Literature

Parataxis

The word *parataxis* comes from the Latin para: side by side, and taxis: to arrange. It is a way of making independent clauses.

In general, the arrangement of two independent clauses within one sentence implies a connection, often illogical, between the clauses. Some writers use parataxis to increase the involvement of the reader: an extra effort is required to discover the meaning of an illogical connection.

The size of the independent object, called the *unit of parataxis* can be letter, phoneme, word, clause, sentence, paragraph, or any other measure. Likewise, an element is the unit of parataxis within a clang. The illogical connection necessary to bring understanding in to paratactic literature is related to the mechanism necessary to hear coherency (along with or included in other factors of cohesion—Tenny op cit p. 87) and creating meaning in the connections between elements in a clang.

It is interesting to note some of the uses of parataxis since it is directly applicable to music. Parataxis can occur horizontally (sequentially), vertically (simultaneously), or multidimensionally, such as the use of an object which is paratactic in relation to the context it is within. Also of interest is the *paratactic list*, which the composer intends to be devoid of meaning; a simple listing of random units.

APPENDIX B: Parataxis

Parataxis
How do unrelated ideas cohabitate?

What I keep under the title *Parataxis* are investigations into the reasons why two sounds work together when there is no logical, causal, or hierarchical reason why they should. Some of the best musical examples of it come from the genres musique concrète and certain classes of improvisation.

The term parataxis is a literary one, invented by a turn-of-the-century Russian literary school to mean "the placing of clauses or phrases one after another without coordinating or subordinating connectives" (Webster's on line.) There are similarities and differences between what I am talking about and what they were talking about. But I think the possibility of a small amount of confusion initially is worth the necessary avoidance of logic already started by the Russians; it is easier to overcome the logical differences than to start a new illogic.

To tighten the definition, a similar concept used in psychological literature is *preverbal expression*. For example Wilhelm Reich considers preverbal expression truer than verbal expression, which he calls "concealiatory" (*Selected Writings* 1974 p. 142)

In my initial paper on this subject [*An Examination of Meaning in the Clang* 1990,] I found equivalents and potential pointers to unearthing musical parataxis in many different subjects from several fields: psychology and psychophysics (neural networks, synchronicity, memory theories such as grouping and coding); literature, and mathematics (fuzzy logic and fuzzy

sets.) In order to place it in the context of the history of music, the idea of illogical connection starts with an idea of James Tenny's about grouping (the *clang*.) But my original reason for writing this paper, what it developed into, and the subject of this appendix are the same: an examination of parataxis in music. Following is some of the most relevant text from the paper, including the introduction and information from the subfields *Psychology and Psychophysics* and *Literature.*

Excerpt from *An Examination of Meaning in the Clang*

The position of elements in a clang is often not explainable by traditional (i.e. harmonic, motivic, etc.) methods. For what other reasons might one clang (or arrangement of elements) be chosen over another in the act of composition or improvisation? Different combinations of elements must have different meanings, in the sense of "...the thing one intends to convey..."

Physically, the combination of elements can produce complex harmonic and non-harmonic spectra. This we can understand. But, especially in the context of the piece from which it comes, a clang produces more than spectral information. There is an element of information or meaning which we cannot understand with Western logical analysis ("A science that deals with the principles and criteria of validity of inference and demonstration: the science of the formal principles of reason" (Webster's Dictionary.) Information which is not obtained by the above science I will call *illogical*.)

When it is stated that some of the information in a clang is not understood logically, another consideration arises. What does it mean when we do not understand? There are at least three possible reasons for this misunderstanding: I. the perceiver is ignorant of the meaning of common logical information, II. the information is knowable but is of a more complex, but discoverable logic, or III. the information is unknowable, i.e. "lying beyond the limits of human experience or understanding" (Webster's.) Cases II and III are considered in this study: is all of the information contained in or produced by a clang knowable? If so, how can it be decoded?

Musicians are able to use the mysterious illogical information. For example, in improvisation there is a direct route from ear to hand—bypassing logical thought—where information can travel. (Some of the information can be attributed to learned motor skills and some of the information falls into cases much like II and III in the above paragraph: it is either too complex for immediate determination of the learned motor skill or it is indeterminable.) There is less inertia, resistance to change (mood, tempo, instrument, or anything) in the illogical mode of behavior. Another example is that it is often said of composition that, although a piece may have a pure logical structure to begin with, the "...'logic' of emotion and intuition..." (Iannis Xenakis *Formalized Music* 1971 p. 178) is also needed for balance. One aspect of the balance which the composer uses with intent is the illogical one.

My original question could be restated: are there determinable or meaningful reasons (besides physical reasons) for creating a clang out of a particular arrangement of elements in a particular instance or context?

Here is another another fundamental question. Can all of the information in or produced by a clang be perceived when it is separated from the body of work from which it comes? The

clang may be more like an ideal model, as often used in physics to simplify understanding or calculations. Although the ideal model does give us information, it is usually incomplete and sometimes incorrect. An element might also be a member of different clangs in varying degrees. The tendency to group things is a common psychological occurrence; grouping or the definition of limits is necessary for comparison and classification.

Given two elements, it may be a subjective decision whether they have an illogical connection or what meaning can be derived from their nearness in space or time. Or, if the information or meaning is of type II listed above, it should be common information once uncovered. Rather than examine a few particular cases for information (since all cases can not be examined,), I will look at the *form* of these connections. Specifically, for the rest of this paper, I will be suggesting possible approaches to discovering the nature of information or meaning in a clang by showing parallels to it from other fields. It is my hope that in this way, thought about musical information might be expanded to include the forms or styles or patterns of thought found in these other fields.

Fields

Psychology and Psychophysics

Neural Nets

Neural nets were designed according to a proposed theory of how the human brain works: many small processing units are interconnected in various ways. The connections are then weighted so that the desired output is produced from a particular input. The work is then done in parallel. Some important advantages to this method are speed and the ability to learn by example.

The neural network resembles the clang in several ways. First is the general form of interconnected elements which form a higher unit. Secondly, a desired result can be produced from each with an assemblage of elements (or small processing units) without needing to know the logic of the interconnections between the elements.

> Knowledge at preverbal, cognitive levels is fundamental to understanding many important aspects of music, including physiological and emotional aspects, and yet the methods of building rule-based expert systems depend critically upon verbalization and introspection, rendering them ineffective for these problems. (D. Gareth Loy "Preface to the Special Issue on Parallel Processing and Neural Networks" *Computer Music Journal* V13 N3 (1989) p. 24-5)

There has been research to try and discover the complex logic (type II, above) occurring between the elements of connectionist processes, which may illuminate the kind of logic (or illogic) behind the central musical problem under consideration.

> Analysis by decomposition of the trained synthetic network might reveal aspects of the process that no amount of human introspection or verbalization could produce. (Loy op cit p.26)

> As far as the network is concerned [patterns in the input-to-

output mappings of the training examples] are purely statistical, but a human examining the network after the training phase is complete may be able to use the patterns to discover a set of underlying rules or a method that expresses the underlying problem. (Mark Dolson "Machine Tongues XII: Neural Networks" *Computer Music Journal* V13 N3 (1989) p. 33)

Memory Theories: Grouping and Coding

The fact that we can recognize a clang probably has a lot to do with the way the elements are grouped. Grouping aids storage in memory (John R. Ruch *Psychology: The Personal Science* (1984) p. 284.)

> Research on the conditions that influence human memory has demonstrated the overriding importance of questions of configuration; whether something is remembered is in large part a function of the form and context in which it is experienced. (Karl H. Pribam *Languages of the Brain: Experimental Paradoxes and Principles of Neuropsychology* (1971) p. 66)

The brain recodes information it takes in, probably to improve its efficiency or effective functioning (Pribam op cit p. 67.) There are many (perhaps infinite) kinds of transfer functions used by the brain for this recoding. The particular class of transfer function we are interested in here is one which can "...transfer where complexity resides in the *arrangement* of simple elements to a pattern where complexity resides in the unique meaning of each component element..." (Pribam op cit p. 70.) What I have been calling ***meaning*** in this paper may in fact be the method or result of this recoding.

The large amount of possible transfer functions suggests that any meaning that might be produced by recoding is probably subjective unless there is a universality in the particular transfer function used by the human brain when presented with a particular stimulus.

The ***information processing model*** of memory, one of several major theoretical models, hypothesizes that

> ...encoding includes reshaping [information] and combining it with existing information. And what is stored is not simply a discreet piece of new information, but a changed pattern of total information, one in which a new piece becomes part of a new whole. (Ruch op cit p. 277)

This hypothesis also suggests that the meaning derived from a clang is not universal, but depends on the contents of the perceiver's memory.

APPENDIX C: Excerpt from Michael Gendreau: *Edgard Varèse, Science, and Sources for the Analysis of his Music* (1991) on Crystal Growth

Crystallography

Varèse studied (or at least discussed) crystallography with Nathaniel Arbiter, a professor of mineralogy at Columbia University [EV1959A.203]. In it he found an analog in the physical world to his ideas of form. It is important to note that, judging by his writings, he had an idea of how he created his forms *before* discovering crystal growth. Varèse recounts the discussion as follows (Arbiter is quoted first; the addition in brackets is Varèse's):

> "'Crystal form itself is a *resultant* [the very word I have always used in reference to musical form] rather than a primary attribute. Crystal form is the consequence of the interaction of attractive and repulsive forces and the ordered packing of the atom.'
>
> This, I believe, suggests, better than any explanation I could give, the way my works are formed. There is an idea, the basis of an internal structure, expanded and split into different shapes or groups of sounds constantly changing in shape, direction, and speed, attracted and repulsed by various forces. The form of the work is the consequence of this interaction. Possible musical forms are as limitless as the exterior forms of crystals." [EV1959A.203, see also EV1968.190-191]

The highly ordered internal structure of a crystal is symmetrical. I have included some illustrations of symmetrical crystalline structure in Appendix G [*not included in this paper.*] We do not know from Varèse's writings whether or not he studied crystallography in any more detail than mentioned above, for example, studying the structure of specific specific crystal systems. Varèse did use symmetry in his compositions [JB.39ff]. It would be interesting to try and find out if he also used symmetry in his "idea...basis of an internal structure"—by the way he describes it above, one would expect that if such a symmetrical internal structural object were found, the same object could be found throughout the same composition.

The randomness in crystal growth is interesting considering Varèse's opposition to indeterminacy (see below). For Varèse, this randomness probably implied a freedom to use any operation (the various types of movement in space) on the sound mass that he felt was appropriate at the moment (by the "exigencies of this particular work"). Unfortunately, he does not leave us any clue as to how he decided the order or simultaneity of the operations.