contrecoup...

Nonlinearity and Computer Aided Composition

Thomas DeLio

I Overview: A Nonlinear Structure

contrecoup... (1987) is a setting of two words extracted from one fragment of a large unfinished poem by Stéfane Mallarmé. The poem was intended as a memorial to Mallarmé's son Anatole who died in childhood at eight years of age. However, it was left incomplete at the time of the poet's own death. The numerous existing sketches for the work were collected and first published in 1961 under the title *Pour un tombeau d'Anatole*. In the words of Paul Auster, the first English translator of this unfinished work, these fragments are really:

> ... the raw data of the poetic process. Although they seem to resemble poems on the page, they should not be confused with poetry *per se*. Nevertheless, more than one hundred years after they were written, they are perhaps closer to what we today consider possible in poetry than at the time of their composition. For here we find a language of immediate contact, a syntax of abrupt, lightning shifts that still manages to maintain a sense, and in their brevity, the sparse presence of their words, we are given a rare and early example of isolated words able to span the enormous mental spaces that lie between them ...[1]

I was attracted to many of the same attributes to which Auster refers, as well as to the fact that the text, as it exists, is indeed not a poem but a series of sketches. Never having been comfortable with the idea of merging a complete, self-sufficient poetic structure with a newly created sonic structure (thereby imposing one logic onto a pre-existing one), I was drawn to Mallarmé's fragments: words and phrases as yet un-refined and un-formed in any traditional poetic sense. I chose to focus intensely upon

the relationship established between two words, the first and the third, of the 119th fragment (as numbered in the North Point Press edition of 1983) (Example 1). [2]

     contrecoup... is a single movement work in five sections, approximately nine minutes in duration, scored for soprano, flute, piano and percussion. The five

Example 1

contrecoup	after-effect
<immortalité>	<immortality>
éternité	eternity
<pré>grâce à	<pre>thanks to
notre amour	our love
- il nous prolonge	- he prolongs us
au delà	beyond
-	
(en échange	(in exchange
nous lui	we give him back
redons vie	life
en nous faisant	in filling ourselves
penseur	with thought

sections are separated by silences that are often as long as the sections themselves. The work's structure revolves around two words from Mallarmé's fragment, "contrecoup" and "éternité," which the soprano presents at the very end of the second section. This is the only time in the work that either text or singer is heard. Thus, most of the composition is devoted to the three remaining instrumentalists whose music both leads up to and recedes from the one brief moment when Mallarmé's words appear.

     The sonic structure of the work is based, to a large extent, on a series of dichotomies (embodying the startling dichotomy felt between the two words of the

text). The instruments are paired - flute/soprano and piano/percussion - and these two pairs are often pitted against one another. As is much of my music, silence plays a crucial role in fashioning both the structure and expressive content of *contrecoup...* Twice over the course of the piece the music moves toward progressively longer periods of silence (nearly one minute in duration). As a result of this process, near the end of the work formal divisions themselves are rendered ambiguous: One silence within the final section is almost as long as the silence that separates that section from its predecessor and is actually longer than some of the silences that separated several earlier sections from one another. Moreover, the final section is itself followed by a long silence that completes the pattern of silences separating previous sections and concludes the work. All of this creates the sense of dissolution with which the work ends. By its conclusion, I would like the piece to delicately straddle a finely drawn line between order and chaos; its elements drifting further and further apart, the structure appearing to gently come apart at its seams.

II The Computer as a Tool for Designing Structure

The computer was used as an aid in the creation of several aspects of the structure of *contrecoup...* First, it was employed to determine the amount of pitched and non-pitched material to be used within each section as well as the evolution of this material from one section to the next. Second, it was used to determine the density of activity within each section, sub-section and phrase. Third, the computer was used to determine the evolution of various pitch collections from one section to the next, as well as the distribution of the elements of each of these collections within the individual sections. Finally, the computer was used to determine the total durations of sound and silence found within each section and to partition and juxtapose each according to various numerical series.

As stated above, the piece oscillates between pitched and non-pitched sounds. This oscillation occurs between each of the two instrumental pairs employed: piano/percussion and flute/voice. Within the first pair, of course, one finds the play of pitched vs. non-pitched percussion sounds (vibes, bells and chimes vs. drums, cymbals, wood block). In addition, there is a play of hard attack vs. soft attack

3

sounds - as determined by the various sticks and mallets employed by the percussionist. Within the second pair, flute/voice, the play of timbres is purposely simpler; sounds are never entirely non-pitched, some noise is merely added to a basically pitched sound (e.g. flutter-tonguing on the flute). Moreover, as noted earlier the flute once, in the second section, evolves (in a very fragmented manner) into the sung voice that represents a different statement of the noise/pitch dichotomy with many more timbral inflections added to a basically pitched sound. Also, with the entrance of the voice, the hard/soft attack dichotomy comes into play within the flute/voice pair for the first time. The first word, "contrecoup," begins with a plosive sound, the unvoiced stop, c, while the second word, "éternité," begins with a much softer attack, é. Moreover, the second word itself alternates syllables with hard and soft attacks, highlighting and intensifying the dichotomy of attack characteristics at this important moment in the piece (Example 2).
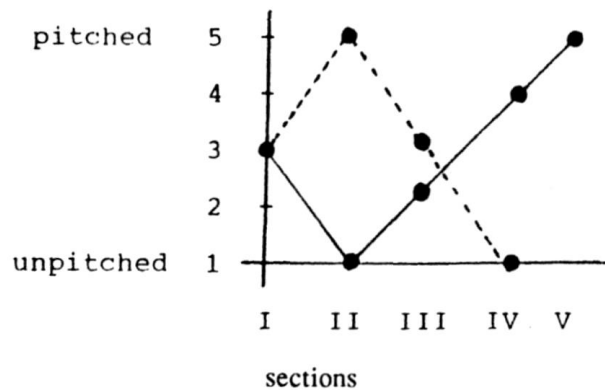
Example 2

é (soft) - ter (hard) - ni (soft) - té (hard)

Using the computer, the number of pitched and un-pitched sounds for each instrumental pair was determined for the entire piece and then for each section. The general relationship of pitched to un-pitched sounds for each instrumental pair in each section is shown in the following chart (Example 3). This chart - the first of many dealing with timbre - was a major stimulus in the composition of the entire piece. In it, I first sensed a way to merge text and music and I first gleaned the overall nonlinear nature of the structure.

Over this structure I superimposed a density plan which, in general, called upon the flute/soprano pair to first increase in density through the first two sections (culminating in the appearance of the voice at the end of the second) and then gradually drop out over the course of the last three. In contrast, the same plan calls upon the piano/percussion pair to decrease in density over the first two sections (while moving toward the purely non-pitched music of the second), and then

gradually increase in density through the last three sections (while moving toward the purely pitched music of the ending).

Example 3

pitched

unpitched

sections

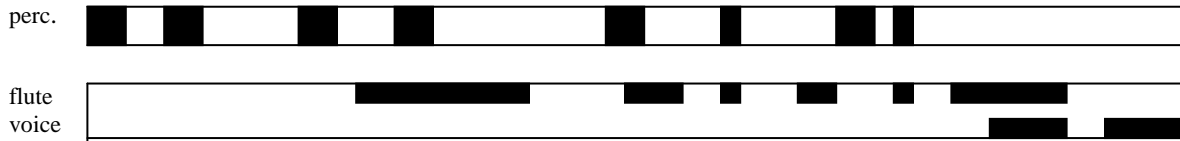flute/voice = – – – – –   piano/percussion = ———————

In terms of duration, the computer was used to derive strings of values from four different, though related numerical series (Example 4). The first, of course, is the well-known Fibonacci series. The others are generated from it a variety of ways. I began with Fibonacci numbers because they seem to engender such a unique, static feeling. Whether they expand or contract they never seem to be accompanied by any feeling of movement (for me, expansion never seems to project a sense of deceleration; similarly, contraction never seems to project a sense of acceleration. With this as my starting point I wanted to gradually move toward different, yet related series, which seemed to project a greater sense of movement. I use values common to two or more of these series to link them to one another or to shift from one to another at various points in the composition (the numbers underlined in Example 4 represent these common values).

Example 4

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a:   2   3   5   8   13   21   34   55   88...

b:   2   3   5   8   12   17   23   30   38   47   57   68   80...

c:       3   5   9   15   23   33   45   59   75   93...

d:       3   5   9   15   25   41   67   109   177   287...
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      The construction of these series was not accomplished with the aid of the computer but the distribution of their elements in time was automated. First, two values were chosen for each section which represented the ratio of sound to silence for that section (values chosen from elements common to all series). Then each of these durations was itself subdivided into smaller values of the same series. Each element in the series was given a different weighting and then values were chosen using different methods depending upon context (with replacement or without, etc.). (The weightings, of course, might be different from one section to the next; indeed, when there were values in common from one series to the next those values were almost always weighted differently.) The result was a "counterpoint" of sound and silence within each section. In its most complex manifestation, in the second section, each instrument pair has its own such counterpoint (Example 5). One might recall that in this section voice/flute are entirely pitched and percussion/piano entirely un-pitched. In fact there is a total dichotomy of all compositional parameters in this section culminating in its final sounds, those of the word "éternité."

Example 5

It is with charts such as this that the full nature of the nonlinear structure that the computer generates is revealed. The block like construction, the elements of which are filled with either sound or silence (which exist on both the macro- and micro-compositional level), is purposely intended to thwart any sense of flow or continuity. While evolution is continuous it is experienced as a series of isolated sonic events separated by silences that seem to be pushing those events away from one another.

With the aid of the computer, I have developed a mechanism for generating pitch structures which are, at times, totally without hierarchy with regard to interval and pitch content, while at other times highly ordered. The composition constantly oscillates between these states, but in general, pitch material is partially ordered in the first section and then highly ordered in the second (with particular prominence given to the tritone), then gradually less and less hierarchical over the course of the third, fourth and fifth sections. More specifically, for each section, a statistical distribution of pitches was generated. One hears, at some moments, a music in which all pitch/interval classes are distributed equally, while at other times certain pitches or intervals stand out and cluster around one another to form more complex pitch/interval structures. In general, in this piece, these different states evolve gradually into one another. Thus, in the second section one hears the tritone evolve out of the more amorphous interval distributions of the first, third and fourth sections (Examples 6, 7, 8 and 9; excerpts from four sections of *contrecoup*...). In addition, in the second section, the music cycles through all possible tritone relations available in the 12-note collection. Thus, the computer was guided not only to choose this particular interval class but also to saturate the music with all possible pitch statements of it. One should note, however, that the music never simply focuses upon just one interval but rather on a more complex hierarchy of intervals in which one or

two are most important, then a few less important and the rest are least important. Of greatest significance is the way certain pitch/interval complexes gradually emerge and re-submerge into a more amorphous, non-hierarchical, pitch/interval distribution. This is a concept that I have explored extensively in subsequent computer works.

Example 6: *contrecoup...*, first section (bars 1-4)

Example 7: *contrecoup...*, second section (bars 1-9)

Example 8: *contreoup...*, third section (bars 5-7)

Example 9: *contrecoup...*, fourth section (bars 1-4)

III The Computer and Nonlinearity

In his monograph *A Searcher's Path* Roger Reynolds identifies one aspect of the computer's influence on contemporary composition:

> The power of [digital technology] is essential in creating diverse, yet identifiable, transformations of original thematic statements. Without them, in turn, extended transformational series would be impractical to achieve... the computer edited whir of oboe sound [as heard in Reynold's Archipelago] evinces a degree and type of elaboration, of kaleidoscopic reshuffling, that would be quite unthinkable (probably even unimaginable) from a solely instrumental perspective. The decision to attempt a formal process of this sort is intimately linked with the fact that the computer offers possibilities far beyond the traditional limits of instrumentally achieved musical variation.
> ...Such "sleight of sound" could, but should not, be indulged for the sake of effect alone. This new methodological strength needs to be put at the service of

forms that are linked to it in significant conceptual and perceptual ways. To do otherwise would be unimaginative, inappropriate, even irresponsible.[3]

Reynolds identifies the impact that one aspect of digital technology has had upon composition today. He also sees the need to link new techniques for local sound transformation to rich new compositional designs that integrate these local techniques into larger forms which will reflect and match their originality. However, the computer has had another more complex impact upon contemporary composition. That influence comes from the computer's own direct influence upon our thinking; not a secondary influence, the result of a computer's transformation of sound materials, but a primary influence resulting from our now extensive contact with the computer and the transformations it brings to our thought processes and experience. This can lead to profound changes in our concepts of both the structure and design of sonic/temporal objects. (Of course, one must be willing and, indeed, eager to seek out and embrace such changes.)

The interesting artist is one who tries to capture experience as accurately as possible. The artwork becomes a model of the uniqueness of his or her experience (and yet at the same time seems to capture something of the universal nature of all experience). Creating music must be recognized as a method of understanding how we perceive. For me experience constitutes a play of contradictory forces: continuity vs. fragmentation, connection vs. dissociation, complexity vs. simplicity, order vs. disorder. It was when the computer became part of my musical world that these dichotomies first crystallized as the essential components of my creative outlook.

The computer program is a nonlinear order, existing in abstraction, all at once, outside of time. My music is nonlinear not only in the sense that the various events of the composition are not always consequences of their predecessors but also in the overall nature of the structures employed and the fact that events are often kept apart from one another (by silence). The music evolves, but does so as if through a series of snapshots. Events balance and evolve through the disparateness of their component parts rather than through any sense of linear continuity. I hope to make vivid this sense by isolating events from one another, to greater or lesser degrees, thus maintaining the potential for connection but never fully realizing that potential. All

of this, of course, is intimately related to my conception of time. What is most important to me is the present, the immediate moment. I try to avoid any sense of past or future. (In this regard, in *contrecoup...*, the word "éternité" takes on a unique temporal resonance.) This concept, which has run through my music for many years, crystallized only after working with the computer for a period of time.

The search for structures that accurately model human experience must be the foremost concern of the composer. The computer offers the means to forge one's own unique path toward achieving this goal. It can lead us to a new understanding of the fragmented, discontinuous nature of our experience and, in turn, lead to the creation of sonic/temporal structures full of fresh insight and daring originality. This, after all, must be the goal of any serious new artistic methodology.

Footnotes

1. Paul Auster, Introduction to *A Tomb for Anatole* by Stephane Mallarmé (San Francisco: North Point Press, 1983), p. x.

2. Stefane Mallarmé, *A Tomb for Anatole* (San Francisco: North Point Press, 1983), p. 119.

3. Roger Reynolds, *A Searcher's Path* (New York: Institute for Studies in American Music, Brooklyn College of the City University of New York, 1987), pp. 60-61.