

**Meaningful Scribbles:
An Approach to Textual Analysis of Unconventional Musical Notations**

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Abstract

This paper draws upon recent studies of writing systems, buttressed with material drawn from general linguistics and semiotics, to develop an approach to the analysis of musical notation as a system of signification in its own right (as opposed to a mere representation of musical sound). Scores are herein understood, following Nicholas Wolterstorff's formulation in his paper "Towards an Ontology of Artworks" (1975), as "a record of the artist's determination of correctness-conditions." Our analysis must, then, provide a clear explication of the means by which these conditions are communicated – even where these means are not readily understood as drawing on any known signifying convention. With this in mind, the method of analysis is designed to be flexible enough to accommodate any notated document purporting to be a musical score regardless of the particular notational conventions used. A description of the relevant linguistic and semiotic terminology and its uses is followed by a discussion of their application to the study of elements of standard notational practice. A sequence of steps, through which the analysis of an unconventional "graphic score" is to proceed and by which musical meanings are to be assigned to the score's markings, is presented. This sequence is illustrated through a progressive sample case that offers a range of possible musical interpretations for variations on a simple notation of the author's devising. Finally, a discussion of the possibilities for evaluating unconventional notations, once musical meanings have been ascribed to all markings within the score, will be undertaken with reference to John Cage's "Variations I".

1. Introduction

While scholarly attention has been paid to the notational component of music, these studies¹ do not explicitly outline a method whereby a musical notation can be treated as a distinct system of signification (as opposed to a mere representation of musical sound). The extant study that has come closest to this aim is Leo Treitler's "The Early History of Music Writing in the West" (1982), which applies Peircean semiotic terminology to the classification of regional musical scripts of the late medieval period. Recent studies² in linguistics reveal some fundamental properties of writing systems for which Treitler's study does not fully account. It is my intention to build upon these studies, augmented by relevant ideas from semiotics and general linguistics, in proposing an approach to the analysis of any notated document purporting to be a musical score regardless of the particular notational conventions (or lack thereof) used. The desire to undertake such an analysis may strike some as odd. After all, the purpose of a musical notation, if it is to be a *musical* notation, is to describe or guide the performance of the musical work notated. How, exactly, a notation does this is still a matter of some philosophical debate, but for present purposes, Nicholas Wolterstorff's formulation will suffice: "Most scores function and are meant to function to guide performances. But what is true of every score is that it is a record of the artist's determination of correctness-conditions" (1975: 136). Given this function, the importance of a clear understanding of the medium by which these "correctness-conditions" are communicated should be evident. If we are to identify proper instances of a work (of notated music), then we must know what the notation signifies.

This paper was written with the radical notational experiments – so-called "graphic scores" such as those created by the New York School³ in the 1950s and 60s and their followers in more recent decades – in mind. In these works, the notation is not construed simply as a means of describing a sound structure or delimiting performance techniques. Rather, a level of strategic ambiguity is introduced by the use of unconventional and often newly-invented symbols. These symbols, when not tied by tradition to a pre-existing musical meaning, interfere

¹ For a recent sampling, see Leo Treitler (1982, 1992), Kenneth Levy (1987), Anna Maria Busse Berger (1993), and Alma Colk Santosuosso (1989) regarding the historical development of musical notation; see Gardiner Reed for a practical guide to modern notational practice and (1987) for a survey of proposed notational innovations; see Jane Alden (2007) for a recent study of the historical precedents for Earle Brown's notational innovations and Mieko Kanno (2007) on modern innovations in prescriptive notation.

² See Coulmas (2003), Harris (1995), as well as Gerhardt Augst, ed. (1986), *New Trends in Graphemics and Orthography* (Walter de Gruyter).

³ "The New York School" is a term that has gained some currency in referring to the collected works of composers John Cage, Morton Feldman, Earle Brown, and Christian Wolff.

with our ability to identify the “correctness-conditions” indicated by the score. In such cases a new reading strategy is required (often aided, but not fully accomplished, by the inclusion of performance instructions, though in some cases no directions are provided at all⁴). The piece of music notated in such a way results from a dynamic interaction between the ambiguities of the notation and the fixing of those ambiguities into particulars to guide a performance. The approach presented herein should serve as a basis for such readings. This approach is presented as a sequence of steps through which the analysis of an unconventional “graphic score” is to proceed and by which musical meanings are to be assigned to the score’s markings (section 4). A progressive sample case (section 4.1) walks us through this sequence, offering a range of possible musical interpretations for variations on a simple notation of the author’s devising. In preparation for this, necessary concepts from linguistics and semiotics are introduced (section 2) and applied to conventional musical notation, which serves as a background for our consideration of unconventional notations (section 3).

While my primary concern is with radical notational experiments, the present techniques can also be applied to other notational approaches, including wholly traditional ones. For instance, a study of the prescriptive notational innovations of Helmut Lachenmann, would reveal much about the composer’s conceptualization of the performance techniques he calls for. A study of the relative success of several of these innovations might, in turn, reveal something of the way musicians experience and interpret musical notation. An analysis of the use of (usually) standard notation to represent the spatial conceptions of musical sound in the work of composers such as Varese, Xenakis, and Tenney might prove similarly illuminating of their work. It should also be stated that the discussion will raise philosophical questions regarding reference and meaning as well as the ontology of the musical work. These will have to await future studies for their full treatment. The question of the evaluation of musical works notated by unconventional means will be addressed in reference to John Cage’s “Variations I” (section 4.2) with the following caveat: I will confine myself to the evaluation of the appropriateness and inventiveness of the notational means employed weighed against the apparent intent of the composer. I am not, at present, concerned with establishing criteria for the aesthetic assessment *as works of music* of works of music notated by unconventional means. That issue can only be properly addressed once the full analysis of such works – merging a textual analysis of the sort I propose with phenomenological analyses of a sampling of performances of the work in question and ethnographic study of the decision-making processes required for each realization/performance

⁴ See, for instance, Cornelius Cardew’s *Treatise* (1967) and *The Great Learning* (1971).

of the work – has been undertaken. Obviously, to present such an analysis, in addition to outlining the proposed method for undertaking the first part of that analysis, would require more space than I could reasonably devote in a single article.

2. The Study of Writing Systems

This section will introduce the requisite terminology for the analysis, defining terms from linguistics and semiotics and explaining their interrelated functions. Most studies of writing systems draw upon the tools developed by linguists to make possible the analysis of spoken language. Such analysis is predicated on the assumption that:

... no matter how we answer the question of whether writing followed, preceded or accompanied the recognition of different levels of linguistic structure, it is clear that, by virtue of the fact that every writing system maps onto a linguistic system, it embodies and visibly exhibits the dissection of units of language and thus linguistic analysis. (Coulmas 2003: 151)

A writing system marks distinctions appearing, at some level, in the sonic form of a language. In so doing, writing can function as a medium for the analysis of spoken language (at the level of those distinctions). In broader terms (not privileging spoken language), two distinct expressions, the written and the spoken forms of an utterance, are correlated by a structural analogy. For instance, if we have symbols representing complete spoken words, then we have a logographic writing system. If we have symbols representing each possible syllable of the language, then the writing system is syllabographic. Where letters correspond to phonemes, the system is alphabetic. These smallest units are those by which the structural analogy is articulated. However, the units of these expression-planes (written or spoken) can be further analyzed – though not always (or often, even) into meaningful parts – for the conventions governing their formation.

Like linguistic sound systems, writing systems are structured and can, accordingly, be analysed in terms of functional units and relationships. The distribution of these units is governed by restrictions limiting their linear arrangement in forming larger expressions. These restrictions can be understood as operating on the graphic level alone. In this sense every writing system is to be analysed as a system in its own right irrespective of other kinds of linguistic structure to which its units and compound expressions may refer. (Coulmas 2003: 34)

Our purpose then includes, not only, an explication of the nature of the analogy between expression-planes, but also a study of the sub-analogical structures of one or the other expression-plane (i.e. the structural aspects of an expression-plane that exist below the level of

the analogy coordinating that expression-plane with another).

According to linguist Roy Harris, the most fundamental characteristic of writing systems, at least in reference to their analysis, is the presentation of the writing within a graphic space. The graphic space makes available two- and three-dimensional spatial structures for the representation of one-dimensional, time-bound activities to which writing is taken to correspond, such as spoken language or musical performance (Harris 1995: 46). Harris distinguishes two forms of writing systems, scripts and charts. Charts may be understood as graphic communications that assign meaning to locations within the graphic space, scripts those that assign meanings to arrangements of marks in relation to one another (Harris 1995: 93). Of course there is no absolute instance of either case – a chart with no markings conveys no meaning, neither does a set of symbols with no arrangement in graphic space. A chart operates by assigning a gradation of values in some parameter to (at least some of) the graphic space's dimensions, as in a map, a seismograph, etc. Scripts still depend on temporal axes determining the order in which the symbols are to be read. In written English, a primary temporal axis is assigned along the horizontal, a secondary temporal axis along the vertical dimensions of the graphic space. Given the syntagmatics of the graphic space in charts, one need only assign the correct parameter and demarcation of unit values to each axis in order to read the chart.

Any script is comprised of marks made within a graphic space. For these marks to be meaningful, they must create a distinction within the expression-plane that is understood to correspond to a distinction in the content-plane of an intended message⁵. Nina Catach, following the influential linguist Louis Hjelmslev, has referred to such marks as “pleremes”. In certain cases, a plereme may be divisible into smaller markings that do not carry meaning in themselves. Such is the case with the morpheme/grapheme (word/letter) distinction in alphabetic writing⁶. Marks that do not carry meaning within a writing system are called “cenemes” (Catach 1986: 3-4). The plereme/ceneme distinction is similar to André Martinet's notions of *first* and *second*

⁵ In some instances this content-plane will be construed as the analogous structure in the expression-plane of spoken language, which, in turn, refers to another content-plane with which it shares some structural analogy (and so by extension with which the written expression shares an analogy) though the analogy to the content-plane is not necessarily of the same structural form as that between the spoken and written expressions that refer to it. For example, the word /book/ as spoken and “book” as written share a structure based upon phoneme/grapheme correspondences, but either /book/ or “book”, as singular units distinct from other nouns in the English language, refer to the object //book// as a singular entity among other physical objects – a grosser analogy than existed between the two expression-planes.

⁶ Actually the graphemes do have a reference – to some phoneme – but it is not a reference that is operative in the consideration of the reference of the word. This phonemic reference operates at a different level of description, the determination of which will be described later in this section. But even this phoneme correspondence runs into trouble, as some phonemes require two letters (digraphs) while single letters can refer to more than one phoneme.

articulation – the smallest units of meaning and the non-meaningful units of which those meaningful units are comprised, respectively⁷. As we shall see below, the concept is not flexible enough to deal with all of our concerns with regard to writing systems; however, it will be seen to be adaptable into a useful tool for specifying the level of description at which (a given portion of) an analysis operates. The identification of marks as either cenemes or pleremes will be contingent upon a tradition, the writing system, which is comprised of an inventory of symbols (themselves, pleremes or combinations of pleremes), a code governing the correlation between a symbol and its meaning, and a convention governing the structural arrangements of subordinate markings into meaningful units. In the case of cenemes, we will have either marks that are combined to form a plereme or that are supererogatory visual information added to the plereme, serving to make clarifying distinctions between similar (but distinct) pleremes or functioning merely as ornamentation. An example of such a clarifying mark would be the horizontal line through the middle of the Arabic numeral, 7, which some people use to help distinguish 7 from other marks to which it might bear a resemblance – T or Z, for instance. The serifs that adorn the letters of various fonts are an example of ornamental cenemes.

The set of rules by which written symbols are constructed from visual marks (cenemes and/or pleremes) is one instance of what Umberto Eco calls an “s-code” (meaning structural code): “S-codes are systems or ‘structures’ that can also subsist independently of any sort of significant or communicative purpose... They are made up of finite sets of elements positionally structured and governed by combinational rules that can generate both finite and infinite strings or chains of these elements,” (Eco 1976: 38). While a code governs the functional correlation between the symbol and referent, creating a sign, an s-code governs the structuring of larger units from smaller units irrespective of the semantic import (or lack thereof) of either level⁸. It is this irrelevance of semantic import that allows us to describe an s-code for the combination of cenemes into pleremes within a script-based writing system. Eco tends to highlight binary oppositions of strings of elements in discussing s-codes; however, he explicitly states that this binary opposition is not a necessary feature of s-codes. An s-code may even operate as positioning elements within a continuum (Eco 1976: 178). This observation is crucial when regarding writing systems – the arrangements of cenemical markings is not a simple binary

⁷ The idea of articulation is based upon a mono-linear conception of *spoken* language, understood by linguistics as a concatenation of phonemes partitioned into morphemes (Martinet 1964: 25).

⁸ This immateriality of meaning is more evident in the following description of a sample s-code: “... we should think of magnetized marbles which establish a *system of attraction and repulsion*, so that some are drawn to one another and others are not,” (Eco 1976: 124).

function but occurs at some number of positions within the two-dimensional graphic space – think of the possible positions of vertical and of the horizontal lines allowed in the Latin alphabet’s capital letters as exhibited in L, T, and H. This structuring of non-significant elements (cenemes) rests upon the fact that the symbols of writing can be divided beyond the level of *second articulation*, in a seeming contradiction to André Martinet’s original use of the term⁹.

The theory of articulation, when wed to the designations of first and second articulations at the level of morpheme/phoneme only, presents limitations that are particularly acute when applied to the study of writing systems. It does not account for the ability to combine meaningful units of different hierarchical levels and to allow them to function, within a particular syntax, as equal to other elements that include a greater or lesser number of hierarchical levels. For instance, a noun phrase containing several words, each of which is independently meaningful, still operates as a single part of speech and can, as such, be paired with a single-word verb to make a complete sentence as in the case of “The jogging man fell.” This fact is represented in the tree diagrams of linguists. Hjelmslev refers to elements that operate at the same hierarchical level as being of the same degree and points out that identical elements may differ in degree depending on context: “...an entity can sometimes be of the same extension as an entity of another degree...” (1963: 43). Eco has noted that phonemes, themselves, may be analyzed into component parts, their combination into the recognizable phonemes of a language being governed by an s-code (1984: 169-179). This has particular relevance to the study of writing systems. Consider the following example from the historical development of the Latin alphabet as related by Stephen Roger Fischer in his *History of Writing*:

In the third century BC, Rome’s first headmaster of a private school, Spurious Carvilius Ruga, observed that the Roman alphabet needed a /g/, so he took the Etruscan C and gave it a hook – G – to supplement their alphabet with this sound. In this way, Ruga ‘voiced’ the Roman C with a single stroke, displaying his recognition that the only difference between the two sounds was a voiceless (C)/voiced (G) contrast... (2001: 142)

Now, suppose the innovation Ruga introduced was adopted as the convention by which all voiced consonants were graphically distinguished from their otherwise identical unvoiced counterparts. The addition of the “hook” would take on the meaning “voiced” in reference to the

⁹ It is important to remember that Martinet explicitly stated that the study of writing was outside the realm of linguistics, though having obvious relations to it (Martinet 1964: 17). He clearly understood that writing operates according to different rules than does spoken language. This is due to the one-dimensional nature of spoken language, on the one hand, and the (generally) two-dimensionality of writing (as per Harris and in contradiction to the characterization by Coulmas, above). This two-dimensionality can be further expanded by the possibility of mixed systems, like musical notation, where a single mark may simultaneously signify as a position in a chart and as a symbol in a script (more on this in section 3).

other phonetic attributes indicated by a basic letter-form. Note, also, that the mark would be irrelevant in respect to vowels, as they are all voiced and have no unvoiced counterparts. A repeatable marking is here used to carry a particular meaning in reference to the larger symbol to which it is applied. It is not merely a distinguishing characteristic, it is a distinguishing characteristic that takes on a definite meaning at each instance of its appearance and, therefore, is entitled to be called a plereme.

In accommodating these observations, we can adapt Martinet's terminology to indicate a moveable distinction that defines a level of description pertinent to a given discussion. By way of example consider the sense of the statements "Please sit down" and "Have a seat". We identify the first articulation (in the sense I am proposing) at the level of the proposition and the second articulation at the level of the words. *At this level of description*, the individual words are not meaningful. It is the meaning of the proposition that is relevant. This is why the two propositions can have the same meaning without sharing any words. We can say that an s-code, for a given level of description, will govern the formation of elements of first articulation from those of second articulation. Furthermore, these elements of second articulation will, by definition, be of the same degree and will comprise an inventory. We can now state that "degree" is the status of an element as being of first or second articulation at a given level of description. The inventory will be the collection of elements of second articulation at a given level of description. Members of this inventory may be compound, formed in whole or in part by units that are meaningful (pleremes) at another level of description, and they or their constituent parts may function as members of other inventories (of elements at different degrees). Similarly, an element within one of these compounds may also be a member of the same inventory as that compound. This is a technical explication of what we have already seen in the example of the noun clause. Each word within the noun clause can serve as some part of speech, just as the clause itself does. So, the inventory of elements that function as some part of speech will include "the running man", "the", "man", and "running". The subclass of that inventory, nouns, will include "the running man" and "man".

The last piece of this puzzle, prior to turning our attention to musical notation, is a consideration of the relation between semantics, syntax, and s-codes. For a syntactical structure to be present it is necessary for the elements of the inventory to be defined according to their function within that syntax. This is not tantamount to assigning a semantic reference. The semantic reference is essential for meaning but not for the proper functioning of syntax (hence the possibility of grammatically correct nonsense). These functions are assigned to subclasses

within the inventory of parts of speech, as seen above. The s-code is broader still, as it determines the disposition of potentially (but not necessarily) meaningful units within a particular system. We might say, then, that linguistic syntax is the ordering of the subclasses of functional uses of morphemes and certain combinations of morphemes operating as single parts of speech, so syntax is a particular sort of s-code. In the case of alphabetic writing, an s-code governs the concatenations of alphabetic characters (graphemes) in the formation of words (morphemes). In relation to musical notation, an s-code provides the convention for the proper formation of symbols in the script. For instance, it identifies the locations, in reference to a notehead, at which we may place a stem, but it does so without any concern as to whether that stem indicates anything. At another level of description, a different s-code governs the proper formation of a sequence of notes. At yet another level of description, another s-code rules the proper formation of a sequence of groups of notes – chords – within a harmonic system. As chords can be said to fulfill functional roles in respect to a system of tonality, we can state that this last s-code is syntactic.

Where a symbol violates the s-codes normally in operation in the sort of text in which it appears, the correlation between expression and content is hindered or broken. Such hindrances can be introduced intentionally, so as to require an active engagement with the text on the part of the reader. It is precisely this type of symbolic production¹⁰ that we consider when we turn to “graphic scores”. In deciphering such works, the interpreter will need to refer back to the physical forms of the symbols, themselves, as well as their arrangement in graphic space, in order to find a basis for the interpretation. Before presenting a method for that undertaking, we should examine the workings of standard notation, employing the terminology developed in this section, as “graphic notations” often deliberately play upon aspects of standard notation.

3. Conventional Musical Notation as a Writing System

As with linguistics, it is almost always the sounded aspect of music that is considered in analysis. When applying the methods of linguistic and semiotic analysis to music, this presents the problem of reference¹¹. This problem does not arise, however, when we discuss musical notation

¹⁰ This sort of symbolic production is referred to as “invention” by Eco (1976: 245).

¹¹ Nicolas Meeùs, for instance, has circumvented the problem of reference by introducing the notion of “analytical pertinence” (Meeùs, 2002: 166) to replace “meaning”. An intuitive move of the same sort seems to be made by many music theorists, linguists, and cognitive scientists (see Patel (2008)) who have compared the operations of music and language, arriving at the formulation: music has syntax but no semantics. If we understand “analytical pertinence” to mean, “having a function in respect to the other elements of the same degree”, then we see that it is precisely analytical pertinence that makes musical syntax a possibility.

because the notated symbol does, in fact, have a referent, in the traditional sense¹². This will allow us to circumvent certain observations of musical semioticians: “Notes cannot be further segmented, but they can be further analysed into what linguists would call their ‘distinctive characteristics’ – their parameters. Neither pitch nor duration can be realised in themselves outside the note to which they belong, of which they are qualities...” (Meeùs 2002: 164). Such statements reflect the same focus on the sequential processing of sound-as-heard evident in the work of Martinet and other linguists. We have already seen, with respect to language, that a different principle is at play within a writing system – one that unfolds in a multi-dimensional expression-plane. And so, we will find that those very properties, which Meeùs calls unrealizable in themselves when considering musical sound, can be indicated by distinct musical notations. For example:

given ♪ = 60, ♪

A duration has clearly been indicated, though we have no designation as to what sort of sound should instantiate that duration. But, of course, Meeùs is right to claim that duration cannot be *realized* in itself because there is no physical representation of these properties of sound except as a constituent element of a sound. In philosopher’s terms, this is the distinction between the intension of the note and its extension – between the properties constituting the notes and the class of realizations of the note as notated. However, in musical notation, we have markings that *signify* these intensional properties. It is these marks that we study when we study music as a writing system. The physical manifestations of these markings constitute the extension of the pleremic units comprising the writing system (musical notation). The identity of a marking as a member of some pleremic content-class connects that marking to its signification – some intensional property of musical sound – within the notational system.

The means of indicating these properties within the graphic space are multiform, as Harris points out:

... notes are different from one another in shape... and their sequence relative to one another is significant, but the location of each in the graphic space provided by the five-line staff, functioning as a chart, is also essential to the musical message... In order to ‘read’ music, we have to deploy two different processing techniques simultaneously. (1995: 94)

¹² This referent seems to be some combination of a description of a sound to be realized and an indication of a performance technique to be employed. These descriptive and prescriptive aspects of notation have led to interesting arguments regarding the function of the score in respect to the ontology of the musical work. See in particular Goodman (1968), Wolterstorff (1975), and Levinson (1980).

Indeed, I am unaware of any system of writing that is as thoroughly mixed as musical notation. This suggests that we should identify what is signified by the placement of various notational markings, and what is signified by the script elements (the shape of these notational markings). Immediately, we note that pitch is designated by the chart-aspect of musical notation and duration and sequence are determined via the musical script. As Gardiner Read states in his manual of notational practice:

Properly written, a musical note... indicates without question two aspects of musical sound. It is first a symbol indication – by its position on the staff and by the clef used – a definite *pitch* to be played or sung. And second, it establishes – by the exact appearance of its three integral parts – the relative time *duration* of this musical sound. (1979: 63)

This basic division of the chart and script aspects of musical notation has deep historical roots going back perhaps as far as the ninth century (Levy 1987: 61). The earliest notation indicated pitch contours, correlated to script forms, to be applied to syllables in the recitation or chanting of liturgical texts. The left-to-right sequencing of events, then, is directly derived from Latin writing. These early *neumes* served as mnemonics to aid performance, only. There was no indication of the pitch relationship between successive syllables, and the contours did not represent exact intervals. It was not until about the tenth century when neumes started to be placed in vertical relation to one another according to pitch-height, thus introducing the first chart-based notation (Treitler 1982: 244). As the chart-based representation of pitch became increasingly refined with the introduction of the staff (first a single line, then having lines added one by one) and the clef, the original neume forms were simplified. The specificity of the chart-based pitch notation had made the shapes of their script forms redundant, allowing that script form to accrue other meanings distinct from the designation of pitch. The adoption of script forms to convey duration was first fully codified in the Franconian notation of the thirteenth century. Now specific note-forms signified specific durational values (Parish 1957: 110). It was in the Baroque era that our modern notation was codified (Parish 1957: 195). As musical practice demanded new indications, as with the shift from the modal to the tonal system, script elements were added. Accidentals, for instance, were introduced into notational practice to indicate harmonic relationships of the pure fifth, an innovation derived from the performance practice of early polyphonic music in which (unnotated) *musica ficta* were used to avoid tritones notated in the score. In other instances already existing features of notation were used to make new distinctions. This led to a situation in which many of the markings contributing to the

form of the musical note have reference within one or both realms of notation (chart and script). Both of these realms have their own s-codes or set of s-codes. In the case of the chart-aspect, the matter is relatively simple: the staff and clef create localized gradations of pitch height, positions upon which are marked by noteheads. Within a multiple-staved system, there are as many localized gradations as there are staves. However, the staves of a system share a localized axis determining the sequence of events, which runs left to right from the beginning of one system to the next, the order of systems being sequential from the top of the page to the bottom. The various s-codes operating at different levels of the script is a more complicated matter.

We can identify distinguishing marks constituting a given note-form (notehead, stem, flags or beams) and analyze the functions they serve in the different planes of notation, the chart and the script. Let us take, first, the notehead. Whether or not the notehead is filled-in or hollow is immaterial to its ability to signify the property of musical pitch as represented graphically on the staff. Furthermore, nothing in the shape of the note, itself, has any reference in respect to pitch. As script, however, it is the placement on the staff that is immaterial. The exact form of the notehead is one of the identifying characteristics of a given durational value indicated by the script. Considering the filling or emptiness of noteheads within the script-based aspects of notation, does not, in itself, mark any significant difference. In fact, we see four different notehead forms: hollow with double lines on either side, hollow, hollow and slanted, filled and slanted. The slanted distinction, however, is too easily lost – particularly in handwritten scores – to be trusted as a clear distinguishing characteristic, so we find the stem attached to instances of the slanted notehead (either filled or hollow as in the quarter note or the half note). The stem, itself, does not represent any alteration in the durational property of the note indicated by the note-form. Indeed, the stem is redundant as a distinguishing mark, serving simply to aid in the distinction of slanted note-forms from their non-slanted counterparts: as there are two attributes of the note form that contribute to its identity as half note or whole in respect to one another (the slanting or not of the notehead and the presence or absence of the stem), neither attribute alone can be said to carry durational meaning (hence making them *pleremes*); they can only be said to be distinguishing marks (*cenemes*). The status of the stem as *ceneme* is further reinforced by the fact that its presence carries no information in making the distinction between a half note and a quarter note, for instance. The filling-in of the notehead serves as the distinguishing characteristic between our half and quarter notes. Why, then, does the note require a stem, if the filled-in notehead is a clear enough distinction on its own? Durations have always been conceived as proportionally related and have proceeded from a smaller number of distinctions to

a greater number of distinctions over time. New note-forms, marking smaller temporal divisions, were often created by adding additional distinguishing marks to the next larger (or when creating larger units, the next smaller) temporal unit. The intricacies of the Renaissance mensuration system make the identification of singular mathematical relationships between these successive temporal divisions impossible – each level of the hierarchical system could be divided into two or three units in a three-tiered system¹³. Also, the distinguishing marks were not repeated. Each new note-form carried a unique distinguishing mark.

This changed with the adaptation of the flag – first introduced as a distinguishing mark added to the minim to form the semiminim (Parish 1957: 144) – as a means of indicating a halving of the value indicated by the rest of the note-form. This is only applied to a certain subset of note-forms in musical script, namely those with filled-in noteheads (and stem). The resulting note-forms indicate a relation to some duration, d , as follows:

double whole note:	$2d$
whole note:	$1d$
half note:	$\frac{1}{2}d$
quarter note:	$\frac{1}{4}d$
eighth note:	$\frac{1}{2}(\frac{1}{4}d)$
sixteenth note:	$\frac{1}{2}[\frac{1}{2}(\frac{1}{4}d)]$
thirty-second note:	$\frac{1}{2}(\frac{1}{2}[\frac{1}{2}(\frac{1}{4}d)])$
sixty-fourth note:	$\frac{1}{2}[\frac{1}{2}(\frac{1}{2}[\frac{1}{2}(\frac{1}{4}d)])]$
one hundred twenty-eighth note:	$\frac{1}{2}(\frac{1}{2}[\frac{1}{2}(\frac{1}{2}[\frac{1}{2}(\frac{1}{4}d)])])$

To the objection that the marking of the flag is merely a distinguishing element (a *ceneme*) in musical script, as with the various forms of the notehead, I answer that the repeatability of the flag always carrying the same meaning, which is easily expressed as a mathematical function, makes this mark a *plereme*. The flag functions much like the dot, which is also additive, and can also be expressed as a mathematical function: $d + \frac{1}{2}d$ for one dot, $d + \frac{1}{2}d + \frac{1}{2}(\frac{1}{2}d)$ for two, etc. The situation becomes very similar to the hypothetical on Ruga's introduction of the hook to form the grapheme, G, discussed in section 2. It will be remembered that the hook expresses the phonemic distinction "voiced" when applied to consonant graphemes (letter-forms). This creates a subclass of graphemes that are compounds of *pleremes*. Our musical analogy to the hypothetical on Ruga's innovation would make the notes with open noteheads analogous to the

¹³ See Anna Maria Busse Berger (1993) for a detailed study of the origins and development of the symbols used to indicate the mensuration of early music.

vowels, the closed noteheads analogous (in reference to their compound nature) to consonants, those with flags being analogous (to a point) with the voiced consonants. The compound script-form of the eighth note functions as a unit of the same degree as a whole note, though the whole note is not a compound symbol. They are both meaningful at a shared level of description.

We have reviewed, up to this point, the function of the notehead in both the graph-based and script-based dimensions of musical notation, and the function of the stem and flag in the script-based dimension. The distinct characters of the two dimensions of the mixed writing system of musical notation lead to the immediate intelligibility of (by now conventional) unconventional notations in which, for instance, the filled notehead without stem or flag is placed on a staff to indicate pitch without any specified rhythmic content. Or, on the other hand, when we see stems and flags absent noteheads – as in some notations for spoken word rhythms or lute tablature, or where we have x-shaped noteheads attached to stems (with and without flags) to help visually differentiate metal instruments from others in compound percussion parts – we have no problem assigning durational values to the second tier of script-based note-forms (quarter notes and smaller values). This is reinforced by the fact that multiple noteheads may be attached to a single stem and that two stems may be attached to the same notehead – the graph-based designation of the stem as identifying which voice a pitch belongs to in instances where more than one voice is notated on a single staff. While the stem serves only as a *ceneme*, marking a distinction between certain note-forms, in the script-based dimension, it serves this wholly different (*pleremic*) purpose (at times) in the graphic dimension.

I alluded, above, to the introduction of script elements to accommodate changes in musical practice. The use of accidentals, for instance, leads to two different indications regarding different aspects of pitch perception: pitch-height, designated (roughly) by the chart-based aspects of musical notation, and harmonic relationships, designated by the script-based aspects of musical notation (in combination with the chart aspects). Articulation markings are attached to particular note-forms as additional descriptive information about the intensional properties indicated by the composite note. Accidentals and articulation markings both tend to be simple, visually, and cannot be further analyzed, as script, into lower level *pleremes*. They can, however, be compounded. I won't concern myself with their structure here, but rather with their combination with note-forms to create a composite whole. There is a rule for the proper combination of these markings with a note-form – they are members of an inventory that are combined according to an *s-code*. We may have a single note-form, one appended with a staccato marking, and another with an accent and a sharp sign, all on a single staff. We refer to

all of these as a singular note, and the note is the unit of first articulation at this level of description. Each of the units of second articulation – the note-form, the accidentals, the articulation markings, and the staff position of each – serve one or more of three functions: a descriptive indication of some property of sound, a prescriptive indication to undertake some action resulting in a sound, or the modification of some indication of another marking within the notation. The note-form and the notehead, for example, are members of the class of descriptive functions. Tablature notation and fingering indications are members of the class of prescriptive notation. The flag, dot, and accidentals (when considered in respect to pitch-height)¹⁴ are members of the class of modificatory functions. These functional classes allow us to describe a syntax (as a special kind of s-code) for the formation of notes at the level of description at which we are operating. We see that the main descriptive elements are indicated by the primary note-form and its placement on the staff, with secondary descriptions being located immediately above or below the notehead (articulation markings). This is also the location for certain prescriptive indications, such as fingering markings, and the status of articulation markings as unequivocally descriptive (rather than prescriptive) is in no way secure. Modifiers occur to the left of the notehead, in the case of those applied to pitch (accidentals), and to the right of the notehead or the stem if applied to rhythm (the dot and the flag, respectively). We are able to give the description above because each element of the inventory can be assigned a functional class membership. We cannot speak of a syntax for the formation of note-forms from the inventory of notehead, stem, and flag, because these are not all functional units – as a *ceneme*, the stem does not serve a function in respect to the other parts of the script. We can, however, speak of the s-code for the formation of note-forms, as the s-code has no requirements regarding reference or function. Enough has been said in relation to standard notation for present purposes. Let us now

¹⁴ A detailed consideration of the prescriptive and descriptive aspects of notation, and certain conditions for the acceptance of innovations in these areas has been offered recently by Mieko Kanno (2007). Unfortunately, the discussion is marred by the absence of any criteria by which a notation can be assigned an unequivocal identity as either descriptive or prescriptive and by a too ready acceptance of the idea that any given notation is wholly one or the other. Leo Treitler was closer to the mark when he stated that “... in varying degrees, people read even staff notation [as prescriptive], translating the signs directly into finger movements,” (Treitler 1982: 241). It is likely that different musicians fall in different locations upon a spectrum in which notations are considered, at one end of the continuum, wholly descriptive and at the other, wholly prescriptive. Among the factors that would seem to play into an individual’s position on this spectrum for any given notation are the quality of one’s ear, the instrument one plays, and the use to which one puts the notation. A pianist is probably more likely to conceive staff notation as prescriptive as there is only one action that instantiates a given pitch within the instrument’s range. A trombonist, by contrast, can play certain notes in the middle to upper register in a wide variety of slide positions, suggesting a more descriptive interpretation of staff notation. Certainly, though, some notations, such as tablature, are unequivocally prescriptive, some notations are unequivocally modificatory, but descriptive notations can always be construed, by the performing musician, as prescriptive. The implications for this fact bears further examination.

turn our attention to the synthesis of the information presented in this and the previous section into an approach to the analysis of any – even the most radically idiosyncratic – musical notation.

4. Outlining an Analytical Approach to Alternative Notations

The dominant conventions treating the dimensions of the graphic space, in a particular class of texts, may be expected to be operative where one expects the chart aspect of a text to be meaningful and where no marking indicates otherwise. In the case of musical texts of this type, we can expect the default treatment of graphic space in two dimensions to be a temporal progression from left to right along the horizontal axis and a pitch height continuum along the vertical axis. In certain instances, such treatment may be insufficient and recourse to other methods of ordering the elements will be preferable, such as those used in the analysis of visual art (in reference to composition, color, etc.) and the psychology of visual perception¹⁵. In other instances, the composer will designate unconventional parameters attached to each dimension of the graphic space.

The case is much different with the markings contained within that graphic space (the script-based elements of a writing system), which may be independently identified as pleremes or cenemes. These might be further arranged, at various levels of description, into compound symbols. The analysis should begin by 1) determining what parameters are to be assigned to the two-dimensional axes of the graphic space construed as a chart – where there is no internal indication suggesting otherwise, it would be wise to follow the standard temporal and pitch continuum interpretations of the graphic space. Then, beginning with the lowest perceived level of description and repeating these steps for each subsequent level of description, 2) identify the s-code for the script-based aspects of the notation (i.e. the *apparent* logical structure governing the formation of the symbols at the given hierarchical level); 3) determine which marks are to be treated as pleremes and which are to remain cenemical at the present level of description. Once all levels of description to be addressed are defined, proceed as follows for each, revising the analysis as necessary: 4) assign functional class designations to pleremes (descriptive, prescriptive, modificatory) in the script- and/or the chart-based aspect(s) of the notation; 5) propose a syntax existing between the functional classes, once assigned (this will require that all members of the inventory under consideration be pleremes, though their exact reference, beyond

¹⁵ See, in particular, Rudolph Arnheim (1974), *Art and Visual Perception: A Psychology of the Creative Eye* (University of California Press).

membership in a functional class, need not yet be assigned); 6) propose semantic references (in the script- and/or the chart-based aspect(s) of the notation) that will not lead to nonsense when building outward from the lowest hierarchical level containing pleremes (i.e. the lowest level of description). In practice, this step may precede or coincide with step 4. When attempting to assign semantic meaning to pleremes, follow the course: (i) identify all markings that have equivalences in conventional musical notation correlated to some musical meaning¹⁶; (ii) identify marks, designated as pleremes, that do not have equivalents in conventional musical notation but which may be identified as meaningful within some other conventional system of writing; (iii) identify the remaining marks that are to be treated as pleremes; (iv) build a catalog of candidate meanings for each mark, drawing on the results from steps (i) and (ii), where possible, and checking the candidate designations against one another within the perceived syntax for intelligibility; (v) once having eliminated nonsensical candidate designations, determine some preference criteria by which one set of coherent designations is selected; (vi) assign semantic references to pleremes according to the preference criteria of step (v). Of course, in the majority of cases, the composer has already provided much of this information in the performance instructions, substantially lightening the work load of the analysis.

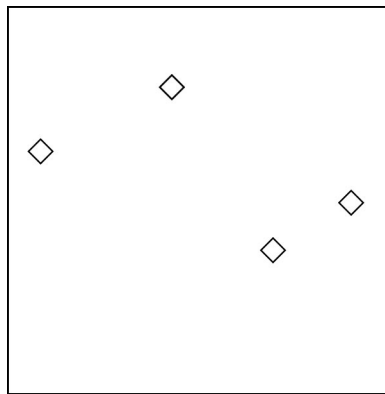
The progressive sample case, to which we now turn, is not intended as an exhaustive instance of the approach detailed above. Rather, it serves as an illustration of certain aspects of this approach as they arise when attempting to assign musical meanings to unconventional notations when they are not accompanied by clarifying performance instructions. As such, reference will be made to the specific steps, introduced above, as they appear.

4.1. A Progressive Sample Case

Imagine a graphic space of undifferentiated background on which outlines in black of equal-sized diamond-shapes are arranged (ex. 1). There is nothing to distinguish one from the next except for its placement within the graphic space. If we are to interpret this as a text, we will need to look to the spatial distribution of the diamond-shapes as the potential locus of meaning. There is no differentiation amongst the forms of the constituent symbols, so any potential meaning is conveyed through the coordinates of the mark's location in the graphic space – a

¹⁶ For instance, in an eighth note in which the flag is placed adjacent to the un-stemmed, filled notehead, we can still identify the usual meanings of each component present: notehead marking a vertical position within a graded pitch height spectrum, the flag halving the durational value of the rest of the notation. This example possesses a deviant morphology that violates the s-code for the formulation of a proper note (in musical script), yet we are still able to incorporate the musical correlations of the pleremes present in whatever interpretation we ultimately give to this symbol.

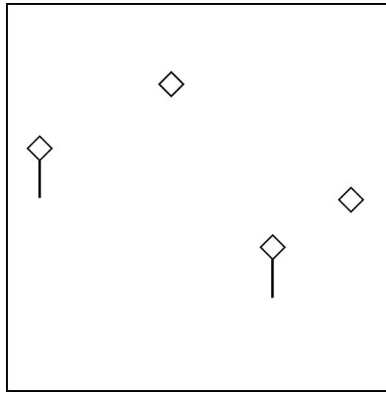
prime example of a chart. It is as though the text indicates “*x* here” at every instance of a diamond-shape and “*x* not here” at every other location. All that would be required to give the text a concrete meaning would be the identification of the parameters to be correlated to each of the two dimensions of the graphic space (step 1 of the preceding section).



Example 1

Imagine now that some of those diamond-shapes are filled in. Having introduced a distinction in the script forms, we can address step 3 (the designation of which marks of the script are to be construed as pleremes and which are to be construed as cenemes), in which cenemes/pleremes will be isolated through the perception of differences that are taken to be substantial enough to constitute some new class or subclass of marks in relation to the others. The text now indicates “*x* here” for all unfilled diamond-shapes, “*y* here” for all filled diamond-shapes, and “neither *x* nor *y* here” for all other points within the graphic space. These marks take on the qualities of a plereme and so may be assigned a functional and a semantic reference in the later steps of our analysis. A vertical line descending from the lowest point of the diamond-shape, if occurring on each diamond-shape and if equal in length, color, width, etc., makes no new distinction between the (potential meanings of) symbols within the graphic space – adding these always-equivalent marks does not change the formulation “*x* here”, “*y* here”, “neither *x* nor

y here” (ex. 2). Indeed, it is the composite of the diamond-shape and the vertical line that now forms the plereme. This plereme is constructed of two marks, which will be considered cenemes at this level of description. However, where some diamond-shapes lack this added mark while others possess it or where these vertical lines are not uniform throughout, the vertical line becomes at least a distinguishing mark and at most a plereme that, combined with the diamond-shape, creates a compound symbol.



Example 2

The reader may have noticed that we have proceeded from step 1 to step 3, the reason for which is that the marks discussed at the outset of the example are not (perceived as) reducible to subordinate parts. Now that we have introduced a second mark, we can approach step 2, on the s-code governing the combination of the discrete marks of the script into compound symbols. On this front, though this example is still quite simple, we can note that diamond-shapes are permissible as free-standing entities while vertical lines only appear as components of a compound symbol. Furthermore, according to the description above, vertical lines only appear as descending from the lowest point of a diamond-shape. So, if we accept descending vertical lines of uniform length from either form of diamond-shape and those two diamond-shapes, themselves, we have four distinct classes of symbols defined by this s-code. While it is possible (in a return to step 3 with this revised example) to treat these four classes as indicating x , y , p , and q , the repetition of the pleremes indicating “ x and y ” within the markers designating “ p and q ” seems to suggest that the more appropriate way of understanding the four classes of symbols would be “ x (without p)”, “ y (without p)”, “ x with p ”, and “ y with p ”. My preference for this treatment derives from the identification of the line and the diamond-shapes as discrete elements of the same hierarchical level, which appear as such by their combination according to an s-code

at the level of gestalt perception¹⁷. If we consider an alteration to our example in which the line exists as a free floating mark, not always attached to a diamond-shape, then the diamond plus line suggests a compound proposition (“ x and p ”). Where the line only appears appended to a diamond, it may still be meaningful as a compound proposition, or it may be construed as a modification of the proposition expressed by the diamond-shape, resulting in a new, singular proposition.

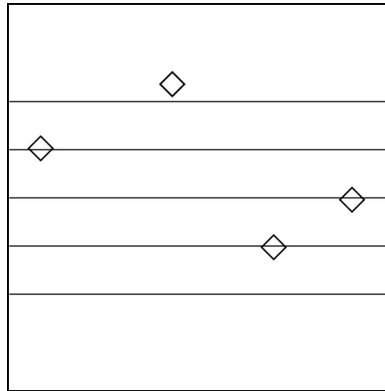
The role these pleremes take in such a proposition will comprise their functional designation, the subject of step 4. If, as first proposed, we consider each plereme to be an independent proposition, we can ascribe a function to each, as seen in section 3, whereby each represents some intensional property of a sound, whether that be an intensional property regarding the qualities of that sound (descriptive) or its manner of production (prescriptive). When we accept the vertical line as a modifier, it modifies whatever intensional property is assigned to the diamond-shape (filled or un-filled). For example, we might construe the line (or its absence) as indicating a duration, the diamond-shapes as indicating two different timbral qualities. In this case, the line and the diamond-shapes perform descriptive functions. Alternatively, we might decide that the presence or absence of a vertical line designates which of two instruments or instrumental groups should perform the sound, while the different diamond-shapes indicate that the sound should be either loud or soft. In this case, the vertical line is prescriptive, the diamond-shapes descriptive. If the line forms a modificatory role – let us say that it indicates that the designation of the diamond-shape is to be exaggerated – and the diamond-shapes perform the descriptive function of designating a loud or soft dynamic, we will get a result, not of compound propositions, but of four distinct singular propositions indicating one of four dynamic levels. Once such functions have been defined, a syntax regarding the combination of these functional symbols into a composite text can be proposed (step 5, which will be addressed once the example becomes complex enough to sustain this aspect of the

¹⁷ In other words, prior to considering any ascription of meaning, the diamond and the vertical line seem to be, visually, of the same hierarchical level – we see them each as self-contained (irreducible) and complete in themselves. As such they comprise an implied inventory that can be combined by an s-code into higher level structures (diamond-shape with vertical line). Where one element of some inventory is taken as meaningful and where we do not possess a code for the ascription of meaning to each mark, I prefer to take a liberal stance, allowing the possibility of meaning to elements of the same level. This is not always the way things work in notational systems – it certainly is not in the case of musical notation – but it is a possibility in a case where we are attempting to derive the code from a document without any known convention behind it. The liberal stance is taken out of a desire to present the richest possible interpretation of the text. Should a substantial statistical sampling of the markings in the text strongly indicate that an element is a ceneme, by its relations to other markings, even though it combines with pleremes at some level of description, then this liberal stance should, of course, be abandoned.

discussion).

Now, if we take this grouping of diamond-shapes and vertical lines as a member of the class of texts “musical scores”, we have recourse to the code of musical notation in correlating the pleremes and symbols contained therein to musical meanings (step 6.i.) and notational functions (step 4). For instance, we may note that the current usage of diamond-shapes in musical notation is (primarily) to designate a nodal point along a string at which a finger is lightly placed so as to produce a harmonic. A graphic space of undifferentiated background with some distribution of unfilled diamond-shaped figures (ex. 1) understood as a musical score may then be interpreted as demarcating nodes of varying pitch heights along the length of a string. Notice that the addition of the designation “musical score” suggests two things: first, the marks, even though undifferentiated, can be ascribed a meaning derived from the traditional musical script; second, the chart’s dimensions can now be interpreted according to the s-code of the chart-based aspect of standard notation¹⁸. The addition of further pleremic content, such as the staff (ex. 3), also taken from the inventory of symbols used in musical notation, will alter the interpretation by introducing new elements that must either be treated traditionally or not, possibly to the exclusion of treating some other element in the traditional manner. Whatever semantic designations are ultimately derived from standard practice will depend on which aspects of that practice are perceived as the least violable.

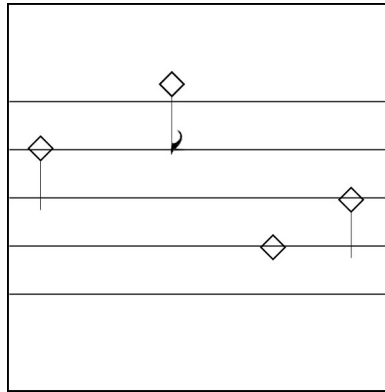
¹⁸ These dimensional designations are hardly unambiguous, particularly in reference to the vertical axis, which is conventionally correlated with pitch height in a musical score but may also, in this example refer to some placement along a string. Nodes do not produce pitches the pitch height of which corresponds to a shortening length of string as the finger “ascends” along the string. They are related to proportions of strings: the 5th partial will sound at any node dividing the string into some number of 5th parts. So placing one’s finger according to the height indicated by the vertical axis of the text will not (necessarily) produce pitches that express the same contour, resulting in possible cognitive dissonance between sound and symbol – one reason that sounding pitch is often notated in parenthesis above the nodal designation. An alternative interpretation would be to produce harmonics that do represent this contour.

**Example 3**

Accepting the lines, added to example 3, as a musical staff, a systematic demarcation of pitch height or diatonic pitch identity can be understood to have been introduced, though there is no definite reference (a clef) anchoring this demarcation. An ambiguity as to whether it is pitch-height or node that the notation indicates remains, though it might be clarified (for instance) through a designation of a specific string, on which each node is placed. This designation may be made (according to convention) by connecting the diamond-shape to a standard notehead below it by a vertical line or by placing a Roman numeral immediately above or below the diamond-shape, indicating a natural harmonic on one of the numbered strings of some instrument such as the violin, viola, cello, bass or guitar. This last additional mark (the Roman numeral), therefore, implies an instrumental designation (and serves a prescriptive function). Where before we were thinking in terms of “some string” we are now thinking in terms of “some instrument containing some number of strings,” at the very least, and are implying, by the numerals indicated, the minimum number of strings the instrument must have. Should a particular instrument be decided upon, a host of considerations leading to possible revisions of the interpretation, based upon the performance practices and notational conventions associated with that instrument, are introduced. These would include the inference of some tuning relationship between strings, which will drastically affect the resulting sound of our interpretation.

If we proceed, not by designating particular strings but by drawing vertical lines descending from the lowest point of each diamond-shape of example 3, we obscure the musical significance of the marking “◇” and introduce a symbol with no conventional musical meaning, initiating steps 6.ii. and 6.iii. Should only some diamond-shapes contain this additional mark, we might interpret it as some alteration of the nodal interpretation – a plereme serving an as yet undefined modificatory function in relation to the prescriptive function of the diamond.

Assuming that some have flags, as in a conventional eighth-note, at the end of their stems (ex. 4), the diamond reasserts itself as a plereme, as interpreted before, while the vertical line becomes the musical notation, “stem” (here we have completed step 6.vi., circumventing 6.iv. and 6.v. for the sake of brevity). The stem, no-stem, stem-and-flag configurations take on conventional rhythmic meaning, granting them the status of plereme constructed of these elements according to an s-code resembling (though not identical to) that which governs the construction of note-forms from stem, flag, and notehead in traditional notation. We can read the rhythmic meaning of these new symbols because the stem and flag distinction can convey rhythmic meaning, as pleremes in musical script, absent any notehead or reference to the chart-aspects of musical notation, as seen in our discussion of lute tablature, etc., in section 3. As the stem, itself, is not generally, a plereme but only becomes one in such headless notations, the presence of the flag, which is a plereme in standard notation, upon some stem is necessary for the establishment of the rhythmic meaning of the isolated stem within the notation.



Example 4

If we fill some of these diamond-shapes seen in example 4, we upset our conventional interpretation, as the nodal pleremes depend on an open diamond-shape. Yet, this filling of some of the diamond-shapes may bring to mind the white notation of the 15th and 16th centuries, particularly if applied only to stemmed note-forms and always occurring in the case of stemmed *and* flagged note-forms. If, as a further variation on the example, we introduce the option of a half-filled diamond, some of our symbols will resemble certain note-forms employed in Italian Quattrocento notation, an idiom that falls outside the standard knowledge base of present-day performing musicians. For those that see these affinities with historical notation schemes , the

note-forms of our example might be interpreted as conveying the rhythmic information ascribed to their historical counterparts¹⁹. If, instead, we introduce certain logical operators such as “&” (and), “ \supset ” (if... then...), and “ \vee ” (or) between the various note-forms of example 4, these will upset the left-to-right temporal sequencing of events for those interpreters that know symbolic logic notation. For instance, two note-forms appearing on either side of “&” might be taken to coincide with one another, whereas two note-forms appearing on either side of “ \vee ” might be interpreted as indicating the performance of one, the other or both note-forms at a given moment²⁰. In both the case of symbolic logic and Quattrocento notation, this sort of designation of semantic content derived from a writing system other than that of standard (modern) notational practice (even when that other writing system is a musical one), is an instance of step 6.ii.

The example has now taken on sufficient complexity for the consideration of possible syntactic relations between symbols (step 5). If the pleremes (diamond, diamond-plus-stem, diamond-plus-stem-and-flag) are identified as comprising an inventory of script elements, and each is assigned a functional meaning, we can attempt to derive a syntax for their combination into larger meaningful structures. The same can be done regarding the chart-based indications of the markings. If their positions are assigned a function in respect to other allowable positions within the chart, then a syntax ruling the combination of larger meaningful units from the designation made by chart placements can be described. The simplicity of example 4 still does not inspire much in the way of a syntactic interpretation, but on the script level, if we assign rhythmic values of one unit to the diamond, half a unit to the diamond-plus stem, and a quarter unit to the diamond-plus-stem-and-flag, we could extrapolate the rule: sequential groups of two symbols will always have the internal relation $d + .5d$, where d is the durational value of the first symbol of the grouping. Without assigning specific durational references, we can state this as: sequential groups of two symbols will always have their second element be the next smaller durational unit from their first element.

This example has walked us through many of the steps of the analysis, hopefully

¹⁹ See Phillip Schreur (1989), for a critical translation of the *Tractatus Figurarum*, which details the intricacies of *ars subtilior* notation in Italy in the Quattrocento.

²⁰ The use of “ \vee ” is potentially ambiguous as it is also a bowing indication within standard musical notation; however, the placement suggested (between, rather than over, note-forms) and the presence of “&”, which has no musical counterpart, make the ascription of meaning based upon the symbolic logic denotations of these symbols the more defensible conclusion. Similarly, once meanings drawn from symbolic logic notation are allowed, the diamond-shape might be interpreted as it is in modal logic, indicating “it is possibly the case that...”; however, the use of these diamond shapes within more complex note-forms and the absence of logical quantifiers within the notation support a non-logical interpretation.

demonstrating the exactitude with which they should be completed. It must be pointed out that the discussion did not move through various levels of description. This is a function of the simplicity of the sample case. However, a situation in which the necessity to treat other levels of description arises can easily be imagined. Picture a larger graphic space comprised of an arrangement of squares containing the same elements as example 4 but in varying configurations. Now the analysis at the level of description already undertaken will have to account for the contents of these additional squares, and a higher level of description will have to be explicated in the analysis of a) those squares' relationships to one another in the graphic space as, possibly, chart indications and b) whether the individual arrangements of their contents are to be taken as compound script configurations, which might take on functional and/or semantic meanings. Other levels of description can be added, ad infinitum, by introducing ever larger graphic spaces in which squares of the next lower level are arranged in reference to one another and/or serve as compound script elements. And so the discussion of levels of description has not been for naught.

Of course, it is usually the case that graphic scores include detailed performance instructions that answer the various steps of the analysis, assigning musical meanings to the symbols found within the score. Often some ambiguities remain – ambiguities that can be fixed with recourse to the method introduced here. The possibility of evaluating radical notational experiments, once the notational ambiguities have been resolved (by the application of our method, by the performance instructions, or by a combination thereof), will be demonstrated with reference to Cage's "Variations I", below.

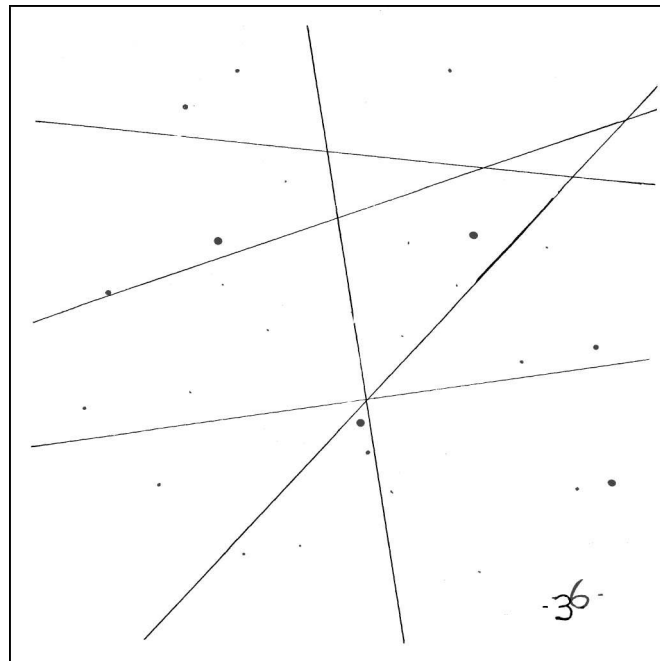
4.2. The Evaluation of "Graphic Scores" After the Analysis: John Cage, "Variations I"

The forgoing presentation indicates that musical notations (conventional and otherwise) have the character of compound propositions designating intensional characteristics of a sound, whether descriptive or prescriptive, modified or not; and that, owing to the mixed nature of musical notation, the propositions will generally be compounds of indications made by the script- and chart-based aspects of the notation. Returning to Wolterstorff's definition of the function of the score in reference to the musical work, the specificity of the intensional properties indicated in the notation determines the conditions by which a proper performance of the work (i.e. a proper member of its extension) can be identified. Where the composer has specified instrumentation, articulation, pitch, rhythm, and dynamic, these are all selected as relevant to evaluations of the extension of the sonic structure notated in the score. Where some of these attributes are not

notated or are left ambiguous, we say that these intensional characteristics of the sound are left indeterminate, leading to a wider latitude for a performance's acceptance as a member of the class of a score's extension. It is through an involvement with such works, particularly those of the New York School, that the present study found its impetus.

"Variations I" is one of several pieces by John Cage, the scores of which consist of a number of transparencies that are to be overlaid upon one another in some manner to make determinations, according to the (rather cryptic) performance instructions, regarding the sonic elements of the particular performance (ex. 5). It is striking that, in using transparencies, Cage has made, not only the markings contained within it, but also the score, itself, indeterminate. In this case, Cage has created six transparencies. One of these contains an assortment of dots of four different sizes, which are to indicate (based upon their size) the number of individual events contained within the larger identity of that dot. The thirteen smallest are to be individual sounds, the next tier of seven dots indicate two sounds, the three of the second largest size represent three sounds, and the four largest represent four sounds. These sounds may be played simultaneously or as what Cage terms "constellations", which I interpret as meaning temporally distinct yet in close proximity to one another. The remaining transparencies each contain five lines at varying angles and points of intersection. Beginning with the dot-bedecked transparency, one goes about making determinations for the performance of each plurality (the three larger sizes of dots), each individual sound of which has five intensional properties decided by a different one of the five lined transparencies, or by a different orientation (always aligned with the edges of the dot transparency) of the same lined transparency²¹. Each line is to be assigned a different intensional property, which it defines by the relation of that line to the position of one of the dots indicating a plurality of sounds. The five properties are: "lowest frequency, simplest overtone structure, greatest amplitude, least duration, and earliest occurrence within a decided upon time" (Cage 1960b: i). The shortest distance from the dot to that line determines its relation to the correlated characteristic. The distances are "to be measured or simply observed" (Cage 1960b: i). Note that these properties are all relational designations meaning that, for instance, the dot that is closest to the line selected to represent the earliest occurrence will be the first sound heard. It is left to the performer to assign particular properties to particular lines.

²¹ Note a perplexing ambiguity in the instructions to the score: pluralities are to be played simultaneously or as "constellations", and yet each individual constituent of a plurality is subject to determinations made by different lined transparencies or a different arrangement of the same lined transparency, one of the lines of which is used to determine the temporal placement of that individual sound in reference to the total duration of the piece.



Example 5 (John Cage, “Variations I”)

In spite of their cryptic nature, these instructions have answered the various points of the analysis laid out in section 4. The designation of meanings ascribed to the chart dimensions (step 1) are addressed through the rules for use of the lined transparencies. The simplicity of all the symbols employed by Cage, as single marks with no subordinate parts, obviates the need to identify the s-code governing the formation of the symbols (step 2). These symbols, straight lines and dots, all take on some meaning designated by the performance instructions, making them pleremic (and so step 3 is completed). The identification of functional class designations for script elements (step 4) is also made (implicitly) within the performance instructions. The dots are grouped into four categories each indicating a different number of events. The actual determination of the five intensional properties for each sound is made by bringing the lined and dotted transparencies together according to the syntax outlined in the instructions (answering step 5). As for semantic reference (step 6), this too is provided when Cage defines the number of events per dot and the properties to be assigned. This leaves us with little work to do in reference to the analytical method, but it allows us to proceed to the assessment of the score as a piece of (musical) writing.

Given the exceedingly large number of possible sonic realizations of this score²², we are in the situation alluded to at the beginning of this section regarding the evaluation of extreme notational experiments. If the score is the record of the conditions defining a proper instance of the associated musical performance and if that record is conveyed by intentionally ambiguous means, then we must conclude that the composer intends any justifiable interpretation of this record as a proper interpretation, upon which a proper performance of the work may be built. This allows us to rescue a criterion for the judgment of extreme cases of graphic notation, as works of music; namely, these performances must be based upon a justifiable interpretation. By moving through the steps of section 4, as we have, we can arrive at a basis for these justifiable interpretations. Though it would be impossible, in almost all cases, to reconstruct the arrangements of transparencies used in a given performance from that performance, this does not preclude the possibility of the performers making a determination as to whether or not the performance was a proper instance of the particular arrangements of the transparencies used in its construction²³. This sort of assessment, however, lies outside of our present purpose and requires a confluence of various methodological approaches (noted in the introduction). We do have another approach to the evaluation of the work available to us (one that does conform to the interests of the present inquiry); namely, the assessment of the ingeniousness with which Cage connects sound to notation for the reader/performer of the score.

The economy of means by which Cage creates this immense web of possibility is quite remarkable: dots of four sizes and four sets of five lines. He has managed to transcend the two-dimensionality (and its traditional musical interpretation) of the graphic space his notation occupies: The system of measuring a dot's distance from the lines of an overlaid transparency

²² For each of the seven points that represent two sounds, there will be 20 x 19 possible arrangements of the transparencies to determine the intensional properties of the elements of the plurality in question. Similarly for each of the three dots representing pluralities of three sounds there will be 20 x 19 x 18 possible arrangements of the transparencies and for each of the four dots representing pluralities of four sounds, there will be 20 x 19 x 18 x 17 possible arrangements of the transparencies. For each transparency configuration, there will be 5! Possible assignments of intensional properties to the lines contained within the transparency. This totals a possible 3,046,528,558,080,000 variations of assigned properties to be applied to the pluralities. A close reading of the performance instructions reveals that there is no direction for making determinations for the thirteen individual sounds: "In using pluralities, an equal number of the 5 other squares (having 5 lines each) are to be used for determinations, or equal number of positions – each square having 4" (Cage 1960b: i). It would appear that Cage is leaving the determination of all performance aspects of the smallest dots to the player's discretion, adding one more layer of indeterminacy to the work.

²³ A key ontological point is thereby raised; namely, that the interaction with the score is a necessary condition for any instance of this work. This is in contrast to more traditionally notated works where a performer might learn his or her part by ear without any impact on the identity of the performed work. This also suggests that an audience is not in a position to pass judgment on performances of the work (a suggestion which is, incidentally, perfectly in line with Cage's aesthetics).

completely avoids any left to right (or right to left) or top to bottom (or bottom to top) readings. Each line may be thought of as a zero point elongated in a single dimension and from which all the various dots of the ground score may be conceived to radiate. And so any given arrangement of a transparency creates a two-dimensional text, the graphic space of which is to be reinterpreted as a network of five independent one-dimensional charts. The intensional properties of a sound – all clearly descriptive, in this case – are expressed through chart relationships, each line taking a meaning, as in a plereme, but also functioning as the instantiation of one of these one-dimensional charts. Dots indicate some number of events or, equivalently, some number of graphic spaces, in which the dot is to mark a single position. That number is indicated by distinctions in the script (the size of the dots). Cage's use of the dot bears a resemblance to the chart-based function of the notehead in conventional notation. Both the traditional notehead and Cage's dots are used to designate locations in a chart that determine intensional characteristics of the event(s) the dot marks – the traditional notehead designating the approximate pitch height of a given event as well as its numeric position in a sequence of events, Cage's dots determining timbre, temporal position, duration, volume, and pitch height in reference to one or more sets of five axes. The choice of five lines for the remaining transparencies suggests an analogy with the traditional musical staff. Having already detailed how these lines redefine the graphic space by operating as simultaneous radial axes, we need only note that the traditional staff is the symbolic marker of both the localized vertical/pitch height axis and the general horizontal/temporal axis to see how the idea of five lines, correlating the chart-based aspects of the notation to musical properties (two of which *are* pitch height and temporal placement), have been so inventively reconceived.

“Variations I” requires a radically different approach to its interpretation than does a work in traditional musical notation. It is no longer possible to read the instructions to the score, open to page one and proceed. The act of reading becomes the primary function of the performer. It requires a substantial amount of preparatory work (including the resolution of ambiguities in the instructions) before the generation of any sound. Indeed, it requires a direct physical manipulation of the materials of the notation. Notation ceases to be a means of arriving at a particular sound construction or even a constrained range of possible sound constructions. It becomes a task of creative engagement with the score that, in the end, will sound. That sounding, however, is not conditioned by the aesthetic preferences of the composer or (to a lesser extent) the performer. It is, rather, the complicated outcome of a reading strategy that must, in this case, be non-linear, keeping track of multiple axes of information at conflicting angles. It

will most likely require the creation of a secondary document synthesizing the determinations made by the particular arrangement of the indeterminate score.

5. Conclusion

It is my hope that the framework presented in this paper – a set of relevant terms, drawn from recent studies of writing systems and buttressed with material from semiotics and general linguistics (sections 2 and 3), along with a systematic procedure for their use (section 4, illustrated in section 4.1) – will facilitate fruitful discussion regarding the very real (and very particular) complexities contained within “graphic scores”. Moving beyond the physical contents of the score and their interpretation, the discussion enlarges to embrace strategies for the evaluation of the work (section 4.2). Even where the sonic extension of the score is so variable as to admit almost any collection of sounds, as we saw with “Variations I”, we can still have grounds for judgments of the score as a text setting forth intensional properties of sounds to be satisfied in a performance of the work. This, in turn, forms the foundation of judgments regarding particular performances (even if the judgments can only be made by the performers, themselves). What constitutes the “work” as a whole, and whether this work is a work of music or something else, remains an open question on both ontological and definitional fronts. A complete analysis of the work will depend on the answer to this question. Once answered, the complete analysis will need to employ a combination of ethnographic, phenomenological, and textual approaches applied to those performances, interpretations, etc., construed as forming a part of the work.

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