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20th Century Form

Interpreting Improvisation: A Histiothematic Approach to Understanding Aleatory

Analytics in Music

As with any academic endeavour, the analysis of music has been refined over many years to form a basic method for better understanding musical compositions. There are many types of analytical methods than can be used, but they can generally be categorized into two basic types: descriptive and prescriptive.

When analyzing music descriptively, the first step is often to render a complete harmonic and structural analysis of any given piece in the hopes that the overall form of the work may lend itself to some insight on the motivations and aspirations of the piece and its composer. Further steps will depend on the goal of the analysis (Schenkerian, Perceptual, etc.)

On the other hand, prescriptive analysis tends to shun the initial step of foreground analysis, and attempt to describe the work as it speaks. Metaphor and literary analysis figure big into this mode of analysis, which avoids placing labels on processes that are not obvious to the ear. This method is widely contested, as it is arguable as to what exactly the ear can perceive or not (i.e. background structure, structural dominants, melodic prolongation); and the ability to hear various levels of structure may vary widely in effectiveness and depth from person to person.

Years of practice have determined that descriptive analysis (i.e. harmonic analysis) is by far the best way to begin an analysis; the realization of harmony and structure “open” the piece for interpretation, after which a more prescriptive analysis can begin. However, this presents a pointed problem when we reach aleatoric music. How are we to analyze the structure of a form that is fluid and can vary widely from performance to performance?

The Whole - Sum of the Parts?

Aleatoric music (a.k.a. Improvisational forms) often include purposefully ambiguous instructions - ad. lib., play as much or little as you want, choose the order of movements, etc - in the attempt to give the performer(s) control of the interpretation of the score, and ultimately the form of a piece. Some composers of graphic scores even do away with standard notational systems to free the interpretive elements of their works.

This flies directly in the face of our traditional descriptive analytical practices. If we are to truly understand these works and the motivations behind them, we must take a new approach to analyzing this music.

When analyzing this new improvisational music, we must begin in the right frame of mind in order to be effective in our research. **First, we must understand that, counter to hundreds of years of analysis, the "object" in aleatory is not nearly as important as the "process."** All forms of traditional music analysis rely solely on one feature of music - that it does not change with time.

In this new way of analysis, which could be coined as process-oriented analysis, we must seek to understand how a piece works, before we can understand why it works the way it does. This is really no different than how we have been treating analysis; it is merely that the importance in the past was placed on "why." Aleatory turns our ideas of analysis upside down, such that "how" is far more important, and in some cases, indistinguishable from "why."

Process-oriented Analysis in Henry Cowell's 26 Simultaneous Mosaics: A Case Study

In 1963, Henry Cowell, near the end of his life, published *26 Simultaneous Mosaics*, an aleatoric piece for violin, cello, clarinet, piano, and percussion. Each performer has 5 movements (the pianist is the only exception with 6 movements) and each performer is instructed to play at will. This instruction can mean a wide array of possibilities: a performer can play any movement at any time; whole or part, skip lines, whatever they deem to be appropriate at the time. (AKA - don't even bother with harmonic analysis). Yet Cowell provided 26 individual movements (or mosaics as he calls them), each with its own form and purpose.

When analyzing aleatoric music, there are certain decisions to be made. In this study, I have elected to use a balanced approach using common practice analytic practices combined with conceptual parallels with alternate disciplines that were historically relevant at the time of composition. Traditional harmonic analysis will be used in each individual part with the understanding that at any moment, a performer has the opportunity to stop and break the form. To best the piece we will need to form a paradigm to analyze the method of composition.[1]

My research has cumluatively led me to understand that many factors go into the product of a composer. His/her mind, experiences, political leanings, and environment (just to name a few)

[1] I have attached two examples to this paper as an appendix; I will briefly describe these orally, but the full detail of my research into them will be available there.

are present in the product of their work, to varying degrees of obviousness. Many argue that these influences possess a broad range of potency; some music has painfully obvious influences by merely existing, while other works possess only the slightest hint of reference to the composer's life, even to the point of the composer only being subconsciously aware of these qualities.[2]

Part of examining these works and developing a paradigm through which to view them includes becoming familiar with the historical environment that the composer was writing in. *26 Simultaneous* Mosaics was published in 1963, which was in the middle of the space race between Russia and the United States. By this time, the USSR and the USA had launched astronauts into low-earth orbit multiple times and President Kennedy had announced America's intention to put a man on the moon. According to Bernadette Bensaude-Vincent, writing for the journal *Historical Studies in the Physical and Biological Sciences*, "The advent of Sputnik in 1957 brought heavy investment in space research with long-range programs. the idea that all materials were strategic emerged in the context of the cold war as a major condition for responding to future emergencies."[3] The government was funding millions of dollars (about 13 million in 1961[4]) to universities who were working at a furious pace to ensure that the first person on the moon would be American, not Russian. Scientific research and education were given new priorities, and the development of space travel had become much more than a fanciful idea; it represented the dominance of capitalism and democracy over communist repression. With all this pressure on America to produce a spacefaring nation, new attention was being given to research, especially to materials engineering.

Materials engineering is the study and development of new materials and their applications. The field used to be known as metallurgy, but many metallurgy departments became materials engineering in the 1960s as the field expanded to include ceramics, plastics, and others. These experiments taking place in the scientific laboratory also seemed to be spilling over into the sketchbooks of American composers, who were busy developing new methods of melodic expansion. The application of other academic fields was already of prime importance to these innovators, and it stands to reason that a cross-disciplinary bridge could be formed between composition and materials engineering. Owing to the aleatoric nature of *26 Simultaneous*

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[2] I will warn at this point that trying to find the "subconscious" influences in a composer's works can be a bit like pulling rabbits out of hats. With enough arguments and by the imposition of our own interpretations (which are admittedly irrelevant to any composer), we can find a million nails to hit with our hammers. This paper argues the importance of the sociopolitical environment a composer works in, and uses that to develop a paradigm to analyze *Mosaics*.

[3] Bensaude-Vincent, Bernadette, "The Construction of a Discipline: Materials Science in the United States." *Historical Studies in the Physical and Biological Sciences* 31 no. 2, 236. University of California Press, 2001.

[4] Johnson, Dixon, "Meetings" *Science*, New Series 166 no. 3906, 780. American Association for the Advancement of Science.

Mosaics, and considering the year of its composition, our analysis will break away from the traditional methodology and instead use concepts of materials engineering to analyze this piece.

Materials research and engineering functions by applying a process to materials called characterization. Characterization of a material includes investigation into 4 key aspects of said material: Structure, Properties, Performance, and Processing. By filtering *26 Simultaneous Mosaics* (hereafter abbreviated as *Mosaics*) through these four aspects, we will begin to see an underlying logic to Cowell's composition and make connections between concepts of material engineering and this composition, and begin to see how these connections may apply to aleatoric music at large.

One aspect that material engineers take into perspective is structure. In order to gauge this, they will test the material in question at all possible levels to get a clear picture of the material's structure (on the macro and micro level) and chemical/physical makeup. We will modify this approach to *Mosaics* by looking at multiple structural levels to see what patterns may arise.

At the foreground structure of the piece, there is no written score, as each member may play any mosaic at any time, in any order. This illustrates an important concept of this piece. The individual movements are in fact *not movements at all*, as the concept of movements implies a set order to things. Rather, these are mosaics, fitting together uniquely, and although each one can be radically different, they fit together to form a larger picture.

Since these are mosaics and not movements, it would seem fair to assume that there is no large-scale structure to the piece. However, further investigation into the structure levels in *Mosaics* reveals that there are certain thematic elements that unify the mosaics and help them fit together.

The first structural level of this piece is made of the mosaics themselves. Just as you would expect in a mosaic work of art, each individual mosaic is structurally consistent with itself. There are 8 different structural forms that are observed in this piece: Strophic, Binary, Ternary, Chain, Rondo, Through Composed, Call and Response, and an interesting form that could be described simply as Effect. These Effect mosaics don't particularly follow a formal structure, opting instead to provide a certain effect. For ease of reading these structures are listed in Figure 1.

Form Type	Number of Mosaics	Mosaic Appearing in
Strophic	4	Cello Mosaic V Piano Mosaics III-V

Binary	7	Vln. Mosaic IV Cello Mosaic I Clar. Mosaics II-V Piano Mosaic VI
Ternary	5	Vln. Mosaic I, II Cello Mosaic II Piano Mosaic I
Chain	1	Perc. Mosaic IV
Rondo	2	Vln. Mosaic V Cello Mosaic III Clar. Mosaic I
Through Composed	2	Piano Mosaic II Perc. Mosaic V
Call and Response	3	Perc. Mosaics I-III
Effect	2	Vln. Mosaic III Cello Mosaic IV

Figure 1: Forms of Each Mosaic

The fact that each mosaic has a clearly defined structure reinforces the idea that although there is no set macrostructure, there are certainly very little aspects of randomness, if any, in this piece. It becomes clear that each note was chosen by Cowell for a specific purpose and that those notes combine within each mosaic to ensure that it can stand alone as a consistent pattern to be combined with other mosaics.

In addition, a running theme pervades the composition of these mosaics. This theme is the concept of a palindrome, which is any string of numbers, characters, or objects that are identical forwards and backwards. For example, mom spelled backwards spells mom. Sometimes these relationships are less obvious, such as the phrase race car (which backwards is rac ecar race car). Musically speaking, some palindromes are explicitly stated in *Mosaics*, such as this excerpt from the violin's fourth mosaic:

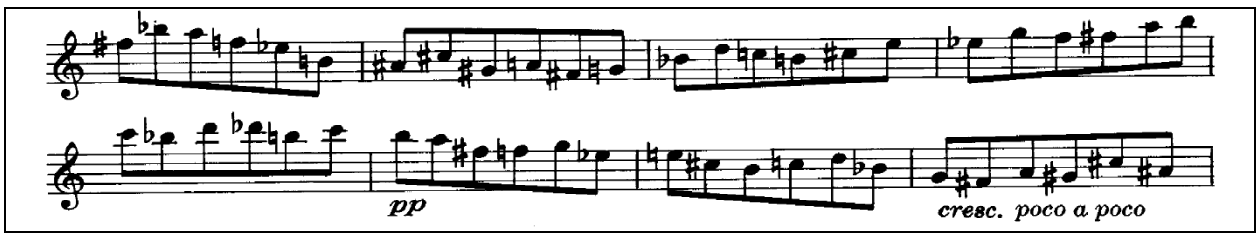

Figure 2: mm. 12-19 from Violin mosaic IV

This excerpt shows the middle of the mosaic where the pattern turns around on itself. The middle measure, measure 16, shows figuration on the pitch C before repeating measures 12-15 backwards, making C the goal of the entire mosaic. These palindromes provide a common ground between different mosaics and add a subtle level of continuity to an otherwise disjunct piece.

Although only 4 mosaics explicitly contain palindromes, they still serve as important compositional devices on all levels of structure. When one considers that a ternary form is by default a palindrome (ABA) that adds 5 mosaics to our original 4 that contain these devices. In addition, one can consider an extended rondo (ABACABA) as a palindrome as well. This form is found in the Cello Mosaic III, bringing our total number of mosaics that have palindromes to 10. In addition, consider that are 5 musicians in this piece: 2 string players, 1 woodwind player, and 2 percussionists (including the pianist). These palindromes serve not just compositional functions; they also form thematic bridges between the mosaics, serving as the mortar between each mosaic tile. Now that the mortar has been set, we will move to observe a few of the mosaics themselves through the lens of materials properties.

Properties and Structure are very closely related in materials science. It was discovered that the close examination of a material's microstructure "provided an understanding of the mutual disposition of phases and of the properties of alloys."[5] In a similar fashion we may analyze the properties of each mosaic in this piece. However, we must understand that the performers can ultimately change the structure of the piece. For this reason, we find a discontinuity in our paradigm: the structure of mosaics has little to do with its properties. Cowell himself mentioned this phenomenon:

> Writing in form, I may add, is not a matter of pushing certain sounds into an unyielding mold; crudities of form tend to drop out unconsciously as further experience is gained. The experience of being in the throes of musical creation is distinctly an emotional one; there is a mere semblance of the intellectual in being able to steer and govern the meteors of sound that leap through the mind.[6]

It would seem that in composing *26 Simultaneous Mosaics*, Cowell has proven that structure arises naturally out of the composer's mind and the direction of the music, not out of obligation to predetermine the layout of a work. Thus, it becomes a moot point to try to analyze this particular piece through the perspective of physical structure in materials science.

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[5] Bensaude-Vincent, Bernadette, "The Construction of a Discipline: Materials Science in the United States." *Historical Studies in the Physical and Biological Sciences* 31 no. 2, 224. University of California Press, 2001.
[6] Henry Cowell, "The Process of Musical Creation" in *Essential Cowell: Selected Writings on Music*, ed. Dick Higgins. (Kingston: McPherson, 2002), 243.

Another aspect that engineers will observe is called the performance of a material. Unlike the musical definition, this iteration of performance refers to observing how well the material in question performs in doing the task the material was designed to do. Conceptually speaking, Cowell has provided blueprints for a material that the musicians then construct. We as the audience observe this process unfolding in open space before us. Thus, the typical process of experiencing music is reversed. Usually, the audience is presented with an object to experience and pass judgment on; our frame of reference is our reaction to the music. But in *Mosaics*, the audience is instead confronted with the forming of an object. The product has become far less important than the process of creating it. In effect, the audience become researchers testing the performance of Cowell's design and the ability of the performers to execute it. This requires a different mode of listening and thinking; the traditional forms of enjoying music must be bypassed and approached much more cerebrally.

When it comes to *26 Simultaneous Mosaics*, the utilization of materials engineering to analyze Cowell's work has shown a method of evaluating such works. Historically, it was indeed likely that the scientific advances during Cowell's time were influential to the American avant-garde tradition, as they had been in the examples provided in Appendix A. We can say all this with certainty because the traditional methods of analysis fail to effectively describe the function of *Mosaics*, while the materials engineering paradigm quite handily provides the frame of reference to effectively analyze this piece. In addition, we can look to the historical context of the space race in America that provided a need for new materials and research, and the tradition of cross-disciplinary composition techniques that began in the 1920s. In so doing, we have effectively proven that a piece such as *Mosaics*, while appearing to have no form, contains a surprising amount of depth and structure.

Appendix A
Two Examples of Cross Disciplinary Influences in Composition

In 1940 a cross-disciplinary approach to composition came from abstract film. The now famous animator John Whitney was beginning his journey into the movie animation industry after spending a year in France studying twelve-tone theory with René Leibowitz. He teamed up with his brother James, an abstract filmmaker, to create a new film based on Schoenberg's serial principles.[7] Whitney's method of composing involved the invention of an infrasonic instrument – in this case, a series of pendulums, which were connected to the aperture on the camera. By using the pendulums to open and close the aperture, the Whitney brothers exposed light to an optical soundtrack inside the camera itself. After development of the soundtrack, audio could be played back via normal projection devices. Whitney decidedly shied away from tuning the pendulums to any scale, as he and his brother needed the utmost flexibility in the production of their film.

Whitney's use of pendulums to create sound from motion represented an application of physics to the process of musical composition. The pendulums themselves made no sound; rather, it was the way in which the pendulum moved that manipulated the aperture and the resulting frequencies and musical structure. Whitney described the relationship between the pendulums and the structure this way:

> The commencement and cessation of the tones was affected by means of knocking or holding onto the pendulums, either suddenly or cautiously. Vertical and horizontal aspects of a composition were thus structurally related in a particularly lively way.[8]

By the 1950s, Schoenberg's technique had widely come into use around the world. Composers were finding new ways to compose music, and the boundary line between composer and theorist was becoming finer and finer with every new approach. Serialism had subjected musical elements beyond pitch such as duration, attack, decay, dynamics, etc. to the twelve-tone technique and created a new pure, or total, serial music. Other composers had branched out to include other fields in this new cross-disciplinary approach to composition.

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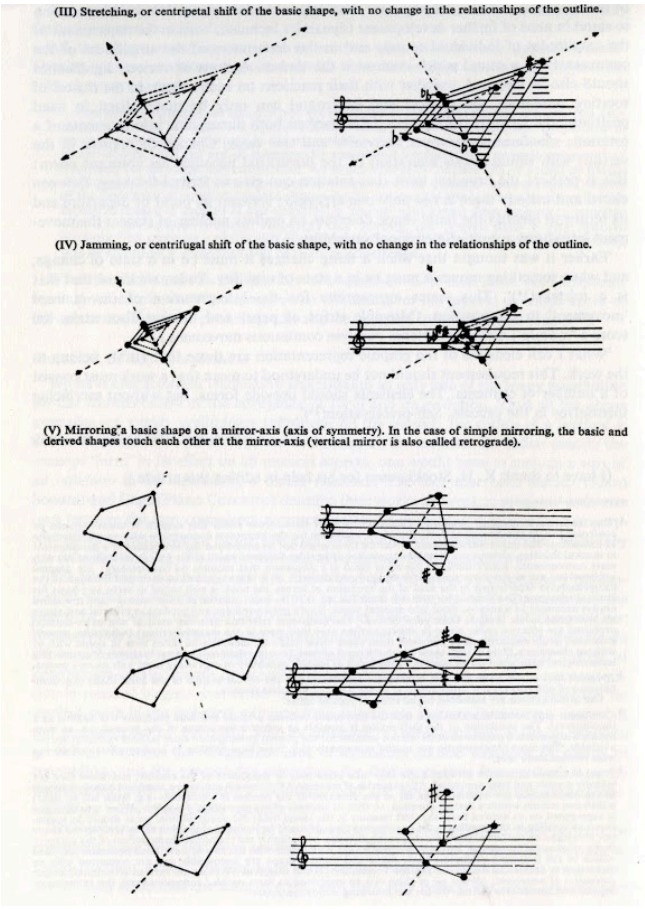
[7] This film is the first of a series entitled "Five Film Exercises" recorded by the brothers in 1943. They submitted it to the 1949 Brussels Experimental Film Competition and won the Grand Prize for their work. It it easily accessible on YouTube.

[8] John Whitney, "Moving Pictures and Electronic Music." *Die Riehe* 7, edited by Herbert Eimert and Karlheinz Stockhausen, 61. Bryn Mawr, Pennsylvania: Theodore Presser, 1965.

One composer in particular who was also interested in these new applications of composition was Mauricio Kagel. Around 1960, he had moved to Germany and was teaching at the Internationale Ferienkurse für Neue Musik in Darmstadt. Around 1965, he submitted an article to the seventh edition of the music journal *Die Reihe*, entitled Form-Space. Kagel was very interested in applying the field of geometry to the notation of a series in order to acquire variations. He postulated that "connecting lines between the combined directions of several notes create surfaces that can be articulated temporally and dynamically."[9] By applying geometrical transformations to these surfaces, new pitch classes could be formed that would otherwise have been inaccessible (see figure below). These new shapes give the composer extra materials to work with that also maintain the consistency and relationships between different gestures in the music.



Kagel's Geometric Transformations[10]

[9] Mauricio Kagel, "Translation-Rotation." *Die Riehe* 7, edited by Herbert Eimert and Karlheinz Stockhausen, 33. Bryn Mawr, Pennsylvania: Theodore Presser, 1965.
[10] Ibid., 58.