THE SECRET ART OF SCIENCE: AN AURAL-BASED ANALYSIS OF JONTY HARRISON'S ACOUSMATIC WORK "PAIR/IMPAIR"

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This paper observes the problems that impede meaningful analysis of form and structure in modern music, specifically electronic music. The premise of this research is to present methods, tools and practice for analyzing music whose visual interpretation, if any, do not represent the aural result of the composition. The means for suggesting a method are derived from documented observations in aural psychology, as well as composers’ writings about musical perception. The result is an analytic model that focuses on the aural experience rather than the composers’ compositional strategies which do not always agree with the resultant composition. The results from the analysis of music by Parmegiani, Harvey, Vega and Harrison help prove the general applicability of this research.
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INTRODUCTION

“Is the portrait of Mona Lisa good if I desire to see it? If not, why not? ”

James Joyce

Following the revolutionary musical inventions and aesthetics created and developed in compositions of the post war era that are based on the manipulation of magnetic tape, it has been noted that there is still today a lack of analytical methods by which these compositions can be further studied. This problem is rooted in the fact that there is no standardized way to speak or refer to the aural body of electronic sounds. There has been very little progress made toward developing a proper and useful descriptive language to better refer to the mechanisms that operate within the new musical creations. The reason a new language for describing musical events is needed in this electronic medium is because traditional vocabularies cannot accurately explain the sounds being heard. Once this expansion of language can be established it will offer more tools to be used to analyze and describe the relational properties these electronically created sound events might have to one another over the scope of a musical work.

With the above mentioned music in which sound is created and organized by electronic means there comes also a new cultural phenomenon, which invites and expects from the listener a different kind of attentiveness to detail than previous music. Listeners in this new genre will be exposed to manipulated sound recordings organized into compositional structures. The electronic musician captures, transforms and synthesizes sound into gestural material that is then structured over formulated time
fields. Many of these objects may not be identifiable by the listener but they will retain a character by which they will be lodged into the cognitive memory of the listener during the performance in the same way that a theme or a motif might be remembered.

On the subject of performance, the loudspeaker medium in western culture has trained its participants to expect sound while not being provided with any visual source to relate to the music being performed. In this case I am narrowing the discussion to what Pierre Schaeffer describes as ‘acousmatic’ music. Music whose performance comes from a recording played over an array of speakers. In most cases these works do not have scores or performers and are presented without visual distractions on a stage from which aural events would, traditionally, originate.

The resulting works made by composers of this medium can focus the attention and create illusions of musical time. It is these illusions that when viewed as a whole, result in the force that drives the flow of a piece. The purpose of the following research is to compile a method for describing these events and subsequently talk about their influence over each other in a musical work for loudspeakers in terms of flow, force, energy and proportion.

Describing Expectations

The tonal system, a western creation that developed in the late 17th century, has created a culture in which musical moments are geared towards an end. This is music that is ‘goal directed,’ a linear approach, meaning that the work flows from beginning to end to an unmistakable conclusion. What we refer to as a musical progression has developed largely from composers conditioning the audience over hundreds of years.

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Early music theory explains and analyzes how basic patterns such as dominant degrees resolving to tonic centers can be applied to different levels of harmonic structures as part of a larger dominant to tonic relation creating, in the end, a more complex linear progression. This achievement, the conditioning of people to understand and expect a dominant to tonic resolution, is created by applying a concept of how and what musical items people accumulate and value in importance in their memory. These usually include themes, motives and melodies. In the end what has resulted is the tension that results from a chordal sequence being executed and the gratification granted when it has reached the tonic. These expectations do not exist for the inhabitants of Tonga, for example, who have not endured such exposure over many generations. Therefore, they are not conditioned to understand musical sequences which would resolve at a, predictable for us, cadence. The concept of musical phrases or sequences is so thoroughly ingrained in western culture that when it is not present in a work of music it becomes regarded as something ‘strange.’ This is not because it has lesser value but because it does not follow the aforementioned conventions of musical structure. However, this reaction is constantly diminishing as the decades go by and audiences are programmed further to hear new, more complex, vertical (harmonic) and horizontal (temporal) structures. In a medium such as electroacoustic music where unfamiliar sounds are to be expected, the listener will begin the process of analytically categorizing events as they are heard. This process is context dependant and our understanding is influenced by such parameters as the density of event occurrences and their familiarity. Here then, linearity exists when “Each new occurrence understood
and subsequently remembered under the influence of prior expectations, implies the future."²

What is crucial to our understanding of expectations is the explanation of what Denis Smalley in his article “Spectro-Morphology and Structuring Processes” refers to as apprehension and contemplation in the musical listening experience.³ These terms relate to what musical information, selectively gathered, is memorized when subjected to different musical situations. Apprehension is the gesture in the musical foreground, which attracts attention and interest. Contemplation maintains a musical process and instead of attracting attention, it creates moments of reflection without breaking the musical continuity. This idea of musical time can then be spoken of as the ‘flow’ of music hinging on the possibilities of memory and expectation, density of musical material and its resulting effect. It should be noted that musical works can experience either apprehension, contemplation or both in all instances adding to the flow of the piece.

Describing Musical Memory in the Western Experience

As composers we organize musical data which, when presented to an audience, is organized in the listeners mind. The listener then compares this data prejudicially, as time passes, to that which has been captured in musical memory. Musical memory, which can be imagined as a mental buffer, has been demonstrated to have certain capabilities and retains different events depending on many possible situations. Unlike a computer buffer where data is stored equally as it is received, the memory of a listener varies in length depending on the density of information and other factors. The

listener also discriminates differently depending on his or her unique personal experiences.

With the presentation of an electroacoustic work, the listener is expected then to listen and to direct the mind to evaluate and appreciate what musical material might be presented. This is the basic contract between the ‘performer’ and the ‘listener’ when entering a space where a performance will take place. When this performance initiates, the listener is immediately stimulated by the instance of a beginning and from then on will hopefully be open to suggestion by the evolution of the work. These suggestions are perceived based on certain conditions where some events might have more importance to the listener than others and which can be distorted into cognitive memory by traditional means. These means are the trademark for the creative process and will be spoken of as instances of repetition, contrast and continuity. These will be our foundations for describing music at different hierarchical levels, in a broader sense, as it is possible to have combinations of these. For example a piece might be best understood as having contrasting materials in the immediate moment, while on the other hand the whole of the piece might be experienced as continuous (i.e. Kontakte of Stockhausen or sections of the Turangalila Symphony by Messiaen).

These understandings of hierarchical levels are indeed intimately related to musical memory. In order for the listener to make the connection between the immediate and the past occurrences, information must be retained.

Gerard Grisey in his article entitled “Tempus ex Machina: A composer’s reflection on musical time” touches on the subject of memory and erosion, which corresponds to

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the concept of musical memory explaining the perception of time passing slowly or quickly. In this article the author outlines the differences between perceptive levels and describes them in relation to the human anatomy. Out of this he is making a contrast between the skeleton, the flesh and the body of musical time where at very simple levels the skeleton of time categorizes event durations, sections. Durations are comprised of the musical events that have length, their initial positions in time and their relations to instances of similar cells. These cells might not be equivalent but even with slight differences they can be perceived as related, which then entitles them to be grouped by association, thus creating a pattern.

Musical Excerpt. ‘Etude Elastique’ from L’ Object Sonore

I would like to introduce an excerpt from Parmegiani’s Etude Elastique (Track 1 from CD), which is the fifth piece from L’object sonore. In the following excerpt (from 3 minutes 05 seconds until 4 minutes 38 seconds, total of 1 minute 33 seconds), which is the ending section of this piece, one immediately hears gesture that at first might be felt as the recording of someone inhaling and exhaling. This sound event from its very first instance is immediately obvious and becomes stronger as it has been heard several times. The average components of these ‘breathing’ sound events have such little energy it is a wonder that they are not masked by the unfolding of the higher energy gesture that is more intense and dynamic. This lower energy object becomes perceptually stronger in the continuity of this section through its periodicity, which contrasts the unpredictable, higher energy activity that it accompanies.

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5 Bernard Parmegiani, De Natura Sonorum, INA C3001, INA-GRM, France, CD
Furthermore, this low energy object outlines the ending section regardless of its level for several reasons: it's periodic motion, it's familiarity as a respiratory rhythm and the density over which it unfolds. The low energy object then has a strong impact on the piece and its flow towards an end. The effect achieved is one of continuity, where all other intensities fall out of focus as they are overpowered by a process that is simpler, periodic and similar to a common body function such as breathing.
ON CONTINUITY

Returning to the skeleton of time I would like to expand on the strategies that govern this realm, which relate to the examination of the pulse. If a sound object at its smallest instance can be associated to its closest, most similar neighbor, it will draw attention to itself. A single instance of a sound can easily go unnoticed but when it is repeated it becomes a more prominent figure. Repetition can then be observed at the motivic, cellular level or as a larger, more encompassing collection of motives creating sections. A sound that is enveloped by certain frequencies and which completes itself as a whole idea can be recognized as a pulse. A second sound that appears in succession and which retains some similarity to the previous envelope can be considered to be associated even though they might not be identical. Our two hypothetical sounds, if allowed to continue appearing in time, result in a pattern that would express a periodic plan. The rate at which these associations occur directly influences the degree of predictability or unpredictability creating a scale that runs between the periodic and stochastic. This underlying layer of energy plays on the expectations created by the probability of instances measured in time from each other. At the most basic level, predictable events ensure stability for the listener, via an equal length periodic pulsation that exhibits no indications of change. Each degree of periodicity has its own effects on the listener, which can be used compositionally as seen in the example of the Parmegiani composition. Regular periodicity has redundancy and influences the attention of the listener. Grisey explains, “mechanical periodicity tires the listeners much as a ceiling or wall with perfectly equidistant tiles.” A side effect of periodicity, once the expectation of a continuous flow is established, is the
state of hypnosis, which in the less mystical sense, tends to achieve what might feel as a suspension in time. At times we can notice how monotony can disorientate our notion of how much time has passed. Monotony’s counterpart in music is periodicity.

Can a noisy situation be regarded as continuous? When we look at the table by Grisey, predictability is scaled from regularity to discontinuity, which he points out to be analogous to order and disorder. As listeners we can consider discontinuity as being unpredictable, unless the discontinuity is itself continuous, in which case the discontinuity can become predictable over time. In other words, it becomes predictable that the musical pattern will continue to be unpredictable. In the visual implementation of fractals as we have seen at an early stage of the development of one function, it might present nothing but seemingly random lines or points until it is allowed to continue its evolution, resulting in the emergence of relations and shapes. A similar principle is applicable to music and I would like to expand on Grisey’s chart to add a wrap around factor. When duration reaches its maximum discontinuity and is allowed to continue it becomes predictable. I have considered this notion before as a composer experimenting with the possibilities of using discontinuity and disorder with different densities that can evolve to present direction and continuity.

The categories that range in between the predictable and the unpredictable patterns are the dynamic transitioning from one state to another that in turn presses towards directionality. A step above maximum predictability and below non-predictability is the dynamic accelerando or decelerando of pulses. These are durations in transition, where the lengths in between are always changing with a ramping contour. There is a rhythmic predictability when events occur with consistently increasing or
decreasing time increments. The continuity of these directions can deviate slightly from a plotted ramping plan and still retain their increasing or decreasing direction over time. Through these continuities, flexibility can be created in the distribution of material throughout the piece by pulling away from the more neutral layers. The general behavior that these directionalities express over the perception of the material is interesting as the amount of information distributed over this progression stacks up during an accelerando or dissipates during decelerando. This results in either tension for the listener as the unknown unfolds faster or release of tension as time is increasingly allowed to evaluate the incoming sounds.

Musical Excerpt. ‘Donna Never Cries’ from Alibi

As an example of transitions between hierarchies of predictability and the release of such I would like to present a section from my own work. In the second movement of Alibi, a tape composition, the opening gestures are dramatic and spontaneous. The music presented in the first 38 seconds of the movement seem related even though their appearances over time do not seem to be symmetrical. The unpredictability of the material is high but nonetheless we relate the events to each other for several reasons: they share a percussive envelope that, in the second half, becomes the onset of a fuller statement. Each moment in this section has a similarity in spectral content. The material of each instance is derived from the same onset.

Each of these instances is dramatic due to the amount of interaction between the spontaneous events of higher energy and those with less energy that seem to be consequential decays. For this reason they are marked as instances that apprehend and attract attention with each attack. These attack points in time have been marked in
figure 1. Furthermore, the amount of stress distributed throughout this section is low in density, which allows less information to make up for the unanticipated, almost frightening attacks in this opening. This material, which has little linearity as it implies only the continuity of unpredictable events, is soon thrust into a section of undetermined order where it is able to grasp some continuity.

Figure 1 Opening section from ‘Donna Never Cries.’

By undetermined order, I am suggesting that the rhythmical beating which covers the period between 38" and 1’20" has a sense of predictability that the previous section did not. Yet this predictability is undetermined because of its asymmetrical internal rhythms. These rhythmic events appear in four groupings that vary in intensity, length and, though only slightly, in accompanying texture. In expanding our study of this period we will find additional symmetries that were not obvious until one maps them over a time line.

By laying out the successive onset times we can start to discover durational relationships between the materials and uncover underlying proportions. There are four
main attacks that are related by their amplitude envelope and spectral similarity. These are the most potent releases of energy that attract attention and create uncertainty due to their sudden nature. The opening bursts occur at 00", 04", 11" and 27" seconds. Their spectrum is relatively full and dissipates extremely quickly. When we evaluate the length in between their instances we begin to realize more about the geometrical proportions. These attacks are separated by intervals of: 4", 7", 16" and 11". If we continue plotting the onsets of the second half and again measure the lengths in between each attack, we also find four instances separated by 7", 11", 7" and 17" long. It should be noted that the two sections are very close in length (1st is 38", 2nd is 42"). Even if this is not obvious from the first listening it may have seemed that there was some type of natural balance between the material but not so symmetrical or statistical as further analysis proves.

When looking at the list of lengths in succession (4, 7, 16, 11, 7, 11, 7, 17) one can start making several deductions as to the directionality that the piece exerts. First, one can see that the shortest duration is at the beginning and that the longest is last. As indicated previously, higher density obscures the focus to the listener due to the amount of information being presented. Considering that the material has decreasing periods (time in between instances), we can say that this scheme ‘proportionally’ unfolds its density from high to low, creating a ramping progression (fig. 2). One might predict from the values given so far that the intervals would, if the process was allowed to continue, continue to increase while repeating some interval lengths from the previous sections.

Considering the asymmetrical rhythms in each pocket of the second section I
would like to suggest that they are a reflection of the larger durations that encompass
this initial musical excerpt. These rhythms, if seen on a graph (Figure 2), have no
common length but rather revolve around an average exponential curve. This is the
same way the rhythmic durations were created.

I would like to emphasize that the compositional process for this piece was
intuitive and that the material was distributed as the unfolding of an aural concept: the
development of a sound burst, transformations of a soda can being opened, and
treating such as musical objects.

In summary, the section in question, which was chosen because of its apparent
continuity, has proven to contain some interesting patterns. The unit divides into two
sections (38" and 42") that each then divide into four subsections. This is the extent of
an even symmetry relationship of the overall form. Next we have the proportions of the
eight durations discriminated as being individual ideas whose lengths we stated as
presenting a ramping progression that can be plotted statistically. In other words it does
not make a smooth ramp but wanders positively and negatively around the contour of
an exponential curve.

![Figure 2](image)

Figure 2 Plotting the eight time lengths over instances.
What has been presented is an analysis of the relationships between musical materials that have been grouped by relying on the use of perception. The outcome of the analysis does not imply that we consciously hear these proportions. Instead, the object of this study is to measure the music from different angles guided by perception in search of an explanation for the flow of the piece. This is the balance between a global perception and an analytical perception.
A LANGUAGE FOR DESCRIBING THE SOUND OBJECT

In attempting to classify instances of sound as they occur in an electroacoustic composition, it is difficult to accurately provide names that are not only descriptive of frequency and amplitude but are also expandable so that combinations can also be represented. Other authors doing research on the subject of analysis of electroacoustic music all have felt compelled to invent his/her own syntax for this purpose. Unfortunately none of them arrived at a common language that might be used to analyze a composition although they all offer interesting conclusions which can be compiled selectively. For the purpose of objectively understanding a composition Gerard Grisey refers to time (both chronometric and psychological) as multilayered. The following will introduce and apply some of his concepts in which time is seen as musical skin, flesh and skeleton.

About the “Musical Flesh”

At the moment that one hears a sound we are likely to describe it by saying: “It sounded like a ….” Our culture has evolved in part through the ability to make analogies and we should make no exception here. The first step to describe a ‘sound type’ would be to determine its recognizable nature. This is important because our conditioning as individuals will force sounds that are familiar to be felt stronger as in the Parmegiani example. Michael Bridger in his essay “An approach to the analysis of electroacoustic music” makes this distinction. Using his categories, we parse sounds as either human, concrete or transformed/synthesized. The importance of recognizable, familiar, human sounds as part of an electroacoustic work is fundamental
to the way a listener organizes it hierarchically in relation to personal experience. This is what Smalley refers to as the ‘indicative fields’. The indicative field “…explains the links between human experience and the listener’s apprehension of sounding materials in musical context.”

The sound type that is *concrete*, meaning a sound sample from everyday life, has a strong yet lesser influence on perception than a *human* gesture because these gestures, speech for instance, have been part of our existence and people have been conditioned to give these sounds prominence for millennia. Because of this conditioning humans are able to recognize sonic human body gestures above all else even in instances where the human sound is masked. The third category, *transformed/synthesized*, includes sound that has little or no resemblance to the living experience, that which is formulated or transformed beyond recognition.

These categories are broad in scope and are designed to encompass as much as possible. They are based on a general understanding of the way we understand and prioritize different sound materials. Once the sound type has been distinguished it is the shape it follows that gives it musical form. The gesture can be mapped according to a ‘descriptive envelope’ that will depict the dynamic contour of these sounds. The dispersal of energy once described, decoded and mapped through the use of our listening habits, will allow us to better deduce the proportional content of a work, the form.

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ABOUT INNER-STRUCTURE

When analyzing a composition it is important to consider the limits of what findings might be useful to the understanding of a work. It is possible to analyze a sound to an infinite number of levels while the important gatherings might have already been found. One can revel in the details and fragment the object into infinity and still insist that there is more to find. While we are preoccupied with measurements over time and the spectral integrity of a sound we must consider what we feel to be the limits of our aural capabilities.

Further description of the sound, once it has been isolated as an object and after the values of its origins are weighed, can then portray the frequency content of the sound form. Traditionally musical instruments are differentiated by the timbres they produce. In other words, the tone quality of a violin is different to that of a trumpet without making any further notice of their spectral content or what frequency relationships might influence these differences in tone. This, historically, has been enough since the performer can measure changes in pitch on his/her instrument and we hear these changes and agree that the pitch A is different from the pitch F. We also say that the pitch A on the violin is the same as the pitch A on the trumpet while laying them over the musical work discriminately according to the desired tone color for each particular moment. The study of these compositional strategies is, of course, orchestration.

What we presently have to manipulate into musical meaning is the sound as an object that not only has a flow but also covers the whole gamut of perceivable frequencies. By this understanding we also think under the auspices of orchestration,
which must be expanded to include the aesthetics of the electroacoustic process. I have found that when trying to explain the timbre it can be best described in terms of an accurate note, a cluster of notes forming a node or as an unidentifiable clump of frequencies called noise. These terms have been appropriated from Denis Smalley. Once an object has been generalized for its content, the dynamic contour of the sound followed by the further defining characteristics must be understood. A sound is perceivable because it has amplitude in the same way that a shape on a canvas has contrast and stands out. The shape of the envelope over which the sound unravels determines its presence. To describe the sounds character it is useful to refer to the standard attack-decay-sustain-release (adsr) method of identifying envelope characteristics.

Elements of the sound that further describe its characteristics fall under the title of ‘enhancement.’ By enhancement we are including additional decaying features such as reverb size, panning and any other characteristic that might prove important to the description.

Musical Excerpt: Mortuos Plango, Vivos Voco

I have chosen Jonathan Harvey’s quadraphonic (reduced to stereo) piece Mortuos Plango, Vivos Voco because it presents us not only with a complex gesture of intertwining materials but also with a nicely orchestrated stream of movement. The excerpt we will look at is the section from 3 minutes 30 seconds until 4 minutes 08 seconds. First let us consider the obvious, that the focal point is the sound of a boy’s singing and its very direct relationship to what sounds like a bell. The unmistakable

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sounds of a boy and a bell strike us as natural sound types in the opening attack of this example and at 3" they begin to transform into each other. What we hear after the onset of this transformation is the swelling in and out of a boy’s sung pitches with what could be understood as harmonized sine frequencies. This texture maintains steady pulsations for almost 30" until it releases with an attack, leaving a faint sinusoidal chord to ascend and fade to silence (fig. 3).

Figure 3  Event shape.

Further listening explains more about the inner events heard in the longer middle portion. We hear the vocal material fading in and out with the other synthetic materials. The vocal material seems to change pitch roughly every 2 seconds. This very periodic pulse is almost disregarded as such because of the lengthy time span between each pitch change. Nevertheless, the result and the probable intention of the composer are of primary importance. The texture is scattered in a constant flux maintaining a low continuous dynamic.

\[9\text{Jonathan Harvey, Mortuos Plango, Vivos Voco, ERATO CD 2292-45409-2, CD}\]
With regard to the pitch material, the opening note F (with F - G grace notes) from the boy is responded to by the bell until they both cross fade with a lower B flat at 3", which is the continuous force that controls the flow of the middle. The scheme for the moment in question is then interpreted as a quick dip from a strong high pitch opening (3") to a less intense low-pitched low energy continuation. This low section continues by pulsating in the distance until an ending attack at 31" triggers the quick rise in frequency which lasts about 5 seconds. The more we uncover, the less mysterious this excerpt seems and the more obvious the traditional schemas that are operating in this electroacoustic work become.

In addition, the entire section is composed using B flat and F in its different octaves. The only timbres present are those of a boy singer and a sustaining bell with its spectral makeup fluctuating at different frequencies.

The overall envelope of this phrase can be represented with a traditional adsr shape in which the sustain portion carries on for 25" before being released. Structural importance is given to the two discrete pulses that give some drive to the ending gesture. This first pulse appears at 28" and repeats at 31" to be immediately succeeded by the releasing gesture. This is important because it creates expectations after a longer non-directional section. This occurs not so much because of its timbre but because of the fact that it is new material. It is admittedly very discrete but it seems clear that something is being stressed at those time points.

With this gesture, Harvey achieves a moment of contemplation of the sound material by using slow, low density, periodicity that does not burden the listener with new, intense material. The material creates a space where very little musical data is
introduced, leaving little to be memorized. This material alone has the energy to unfold over an infinite amount of time because it presents no determination for a consequential arrival or pause. It creates a texture that can unravel by its own existing process. Hopefully this explanation clarifies the meaning of the work by uncovering its techniques. This is our goal; to identify what we understand as the processes heard relative to the transparency of the compositional process.
ASSOCIATION – THE STRUCTURING PROCESS

It is important to stress the difference between the compositional structure and the audible structure. This process does not refer to the scheme that a composer would follow resulting in an electroacoustic composition. Instead this has to do with the listening experience of an individual and how that listener understands and re-synthesizes in his/her own mind the structure of a piece. Hopefully this has much to say about the way any given, willing and well conditioned listener will group the aural information as it is made available during a piece.

Although association is mentioned last, this is the first step that the listener would take when exposed to an electroacoustic performance. Here, the strongest impressions are made unfolding over time. These will also be related to other strong impressions during the course of the musical piece. At this stage one observes prominent characters, characteristics and their relationships at a hierarchical level that depends on the density of information. While the piece might be performed over and over again with each performance as accurate as the previous, the density of the piece will change in the listeners mind due to repeated listening. During each performance there will be new impressions noted and these will be related to those first impressions to make a deeper understanding of a work. Such is the case with the example by Jonathan Harvey in which the forty-second gesture initially sounds whole and fluid. However, successive auditions reveal that there are smaller components within the total idea or phrase.

What we would like to find in a relationship between objects is the consequence that one has over another. By establishing consequential relationships we further explain in our minds the cause for an occurrence as something that was provoked by a
previous instance and presents certain resultant characteristics and potentials. At this level, and for the purpose of analysis, I will describe strong accents over a time line as markers only. These markers will represent the beginnings of sequences or sections that remain distinguishable from a proceeding one, defining the overall structure. During the initial listenings, markers might change as we clarify our understanding of the transitions. As the piece unravels the structures become more obvious. A marker will label sections composed of gestures whose characters outline the scope of a section. A gesture will be described by its envelope’s attack, continuation and termination. These concepts, discussed previously, help clarify the type of sound shape a gesture can take as it operates at different levels and groupings.

In composition, once a sound (motive, gesture) has occurred it is reasonable to expect that a second one should follow. This musical practice is what initiates meaning in a composition. Dick Raaijmakers explains: “Placing one single [sound] point is not enough for expressing something. [the] character is determined by the way in which this juxtaposition, or counterbalance comes about.” An initial musical gesture is typically followed by a consequential answer, the ‘second point’, and from this correspondence we begin to deduce the various levels of structure as more points, and gestures are made obvious.

Texture is the material that is not heard as individual points, but rather points that are associated with a less dynamic subject. This material operates at lower perceptive levels. The concept of ‘texture’ contrasts that of points and gestures in that its function is seemingly left to its own closed relationships. What we describe as texture is

10 Dick Raaijmakers, Cahier M. (Leuven: Leuven University Press, 2000),
something that has its own internal mechanism and can continue behaving by its own rules. The actions of gesture and texture can achieve different levels of intimacy, expressing extreme contrast or deep interaction and every degree of possibility in between. These devices are the building blocks by which a section may be defined as unique relative to a subsequent or preceding section. Considering the three previous musical examples one can see how differently the gesture and the texture operate toward the founding of a section and its impact on surrounding materials. Each section should then be seen over the full scope to point out recurring blocks and evaluate whether they function as a repetition or a variation. Once this is clear the flow of energy shows its directional properties, which are all impacted and decided by the strength of musical memory.

What we expect to see is not a validity of assumptions since these have no part in the analysis. Instead, we should make our measurements and let the underlying foundations of a work rise to the surface of our analysis. Out of this process the explanation for a work’s unique sub-conscious order and balance should arise. From these deductions we will better understand the greatness or weakness of a piece in terms of architectural perception. “If a man hacking in fury at a block of wood make there an image of a cow, is that image a work of art? If not, why not?”11

There is no question about the importance of being able to uncover structural meaning from an electroacoustic work. The proposal for a method to break down music using strictly aural capabilities is directly influenced by the absence of a score of events

11 Joyce, 214.
but it can only be seen as remarkable faith for it is not the availability of a score that is missing but the honest evaluation of the heard music.
ANALYSIS OF JONTY HARRISON’S “PAIR/IMPAIR”

In the proposal for an aural based analysis the work’s perceptible structure, rather than its compositional structure, will remain the object of our preoccupation. By taking into account only the recorded material as the source of information we can extract the key mechanisms active in the music as they are heard. The identification of objects as they appear through frequency, amplitude and time as well as their transformations or consequential relationships during the course of the electroacoustic work provide the crucial data for consideration. Our aural based analysis will intentionally ignore the composer’s compositional scheme in case they do not correlate with our understanding of the work. We are concerned with the reality of perception in its levels of consciousness as it applies reason to the whole of the work.

In Jonty Harrison’s *Pair/Impair*\(^{12}\), we find the challenge of understanding a musical work that has no traditional melodic or harmonic processes present. Instead, its character is derived from what we have called gestural objects. Initial listenings reveal the presence of these objects and their tendencies to appear within particular spots in the piece. Furthermore, their dynamic contrasts change with incredible spontaneity. These components become our initial clues that point to subdivisions of the entire work.

The First Listening

We must start by marking the most general and broad cues in the piece. This will provide an initial framework that may be singled out as the preliminary overall structure. The strongest indicators of sectional divisions occur in this piece at 5’35” and

\(^{12}\) Jonty Harrison, *Pair / Impair*, IMED 9627, CD
at 7'45". These indicators are singular as a result of the obvious contrast in density and the differences in sound types that transpire at these moments. This is reinforced by cadential\textsuperscript{13} treatment of the sound material to emphasize this contrast and guide the listeners’ expectations.

The sectional division at 5'35" provides a strong impulse for the piece. The activity that occurs at this point, which is understood as a return to material from the beginning of the piece, arrives abruptly with no foreshadowing leading up to its arrival. The absence of any indication of an upcoming event results in the absence of any transition, creating a dramatic surprise strengthened by the return of material that resides in the musical memory of the listener. The sharp contrast in density is also crucial to this effect. The musical information prior to 5'35" exhibited relatively low amounts of information and is underlined by a long wave of slow periodicity. This low energy periodic section is based on material that exhibited faint overlapping decays.

The information that arrives at this point is striking in a manner analogous to the opening. However, it is not new material despite the contrast it provides. The previous patterns vanish at the onset of the new material’s attack, which continues by sharply opposing the periodic past with an unpredictable behavior, high energy momentum and a more focused region in the spectrum.

The section in between 5'35" and 7'45" develops as a condensed version of the first half of the piece. Within this two-minute section there is a strong musical statement that then decays for half the length of the section. This section resembles the first half to the extent that it even resorts to the use of a long decaying periodic gesture for its

\textsuperscript{13} In this case cadential refers not to harmonic progressions but to other methods for creating an ending gesture such as silence after a long activity.
second half. However, this time it is finally allowed to reach a complete silence at the end. This cue demarcates the end of the section at 7’45”. At this point in the piece we reach the end of the inclusion of new material. Almost all of the gestures presented after this point have already appeared elsewhere and amount to a reflective period. The flow of energy is controlled by a descending gesture composed of what seems to be an array of streaming oscillators that lasts for almost the entire final four minutes. Over this texture, sporadic bits and pieces of the work make their appearances. However, these statements do not exhibit the same force, drive or energy that they maintained in previous sections. The plan is prototypical for an ending since all materials flow towards the lower end of the spectrum. Although the section is not periodic, it presents a smooth and constant texture whose demise is predictable to a degree.

A sectional demarcation at 2’44” is also apparent. However, at this moment it is more difficult to define what specific materials constitute this formal division. Unlike the other moments where there was an abrupt or obvious termination of an unraveling mechanism, the dynamic energy with which the piece starts shows no sign of termination until there is a burst at 2’44” that decays into a different section. Since the opening material had hinted at long decays, it takes time to notice that there is a formal change at this spot. The decay must evolve before we realize that another section has commenced and that the sharp, abrupt gestures are not returning. The marker was then obvious only after we no longer expect to hear the opening material again. This transition marks a change in density as well as the establishment of regularity for the
first time. As a result, stability becomes apparent, enabling the listener to evaluate the material presented prior to this time.

It can be said then that there are four distinguishable sections in this work (0'00", 2'44", 5'35" and 7'45"). In each of these sections, the material is unfolding in accordance with its own character. Each of these sections express individual conclusions and create unity within the work by maintaining relationships throughout the piece, repeating material and providing contrast.

Activity

Activity can be defined as the density of information at a given moment in a composition and is described by the level of predictability or non predictability of occurrences. The activity within a section is what we as listeners intuit as time points, which we measure, giving us an understanding of the amount of musical time that has passed. The regularity or irregularity of a section can severely distort our sense of the passage of chronometric time. Playing with this sense of time, the composer often constructs a meaningful way to balance the proportions of the piece to generate the flow of a perceptible structure.

By density of activity I am also referring to the dispersal of material over the vertical spectrum of perceptible frequencies relative to the horizontal passage of musical time. Characteristics of gestures can be made distinguishable when layered over each other depending on their spectral regions.

The material that opens Harrison’s Pair/Impair begins with intense energy and becomes known throughout the work as the dominant character. We perceive it as something that has a general characteristic that we recognize every time it occurs even
if each instance is a variation and no exact replication is ever asserted. From this, one infers that there is an average predictability to these rapidly changing objects. What we hear throughout the opening section is a noisy sharp attack with prominent low frequencies below 1000 Hz that releases quickly with a rising pitch. This results in a sound that resembles a drop landing in water and can be synthesized readily. From this initial gesture, most of the subsequent instances can be derived from or found as part of another longer gesture that enables us to group them together as a singular idea. We find this characteristic attack alone as a single gesture or as the initial attack of a longer, more complex gesture such as the one found at 07”. At 00”, the noisy low heavy onset of the drop initiates an attack is followed by sustained midlevel noise that concludes with the drop gesture. This type of sequence is found throughout the opening section of the piece, helping to identify the drop gesture as predominant and creating consistency that defines the sectional boundaries.

Among the other sound objects that have significance in the piece are those that follow periodic schemes and hold sections together by providing consistency in rhythmic and spectral content. These sounds provide great contrast to the drop gesture.

The most prominent rhythmic figure is also one of the least implemented sound textures that only lasts about 25” with each occurrence. This sound event appears first as part of the beginning of section 2 (2'49”) and then again at the start of section 4 (8’03”). In both instances this figure provides a steady impulse that generates stability. This sound type can be described as a fast enveloped rising cluster of metal formants followed by a similar descending gesture. These two fall in a rhythmic pattern best described as 8th notes in a tempo of quarter = 45 bps. Each beat has a spectral
content similar to that heard in metallic scraping sounds in which the resonating scheme of partials rises in frequency and then descends.

Another significant rhythmic pulse is prevalent in the very slow-paced texture that dominates and maintains the flow of the 2nd section. This is a very low and murky sound whose spectrum is stronger in the low frequencies around 200 Hz. Although this texture’s dynamic energy is moderate, it remains prominent as a result of the relatively low density of the surrounding material. Regarding the rhythmic pulsation it creates, it maintains approximately 10 second intervals between occurrences. The pattern is skewed a bit towards the end of the section but it still is not enough to predict the sudden return of the opening material.

The Sections

As mentioned previously, four sections are designated as globally perceptible in the scheme of the work. What we have provided so far is a description of the sound types as they have been made obvious to us through listening, which are distinct enough to render the four parts distinguishable.

The first section (0’00” – 2’45”) holds together as an idea despite the sporadic and very unpredictable attacks. Looking further into the manner in which the material develops one can see that with each attack there are several ways in which the envelope will provide or deny a sustain for the attack. The first three gestures provide us with envelopes that explain to some degree the level of unpredictability as their variations are seen throughout the section. Taking the instances at 00”, 07” and 10” we see three gestures whose attacks are nearly identical yet their sustains incorporate different material. The divergent sustaining materials consist of noises with different
spectral dispersion and continuity. We can hear that the first sustain is a descending texture that, when measured, does not ascend above 8000Hz while the second one is shorter and its constituent frequencies are all primarily above 8000Hz. One could speculate that one is a sped up transformation of the other given basic knowledge of analogue studio techniques. Upon further inspection of the section, it becomes clear that this type of gesture is predominant and has dramatic effect upon the other material. Seen as a variation, one can point out that each instance is recurring on average every ten seconds after the 45” mark.

The opening subsection differentiates itself from the material that follows 45” since new material is introduced after this point. This new material is similar to the onset of the drop effect but reserves itself to a very simple envelope (2 milliseconds long with quick repetitions.) The fast envelopes occur only in between the attacks of the opening gesture and always maintain the same structural envelope. As mentioned previously, these introductory gestures have an average periodicity and all other materials stop while they are initiated. The material between these attacks is so active that it distorts the perception of rhythm created by the opening materials throughout this section. There are a total of 13 gestures in this section including the 3 in the first 45”. This knowledge provides a more comprehensive understanding of the way this section creates momentum through a very focused amount of material.

0’00”----------------0’45”-----------------------------------------------------------2’45”
00”          07” 10”

Figure 4  Section 1.
The third section (5’38” – 7’45”) is the most important section of the work as it starts making larger scale relations. This is due in part to its obvious relationship to the opening section. These two sections are related by similarity of material and procedural tendencies and its implementation of sequential materials. On the first listening one does not readily perceive any difference between the two sections and they are generally understood as repetitions of the same material. However, it is important to notice that the complex opening gesture from section 1 is not present in this third section. Instead, the memorable fast envelopes are reinterpreted in the third section, helping make a strong correlation with the first section. This texture develops until the last attack releases at 6’30” into a slowly decaying gesture that is reminiscent of the transition between sections 1 and 2. This event transfers the continuity of the section into something very different but no longer surprising. The material heard in this section comes entirely from the first two sections and it is possible to say that this section is a summary of the first half of the piece since it presents the same exact flow of energy. This section presents the same, though temporally compressed, shape in 2.5 minutes that the first section did in 5.5 minutes with one major difference. This second statement also contains the full completion of the decaying envelope. This section, unlike the first, reaches a full silence at 7’45” before any new development takes place.

\[
\begin{array}{c}
\leftarrow 52” \rightarrow \\
5’38” \longrightarrow 6’30” \longrightarrow 7’57”
\end{array}
\]

reflective of section 1 \hspace{1cm} reflective of section 2

Figure 5 Section 3.
The listener is exposed up to this point to a geometrical form as the work is obviously divided into two almost equal halves where the second half returns with all the material of the first half albeit with different proportions. The listener who is attempting to cope with sound objects as musical agents is given much to grasp from this scheme because it provides repetition, and through repetition we can begin to understand formal relationships.

In sections 1 and 3 the predominant material is unstable due to the consistent presenting of unpredictable materials. In the second section (2’44” – 5’38”), an opposite mechanism predominates. This section is related to contemplation of the materials past and present. Here the listener is presented with a dramatically less dense section that has sparse amounts of data. The extent of this effect is reinforced by the use of periodic rhythms that have relatively minimal spectral complexity. As I described previously, there are two types of periodic events in the piece and both overlap each other in this section. Starting at 2’49” and lasting roughly 25 seconds the machinelike eighth-note rhythmic pattern fades in and out, creating a sense of stability in contrast to the largely unpredictable character of the first section. Once this stability has been established, an even more predictable pattern emerges in the low areas of the spectrum that repeats itself with little variation for the rest of the section.

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2'44"---------------------------------------------------------------5'38"
|----fast rhythms-----
---------------------------slow rhythms-------------------------|
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Figure 6 Section 2.
The other distinguishable layer, which is composed of material that lies higher in the frequency spectrum, is lower on the hierarchical scale. This layer includes sounds that have no determined periodicity and whose envelopes are faint. It is difficult to determine the beginning of this section since it overlaps with the conclusion of the previous section. At exactly 2’44” there is an attack, which releases into a decaying tail and can be perceived to have been initiated by the burst. It is from this tail that the second section and its rhythmic figure emerges as the result of a dynamic cross-fade of materials. I have nonetheless marked 2’44” as the beginning of the section because it is this releasing, decaying energy that initiates the onset of the new activity and flow.

The fourth section (7’45” – 11’45”) is the most isolated of the sections. It moves toward the ending of the piece by presenting a long unwinding canvas of sound with sporadic reappearances of the sound objects from the previous sections. Characteristically different from all of the other sections, section four is the longest, exercising its function as a reprisal of all the actions experienced and retained in memory while following a direct path descending in frequency, volume and energy. The utilization of traditional closing gestures indicates that the end is near. The surface gestures are heavily masked and lack contrast from the full descent of the noisy texture. This noisy texture consists of a synthetic group of formants that remain constant and are accompanied by short pitches descending on an exponential ramp. Once this texture has reached its demise, a final, weak and repetitive gesture emerges to conclude the piece. The effect again is of contemplation in which the listener is not attacked by any striking material, sudden changes or contrasting gestures. Instead, a drowning reflection of the whole piece unfolds.
Proportions

After illustrating each section’s parameters and their activities, it is possible to draw some conclusions regarding their macroscopic proportions and relationships.

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Figure 7  Proportions of the work.

Sections 1 and 2 span the first half of the composition’s duration and contain the concentration of all sound objects appearing in the work. After this point there is almost no new material or any new original statement. The conclusion of these two sections occurs almost exactly in the middle of the piece. After this point, a reduction of what has just been heard takes place in section three. The length of section 3 is roughly 2 minutes and measures about 1/6 the duration of the whole work. The ending section lasts 4 minutes occupying 1/3 of the total duration. The opening half of the piece was perceived as two sections divided at 2’44” and ending at 5’38” with an approximate length of 2’49” each (2’49” section 1 and 2’54” section 2) corresponding to half of the work.

Conclusions

I chose to analyze this composition because I was interested in examining the fluidity of the work’s form. While there seemed to be a well-distributed order, which I could not grasp without closely looking at the elements available, these proportions were not obvious from the start. This provided me with the opportunity to utilize my
analytical method to clarify what we have not been fully aware of in a piece that exists only in a recorded medium.

Applying these analytical tools to electroacoustic tape music is intended to first clarify the way a sound object, which may not be identifiable, might be described. Second, these tools can also be used to describe the relationships between electronic sounds in an effort to identify the perceived form of the work. Basing an analysis solely on the aural properties of a piece is advantageous in that it encourages us to find a syntax that is useful for acknowledging characteristics of sounds that might not be easily identifiable. However, the ultimate goal for such a descriptive method is to be able to elucidate the relationships between these objects throughout a musical work.


Harvey, Jonathan *Mortuos Plango, Vivos Voco*, ERATO CD 2292-45409-2, CD


Parmegiani, Bernard, *De Natura Sonorum*, INA C3001, INA-GRM, France, CD


