began to look to the musical excerpts for clues in a constant search for an improvement in pedagogical practice. The deductive thinking in European harmony texts so greatly influenced American authors that the emergence of inductive thinking was extremely slow.

(5) Recognition of music as an extremely complex art.-The desire on the part of nineteenth century authors to reduce great music to a few basic principles slowly gave way to a realization that such a reduction excluded many ideas which rightfully could be considered in the training of musicians. This change was accelerated by a rejection of "laws of nature" as the determining factor of musical greatness. With an acceptance of social requirements as the determining force of musical greatness, pedagogical practices began to change.



Perhaps the most important change was the acceptance of music as an extremely complex art. Heretofore harmony, counterpoint, ear-training, keyboard study, and original composition were considered separate skills which were learned at the "appropriate" time. Authors began to realize that all of these skills were vital to the student's development. In effect, authors were beginning to recognize that harmony as a means should not be greatly different from the musical end.

(6) Student interest.--With the decline in the belief of instinct as the determining force of student accomplishment, authors began turning their attention to developing the student's interest in harmony. In contrast to the European view that harmony should be a strict study which students must suffer through before attempting composition, American authors claimed that harmony was the most pleasurable way of learning about music. In order to make the study of harmony more appealing, ear-training, keyboard work, and original writing were added to the harmony text.

(7) Positive approach to harmony.--European authors presented harmony in negative terms which dictated what should not be done in place of what could be written. By using the idea of musical instinct as a means of setting limits before the student, possibilities beyond these limitations simply were not considered. Many American authors subscribed to this approach, but some saw the rejection of musical instinct as an opportunity to move in a different direction. They began to frame musical concepts in positive terms which allowed students to explore beyond the limits of the text.

(8) Harmony as an artistic subject.--While European authors treated harmony as a science, American authors began to see artistic possibilities in the study of harmony. The difference between European and American thinking on this topic was not as well defined as this delineation might suggest. The rejection of figured bass was an obvious result of this changing view; heretofore it had been employed as a mechanical approach to harmony.

American authors were so thoroughly indoctrinated with European traditions in the writing of harmony texts that differences between American and European texts are often very subtle. Yet new pedagogical practices may clearly be seen when a large group of texts are considered.

#### Texts Written by Authors at the New England Conservatory

In 1867 the New England Conservatory began offering an academic program in music. Almost immediately this institution became a place of important activity in the writing of harmony texts. No other institution could boast of a faculty having so many authors. Almost without exception every text written by this group of authors met with wide acceptance.

George Henry Howard (1843-1917) studied at the Leipzig Conservatory with Richter and Papperitz, and later in Berlin with Haupt and Kullak. Howard's Course in Harmony presents the first mention of student interest in an American harmony text. Previously student interest was a secondary consideration to the demand for student submission to an author's philosophy. The principal means used for creating interest is the presentation of a wide variety of exercises. Many creative ideas of Howard and other authors were ignored because of the German scholastic dominance of American thinking.



Percy Goetschius (1853-1943) is one of the most influential authors in the history of the American harmony text. The Material Used in Musical Composition was written in 1870 for use at the Conservatory of Music, Stuttgart, Germany. It was first published in America in 1889 and eventually went through twenty-five editions.

Originally the text was designed for use in harmony classes attended by English-speaking students at the Conservatory. The text was based upon the method of Professor Immanuel Faisst, an esteemed member of the faculty. Faisst lectured without notes, and extemporized examples and exercises as needed. Goetschius wrote down the lectures of Faisst and began giving lessons using his manuscript. Upon graduation he taught at the Conservatory from 1876-1885 and was honored with the title of "Royal Wurttemberg Professor of Music" before returning to the United States. The wide acceptance of his text continued the dominance of German traditions in harmony pedagogy for a long time.

The literary style is meticulous and precise, leaning toward the complicated and didactic. For its time, this is one of the most tightly organized texts. There is a provision for almost every conceivable possibility. Two sizes of types are used, large type for information essential to every student, and small type for exhaustive explanations which may be omitted if students deem them unnecessary. The rigid control of every conceivable possibility left no room for creative experiments by the student. The implied prohibition on creative writing is the strongest influence Goetschius had on later authors.

Authors near the turn of the century were drawing from a common body of pedagogical thinking. Each author laid claim to any small changes he might make, but such differences generally were minor.

#### Texts Written by Authors at the Institute of Musical Art

Second only to the New England Conservatory in attracting prominent authors of harmony texts was the Institute of Musical Art in New York City. In the early twentieth century this institution employed such prominent scholars as Percy Goetschius, Thomas Tapper, Franklin Robinson and George Wedge.

Thomas Tapper's (1864-1958) First Year Harmony (1908) and Second Year Harmony (1912) were written during the author's stay at the Institute of Musical Art. Tapper studied in the United States and in Europe. The aim of the author is to present "Lessons in Tone." The student must learn to hear, think and record tone. Creation or self-expression is the objective of those skills. To achieve this objective Tapper writes a text in which explanations of musical reasoning replace the older approach of merely describing music.

Another important change appearing in Tapper's text is the treatment of cadence. It is used as a recurring device for unifying the subject. Also, this is the earliest presentation of the important role played by the ii chord in cadential passages. The presentation of the cadence progression ii-V-I before IV-V-I is suggestive of Piston and Goldman. They contend that the harmonic role of the ii chord is more important than the IV chord because of the fifth relationship between the super-tonic and the dominant.



In 1930 and 1931 George Anson Wedge (1890-1964) published his Applied Harmony in two parts. The text was developed in classes at the Institute of Musical Art of the Juilliard School of Music, New York City. Howard A. Murphy, co-author of Creative Harmony and Musicianship (1951), assisted Wedge in the preparation of the text. An important feature of this text is the piano-style exercises in which Wedge gives the germ of a musical idea for students to develop. This interest in motivic development represents a significant step in dealing with musical ideas in the study of harmony. Heretofore harmony and composition were treated separately.

#### Texts Written at Harvard University and The University of Pennsylvania

Compared with the New England Conservatory and the Institute of Musical Art there were very few other institutions which attracted a comparable number of harmony textbook authors. The other institutions which had strong reputations in the late nineteenth and early twentieth centuries were Harvard University, the University of Pennsylvania, Oberlin Conservatory of Music, and the Peabody Conservatory of Music.

#### Harvard University

Walter Raymond Spalding (1865-1962) studied with John Knowles Paine (1839-1906) at Harvard before going to Paris to study under Culmant and Widor, and to Berlin to study with Rheinberger. He began his teaching career at Harvard and eventually succeeded Paine as head of the music division.

Foote and Spalding were co-authors of Modern Harmony in its Theory and Practice (1905). It is a blend of German organization and treatment of the subject, and the American adaptation of German ideas for use in this country.

Foote and Spalding are the first American authors to adopt Charles Vincent's chart indicating possible progressions of root position triads. After Foote and Spalding the chart appears in texts by Carl Gardner, Thomas Tapper and Walter Piston.

#### University of Pennsylvania

While at the University of Pennsylvania, Hugh Archibald Clarke (1839-1927) published two harmony texts. His chief theoretical works are Harmony on the Inductive Method (1880) and A System of Harmony Founded on Key Relationship (1898).

In the mid-nineteenth century the commercial success of a book was almost guaranteed by the claim that it adhered to the Pestolozzian method. Clarke's claim is a carry-over of that practice. Basically Clarke's system is no different from other systems of harmony in the nineteenth and early twentieth centuries because the deductive method was the accepted procedure.

## Structural Coherence in Stravinsky's Piano-Rag-Music

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Stravinsky's 1919 Piano-Rag-Music is often maligned as an aberrant excursion of minor consequence, especially compared to *L'Histoire*, *Symphonies of Winds*, and other familiar works of the same vintage. This paper wishes to take exception with that verdict.

Stravinsky always viewed each new work he undertook as a particular obstacle to be hurdled, a compositional problem to be solved. The intent here is to suggest the specific techniques employed in solving the unique problem posed in this piece -- a problem of writing in a highly identifiable form closely linked to tonal and rhythmic conventions endemic to the style, without forsaking the need for a cohesive basis so intimately associated with Stravinsky's fundamental approach to composition.

The architecture of the work is suggested through an investigation of the unordered pitch-class sets. The numerous partitions of the composition which appear seemingly unrelated at the surface are found to be traceable to a rather limited vocabulary of sets articulated at the work's outset. Speculation regarding the event pacing as engendered by these seminal sets is also addressed. Conclusions reveal that even in a work usually thought of as improvisatory, Stravinsky seems to have brought a measure of structural coherence to every dimension.

This paper appears in the form of an article in Music Theory Spectrum, Volume 4, 1982.



IN QUEST OF BETTER FRESHMEN  
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The teachers responsible for the pre-college training of our freshman music majors are very likely to have been trained in our own institutions. Instead of complaining about the inadequate preparation of freshmen, we need to look at the elements of our theory curriculum and consider where we can introduce ideas and skills which will provide future studio and public school teachers with the ability to teach the essentials of music theory in a practical, performance-centered way.

Three recommendations seem to be fundamental to the achievement of this goal. First, the college theory teacher must provide an example of musicianship, using the singing voice confidently to communicate, using piano or another instrument freely in order to illustrate what is being discussed. Second, we must guard against setting the example of presenting partial or oversimplified concepts; an illustration here is that of teaching the C, G, and F clef signs along with the pitch sounds they represent and letting the principles of staff notation emerge so that from the start students have a perspective of the grand staff and its partitioning into five-line segments. Third, we need to allow students to behave as teachers under our observation. Let them share with their classmates the repertoire they are learning by performing and explaining it. If they have experience in conducting, arranging, composing or any other musical behavior, try to bring these skills into play as a part of translating the insights of the theory class into practical application in developing musicianship.

There is a good chance that in time the people we prepare in this way will send us freshmen about whose preparation we will have no complaints.

FACILITATING CHORALE-STYLE WRITING  
THROUGH THE STUDY OF TWO-VOICE COUNTERPOINT

Don McManus - Angelina College

This presentation reviews pedagogical material<sup>1</sup> to make a position statement regarding the feasibility and potential applications of skills imparted to the freshman-level student through the systematic study of two-voice counterpoint.

The presenter maintains that the lower-level theory student is capable of successful manipulation of rudimentary counterpoint as soon as the student has a working knowledge of note values, meter signatures, and intervals. The thrust of the paper addresses a suggested sequence of study encompassing the following principles: consonance and dissonance (categorized by utility as perfect and imperfect consonances, available and unavailable dissonances), interval complements, simple and compound intervals, harmonic stability and tendencies of the four interval categories, melody-writing (conjunct versus disjunct motions, focal point, non-favored melodic intervals), contour interaction between consecutive harmonic intervals (contrary, oblique, parallel, and similar, crossed voices, overlapping), cadential closure formulae, rhythmic implications of tied notes, agogic accents, dynamic markings, and complementary rhythm.

The inclusion of such a study in the freshman regimen can afford several advantages, particularly in environments where the student will be exposed to traditional aspects of chorale-style writing. Several modes of application are listed below.

- (1) Needing only a few minimal skills the student is enabled to compose single-voice melodies that exhibit reasonable contours, a sense of goal, and rhythmic variety.
- (2) The student learns to recognize the harmonic implications of two simultaneous melodic entities. Tendency tones are found to have both vertical and horizontal vestiges.
- (3) Rudimentary experiments with harmonic rhythm, prolongation and displacement, and closure become practicable.
- (4) Conventions of notation and writing for non-keyboard instruments find fertile ground as adjunct studies.
- (5) The student with minimal or no prior keyboard skills is afforded a performing outlet.

The presenter maintains that such a study can provide both immediate and long-range applications for the student who is often felt to possess few demonstrable or creative skills.

<sup>1</sup> Selected excerpts (Chapters 1-3) from Harmony through Counterpoint by Douglass Green.



"Pitch in Contextual Evolution: Varese 'Density 21.5'  
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North Texas State University

There have been numerous studies which have applied the general principles and formulas of Information Theory to music in an attempt to understand the nature by which musical meaning is received and translated. However, these studies do not adequately account for the role of human memory as it affects the reception and processing of musical information. In this presentation the author has shown his attempts to integrate a widely accepted model of memory(1) with some of the basic premises of Information Theory.

Information Theory generally posits the receiver as a single dimension channel whose response is based on a serial presentation of information, with the greatest strength of response deriving from the most recently heard 'bits' of information. The terms "first-order", "second-order", . . . "nth-order" account for the number of previous units of information which bear on each next response. There is no accounting made of the additional weight a particular unit may carry based on its recurrence or similarity to some previously heard, but more distant event. In this paper, the author posits a second dimension or channel of response potential which fluctuates in recognition of previously heard information. He traces the development of a simple theory and tests its application to Varese' Density 21.5 for Flute Solo.

First, the melody is parsed into its constituent Minimal Intelligible Units (MIU's). For the purposes of this study these are taken as pitch successions devoid of durational information (2). Each MIU is taken in its order of appearance and compared with a generalized replica of each previous MIU to see if it is a processed version of an earlier MIU, or newly derived. In Density 21.5 there are two motives which comprise the first half of the piece. The processes which have operated on these motives to create the derived motives are placed into a hierarchy from "least disruptive"--of the recognition of similarity between the original and the result--to "most disruptive" of this recognition. (This hierarchy may be considered informal and somewhat arbitrary in that no formal psycho-acoustical data has been used to verify its order.)

Thus, two measures of response are used and developed into value scales. The first depends on the order and 'recency' of an MIU and is termed 'Order Value' (OV). The OV of an event is derived by subtracting the number of non-similar events which have occurred since the most recent similar event from the constant value, '6'. Thus, an event which occurs following three dissimilar events would have a value of '3'; one which follows two dissimilar events a value of '4'; etc.

The second value scale accounts for the kinds of processes that occur, recognizing that the resulting motive may be strongly or weakly associated with its original version. Among the processes found in Density 21.5, given in their order from weakest to strongest effect are:

1. Segmentation; Extension by repetition of pitch or interval;
2. Intervallic expansion/contraction; Transposition
3. Inversion; Retrogression; Rotation of Intervals, without transposition;
4. Omission/Interposition of pitches or intervals;
5. Octave displacement;
6. Other effects.

Each number from 1 to 6 above becomes an index of the strength of the process and is called a 'Process Value'(PV). The PV is integrated with the OV to yield an index of the Strength in Memory (SIM) for each MIU. The formula is as follows:

$$OV - PV = SIM$$

Example 1, which is the first four MIU's of Density 21.5 illustrates the application of the formula. MIU's a and b have no predecessors and thus no values OV, PV, or SIM. At MIU c, which is like MIU a, an OV of 5 arises (one dissimilar event has intervened) and the un-processed restatement of a in c yields a PV of 0, so the SIM for c is  $5 - 0 = 5$ . MIU d is like b, again one event has intervened (OV = 5), however, d is a fragmented version of b so the PV = 1, thus yielding a SIM of 4.

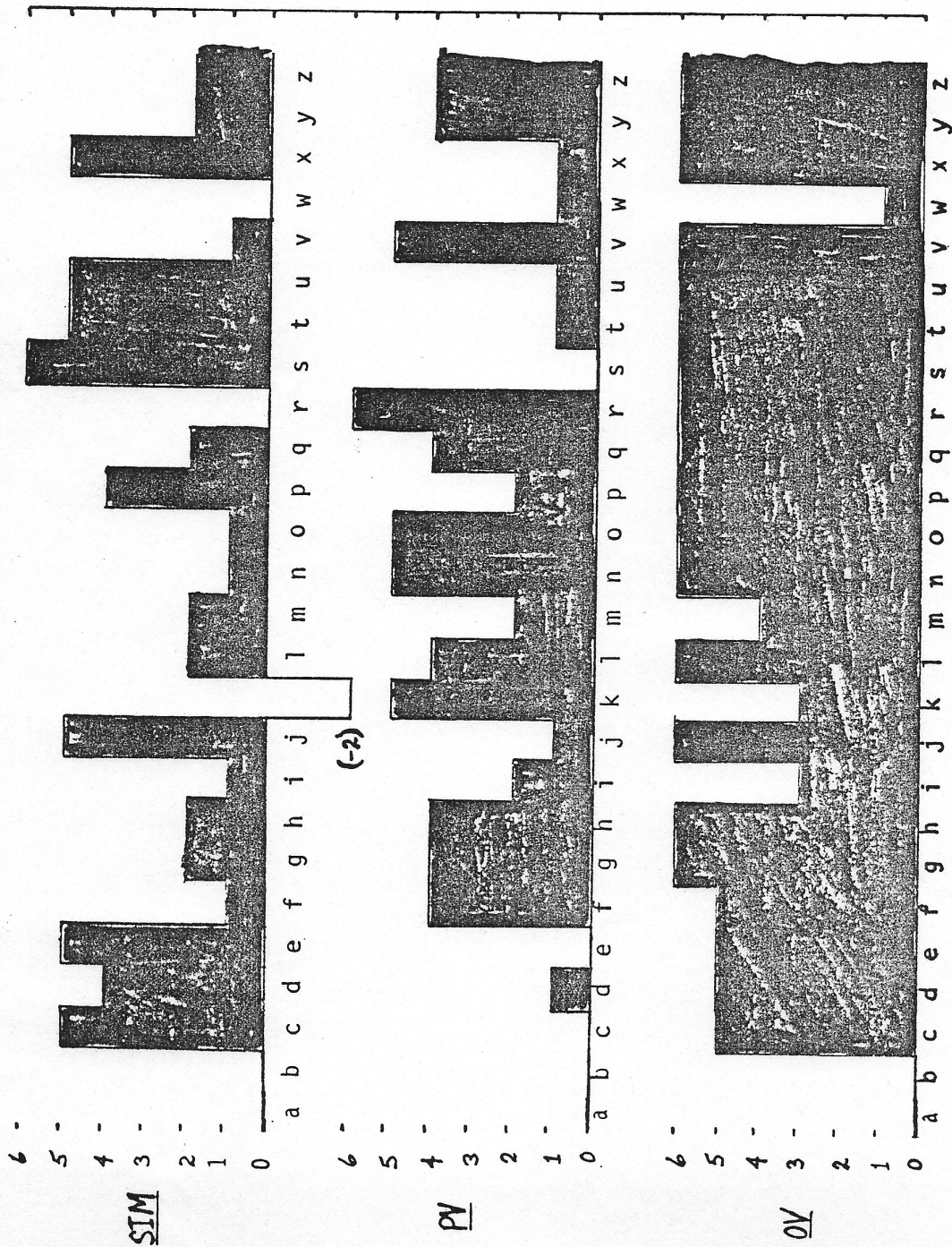
The graph illustrates the OV, PV, and SIM for mm. 1-23 of Density 21.5. Note the variety of SIM values deriving from both order and processes. This would seem to indicate a richness in the kinds of responses that a typical listener could make to this piece, notable for the limited amount of raw material from which those responses have been derived.

Notes:

1. Donald A. Norman, Memory and Attention: An Introduction to Human Information Processing, 2nd. ed. New York, 1976.
2. Thomas Clark's companion paper deals specifically with the rhythmic element of Density 21.5 and should be consulted for additional insight into this element.



Example 1: Varese' Density 21.5 mm. 1-4 with MIU's marked.



RHYTHM IN CONTEXTUAL EVOLUTION  
Traced Through Varese's DENSITY 21.5

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Rhythm is an articulate manifestation of time, the most basic substance of music. Musical time is not experienced uniformly; changing contexts, experience and expectation bend the course of temporal comprehension. Each rhythmic event exists in a unique environment; context is change.

Context is, more precisely, an accumulation of information about previous events and their relatedness. This information can generate a stream of expectation and prediction, but only in a well-defined style system, something not yet adequately understood in modern music. Context is, nonetheless, useful as an embodiment of perceptual perspective moving through time space.

Events, sound and silence patterns, or surface rhythmic units have measurable durations. The completion or end of a rhythmic unit is signalled by rhythmic means: a rest of significant duration or an extreme duration of sound, significantly longer or shorter than prevailing durations in the pattern. The end of a rhythmic unit may correspond to a sense of completion or punctuation by extremity in other sound parameters such as pitch or loudness, but such correspondence is not exclusively necessary to identify boundaries of rhythmic units.

Duration strings form adjacent proportions, some simple, some more complex. Basic operations can group smaller durations into larger units or molecules by their adjacency and simple proportions. This creates levels of rhythm, a hierarchy of surface, molecules ("motives"), bounded events ("phrases"), and sections. Dynamic, agogic, and metric stress give event units a sense of directional focus, exemplified by the descriptions "moving toward" and "ensuing from". Pitch and its registral and directional distinctions can be seen to make rhythmic differentiations and form groups; however, in this study it will not be considered so that fundamental rhythmic principles can receive isolated focus.

With the recognition of rhythmic units, their durational, proportional, and underlying grouped properties, relationships between units (e.g. extension, expansion, interruption, fragmentation, compression, inversion, retrogression, permutation) can also be identified. These relationships are useful in replacing simple contrast/continuity distinctions as building blocks of form. However, application of such transformational operations is limited by their inflexibility to subtleties of shading. Less rigid schemes of comparison are proposed here, constructed and employed by quantifying aspects of rhythmic relatedness in a continuum of change.

Transformational relationships of rhythmic groupings in the first three phrases of Varese's DENSITY 21.5 are shown. A complete durational catalog of the piece, including metric stress and molecular groupings, is also given with analytic commentary on the interpretation of rhythmic motives.



Definitions of comparative rhythmic information include density of metric stress, durational density or fullness, attack density, proportional complexity, fluctuation, proximity of matching information, and a rhythmic contrast quotient. Each is measured and shown graphically for the extent of DENSITY 21.5.

The significance of relationships can be measured by their contextual proximity. Stated mathematically, the degree of similarity an event has to immediately previous events is inversely proportional to temporal distance back to most closely related previous events. A composite graph of contrast and distance values portrays this mirror quality of similarity and proximity. Sectional form can be replaced by the identification of regions or currents of relatedness. Tracing course changes in the nature of relatedness through a musical work can thus sketch an evolutionary process that is the embodiment of form.