Developing Analysis Criteria Based on Denis Smalley's Timbre Theories

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Abstract

This paper represents part one of a two-part process. The aim in part one is to outline a number of Denis Smalley's theories and to create a framework that could provide the criteria to analyse his musical works. The second part of the process would be to actually analyse the one or more works according to the identified criteria. A substantial part of the current paper is an attempt to summarise and make comment on a Smalley article. Having identified the key concepts, the paper establishes relationships between the concepts and proposes a methodology for analysis.

Keywords

Denis Smalley, timbre, electroacoustic music, analysis.

1 Introduction

Denis Smalley has written and composed extensively within the field of electroacoustic music. In his writings he has developed new concepts and theories to describe acousmatic music. Probably the best known concept is his spectromorphology - the temporal unfolding and shaping of sound spectra (Smalley 1986).

This paper represents part one of a two-part process. The aim in part one is to outline a number of Smalley's theories and to create a framework that could provide the criteria to analyse his musical works. The second part of the process would be to actually analyse the one or more works according to the identified criteria.

Rather than survey all of Smalley's written works, this paper concentrates on one of his seminal articles called *Defining Timbre – Refining Timbre* (Smalley 1994). A substantial part of the current paper is an attempt to summarise and make comment on the Smalley article. It is also an attempt to demystify many of Smalley's concepts since they are shrouded in, sometimes difficult, terminology which is much of his own invention. Although the jargon is difficult, it does offer the possibility of facilitating a certain dialogue concerning some very hard-to-grasp electroacoustic music concepts. Having identified Smalley's salient theoretic concepts, the paper aims to codify the relationships between the concepts in a way that may prove useful in analysing Smalley's music.

The processes of identifying entities and establishing functional relationships are just as relevant to musical analysis as they are to musical theoretic concepts, as we shall see in the paper below.

We begin with a precautionary note. Organising timbre can be a primary driving force in electroacoustic music, but timbre has had an infamous reputation for being very ephemeral. Smalley begins his article with the following caution:

> (Timbre) is one of those subjects where the more you read and the more you have hands on compositional experience the more you know, but in the process you become less able to grasp its essence. (Smalley 1994:35)

2 Defining Timbre

The difficulties in defining timbre are even highlighted by the contradictions in naming timbre. While the French term *timbre* identifies the object that actually creates the sound, the German term *klangfarben*, or sound colour, is more abstract and detaches the sound from any source.

Like Grey(1975), Erickson(1975) highlights the multi-dimensional nature of timbre, and its subjective and objective variations. He talks of the subjective constancy of timbre and its use as a carrier of other musical information (e.g. melody) and of timbres as objects. These come together in *Klangfarbenmelodie* as contrast and continuity.

Denis Smalley presents four definitions from four different perspectives:

The American National Standards Institute:

> ...that attribute of auditory sensation in terms of which a listener can judge that two sounds similarly presented and having the same loudness and pitch are dissimilar. (Smalley 1994:36)

The instrumental composer:

> timbre is an extension of harmony, or vice versa. The composer uses spectral analysis as a basis for conceptualising the

relationship between pitch and sound qualities, and attempts to negotiate fluent border crossings between the two. (Smalley 1994:36)

The researcher:

> Through research and through electroacoustic compositional experience we have become very aware of the multiple variables which determine timbral identity. And we have also become concerned to differentiate what is acoustically present in sounds from what is psychoacoustically pertinent.

Everyone:

> The everyday language of qualitative description is accessible to everyone. It is closely allied to the "matter" of sound. Terms like bright/dull, compact/spread, hollow, dense... (Smalley 1994:36)

3 Smalley's Theories of Timbral Organisation

3.1 Timbre and Source

Smalley highlights the importance of the sound source when discussing timbre. He provides a preliminary definition, adapted from Michel Chion, that takes the sound source into account:

> Timbre is a general, sonic physiognomy through which we identify sounds as emanating from a source, whether the source be actual, inferred or imagined. (Smalley 1994:36)

Smalley defines the term *source bonding* to encapsulate:

> the natural tendency to relate sounds to supposed sources and causes, and to relate sounds to each other because they appear to have shared or associated origins. (Smalley 1994:37)

Smalley then acknowledges the socio-cultural contribution the listener makes in the "adventure of bonding play" when listening to electroacoustic music, which he regards as a perceptual activity.

Smalley explains that source bonding is extrinsic in that it refers to **sounding** experiences outside the work itself. He then defines the *extrinsic matrix* which, in addition to external sounding experiences, includes links to a wide range of real and imagined **non-sounding** phenomena too. (Smalley 1994:37)

Smalley doesn't expand on the notion. Instead he turns to the notion that timbre is concerned with the temporal unfolding and shaping of sound spectra or *spectromorphology*. Motion, growth and energy are associated with spectormorphology and therefore have a sonic reality but they also can be interpreted metaphorically and symbolically.

We can see that in addition to the physical unfolding of the temporal shape of the sound (amplitude, spectrum) Smalley has added the listener, metaphor, symbology, and perceived source. This quite complex combination Smalley attempts to define in an abstract and succinct way. His definition of timbre has become:

> a general, sonic physiognomy whose spectromorphological ensemble permits the attribution of an identity. (Smalley 1994:38)

3.2 Source-cause Texture

In a section called "source-cause texture", Smalley invents a lot of his own jargon which can be difficult to interpret. It is worth persisting, however, as many of his ideas strike at the heart of the function of timbre in electroacoustic music.

He begins this section by looking at the identity of instruments, exposed through our experience of what he calls *source-cause levels*.

Imminent level - the ongoing, intrinsic musical context where we encounter the instrument (eg. the violin). Associated with the imminent level is *registration* - the articulation of note objects and their chaining in phrases over a continuum of registers.

Cumulative level - which includes our previous experiences of violin sources in the hands of other violinist-causes who articulate the same music and other genres and styles.

Extended level - extends the source-cause base to include the immediate family of stringed sources. (eg. viola, 'cello, double bass)

Dispersed level - spreads over the widest possible range of source-causes to include all bowed and plucked (string) instruments and the (string) instruments of other cultures.

The four levels together he calls *source-cause texture*.

We may accept this scheme for instrumental music, but how can we apply his notion of source-cause texture to electroacoustic music? Smalley answers by noting that in electroacoustic music we do not find such a definable hierarchical basis for establishing the source-cause aspect of timbral identity.

The discussion then turns to the concrete example of a "water" source-cause. "In a musical work, water, like any sounding source, can exist on both the imminent and cumulative levels." (Smalley 1994:39) That is, the water sounds can function within this musical work and other musical works, but it is much harder to identify families of water sounds or extended families of water sounds (as they function within musical works).

So although the extended and dispersed levels cannot be identified in electroacoustic music, Smalley goes outside the confines of the music.

> ...it can be extended beyond the cumulative level by referring outside the musical works to the extrinsic matrix. (Smalley 1994:39)

That is, to both the sounding and non-sounding inferred phenomena.

> ... the sounding area of the extrinsic matrix can provide a substitute for the extended and dispersed levels of source-cause texture, ... (Smalley 1994:39)

So in our example of water, there are many experiences of water **sounds** beyond the cumulative level, in nature and culture. But what about non-sounding inferences?

> When the non-sounding area (of the extrinsic matrix) is entered we are no-longer on secure common ground because source bonding is no longer operable: we cannot identify real sources and causes. (Smalley 1994:39)

Smalley does, however, go on to highlight the importance of such non-sounding inferences and contends that it is the spectromorphological attributes and ideas that evoke non-sounding substitutes for (instrumental) extended and dispersed levels.

While this seems very ephemeral, it may be the very essence of being for electroacoustic music.

> I believe that such ideas, intangible as they might be, are a means of articulating that necessary, shared, higher-level cultural basis for a music with non-existent source-causes. (Smalley 1994:39)

Smalley begins to expand on the idea that spectromorphological attributes can evoke non-sounding real and imagined phenomena by first considering instrumental gesture.

> ... behind the causality of instrumental gesture lies both a broader experience of the physical gesture and its proprioceptive tensions, and a deeper, psychological experience of gesture. In instrumental music human-bonded source-cause texture *represents* these primal levels of gesture found in the extrinsic matrix. In electroacoustic music where source-cause links are severed, access to any deeper, primal, tensile level is not mediated by source-cause texture. That is what makes such types of acousmatic music difficult for many to grasp. In a certain physical sense there is nothing to grasp - source-cause texture has evaporated. (Smalley 1994:39)

Smalley is desperately searching for a "Something to hold on to factor" (Landy 1994) when considering the most abstract aspects of electroacousticmusic.

Finally he turns to the spectromorphology of the musical work in the search for the identity of timbre.

3.3 Registration

Smalley states that timbral identity in electroacoustic music is heavily reliant on the immediate experience of the work itself and, moreover, the ready identification of the functional elements in the work.

> If timbral identity in electroacoustic music is so heavily reliant on the single imminent level then registration in the work is key. (Smalley 1994:40)

I interpret his concept of registration in music as being the recognition and connection of events or phenomena in the music. While this can be quite systematic in instrumental music, it is problematic in electroacoustic music where there is no consistent low-level note object.

Registration then becomes concerned with variable spectromorphological attributes. Smalley notes that this could become so general we could lose our way, so we need to discriminate the **incidental** from the **functional**, i.e. to perform a functional analysis of electroacoustic music.

We have to decide which spectromorphological attributes matter, and we have to discover this anew in the imminent level of each electroacoustic work. A pair of related variables underpins our attempts at determining identities:

> 1. the coherence and strength of spectromorphological identity;
> 2. the duration needed to establish existence and expose registration. (Smalley 1994:41)

3.4 Existence

There is no standard duration for establishing existence.

> There are certain types of spectromorphology whose existence can only be established after a certain evolution time because the completion or partial completion of a pattern is integral to identity. (Smalley 1994:41)

Continuous transformation can become what Smalley calls a *registration generator*. Change becomes fundamental to existence and we apprehend identity as a consequence of change.

3.5 Coherence

Smalley introduces coherence by stating:

> The notions of existence and registration imply a certain coherence, otherwise identity would not be feasible. (Smalley 1994:41)

To my mind, the process of searching for coherence is the same as the process of creating connections within a work. Smalley, however, considers coherence in a much more subtle way, on both the micro and macro levels. He uses it to establish identity. Along the way he creates the notions of *integration* and *disintegration.*

> Coherence in the case of instruments is usually associated with spectral fusion, which in turn is associated with harmonicity. ...Since fusion is so often closely aligned with harmonicity, and since I find it too rigid a word, I prefer the term "integration". That also allows us to talk of an integration-disintegration continuum. ...Integration means that within a sonic physiognomy the distribution of spectral components in spectral space, and their behaviour over time should not be such that a component or sub-group of components can be perceived as an independent entity. Certainly a fairly high degree of integration is necessary if something called timbral identity is to be established. (Smalley 1994:41-42)

Smalley also highlights the problem of discriminating between integration and disintegration.

> ... but where are the borders between tight fusion, a loose interdependence, and a dissolution towards independence? When is a timbre a timbre and when is it a collection of timbres? When does the physiognomy crack?
> The course of even a relatively short spectromorphology can travel between integration and disintegration. (Smalley 1994:42)

His solution to creating connections between identities in electroacoustic music is to introduce the concept of discourse.

> Playing with integration and disintegration is at the very heart of electroacoustic musical discourse, a discourse which becomes spectromorphology itself once the timbre complex is spilt open, a discourse where the notion of timbre can at one moment perhaps be grasped, but at the next it evaporates. (Smalley 1994:42)

3.6 Discourse Stability and Variability

In electroacoustic music, a timbre may be a discrete object, easily separated from its context or it may be a continuity intertwined with other continuities and not so easily separated. To help identify this phenomenon, Smalley introduces the concept of *timbral level*; which concerns the relationship between two continua.

> 1. *duration*: short-term entity ..... longer term evolution
> 2. *separability*: discrete object ..... continuing context
> ... Timbral level in traditional note-based music is quite simple. The note is the lowest level and is articulated by an instrumental source. Form develops from note articulations. In electroacoustic music continuing contexts resist and deny low-level segmentation. Thus once timbral level ceases to be clearcut we cannot separate timbre and discourse: timbral attributes become woven into the spectromorphological fabric. (Smalley 1994:43)

Now that Smalley has established some bases for determining identity he discusses discourse in more detail. He asserts that discourse is about maintaining and developing some of the established identities.

3.7 Transformational discourse

The first approach to discourse is the *transformational discourse*.

> … where an identity is transformed while retaining significant vestiges of its roots (i.e. an identity-base in the imminent level, or a strong extrinsic identity). To achieve this, certain attributes must remain stable while others vary. (Smalley 1994:43)

He gives some examples of prevalent techniques used for digital transformations:

1. stretching or contracting in time which does not threaten too much the aural, evolutionary integration of spectral components. Compress too much and you destroy identity; stretch too much and you destroy, for example, attack identity.
2. changes in spectral density by thickening, or by spreading in spectral space, which are perceived as addition – a growth process.
3. changes in spectral weighting (e.g. brighter, or emphasizing internal intervallic pitch) without altering the essential content (i.e. frequency spacing) of the spectral envelope.
4. variation in or reshaping of a morphology (for example, the attack impact) in such a way that it does not effect the identity of the continuing body of spectromorphology. This implies that

a. the sound is a strong spectromorphological type well known through extrinsic experience (e.g. a bell, the voice); or
b. that the base-spectromorphology has been previously announced and that if this was some time previously then it was striking

> enough in context for relevant features to be memorable; if the base- spectromorphology is less memorable it would need to be relatively contiguous to the present event.
>
> (Smalley 1994:43-44)

Smalley makes some important points in passing regarding memorability and contiguity.

> It is undoubtedly true that pitch relations and source-causes are the most easily memorable sonic phenomena, and that the problem with multiple spectrological attributes is that we do not know which ones are to be relevant in the discourse. This is why electroacoustic music which avoids pitch phenomena and strong source-cause references will be most frequently concerned with contiguous relationships. … Non-contiguous discourse can only be highly developed within the precise and detailed memorability of culturally imbedded pitch and rhythm systems. (Smalley 1994:44)

The above quotes contain important implications for the analysis of Smalley works, e.g. where pitch, rhythm and strong source-cause references are not used then we should find contiguous relationships and continuous transformations.

3.8 Typological discourse

Smalley's second type of discourse is typological discourse.

> Identities are recognised as sharing timbral qualities but are not regarded as being descendants of the same imminent identity – they do not possess a common identity base. Typological discourse is associative. (Smalley 1994:44)

Smalley invents the term *generic timbres* to describe larger groupings of timbres. He gives two examples of generic timbres: *Noise* and *Inharmonicity*.

To transformational and typological discourses Smalley adds a third type: *source-cause discourse* – concerned with the bonding play of specific or inferred sounding identities.

Compare Smalley' s notion of discourse with Emmerson's mimetic and aural discourse plotted against an abstract and abstracted syntax continuum on his "Language Grid". (Emmerson 1986:24)

3.9 Discourse Summary

Smalley points out that these various discourses are not mutually exclusive, and "tipping the scales either way can be a question of listening choice and listening experience – listening experience is variable and subjective." (Smalley 1994:45) Thus he ends up with six interactive types of electroacoustic discourse. The first three are those mentioned already:

> *Source-cause discourse*
> *Transformational discourse*
> *Typological discourse*

The second three discourses are concerned with relations among identities. They are:

> *Behavioural discourse* – the changing states of identities' cohabitation/conflict and dominance/subordination;
> *Motion discourse* – the relations of types of motion and growth and their directional tendencies;
> *Tensile discourse* – how the previous five discourses together create formal tensions. (Smalley 1994:46)

3.10 The Timbre of Pitch – the Pitch of Timbre

Smalley also writes of the pitch of timbre and the timbre of pitch. This section is a very important and very revealing discussion in regard to Smalley's own works. One always has the vague sense that pitch is important in Smalley's works but its manipulation is not overt and its use is hard to grasp.

He introduces the notion that pitch and timbre can cohabit the same space.

> Once tonality and intervallic pitch are no longer regarded as the predominant carriers of musical messages, pitch and timbre can cohabit in a spectromorphological music where the ear has opportunities for shifting in and out of pitch values. (Smalley 1994:40)

Surprisingly Smalley postulates that: "Pitch is even present when not perceived." (Smalley 1994:40). This statement may provide a telling insight when his own works are examined.

How can this non-perceived pitch operate? Smalley elaborates:

> Perhaps it is resting, hidden deep in a spectromorphology, awaiting possible attention, a moment when, for example, the context might change so that perceptual focus becomes directed towards what was a sleeping attribute. (Smalley 1994:40)

Pitch becomes contextual in electroacoustic music, and:

> Timbre rather than being that part of the sound which is not pitch, encompasses the inherent qualities of the whole sound. Perceived pitch is one of these inherent qualities, but the term "timbre" cannot be expected to shoulder the burden for all others. (Smalley 1994:40)

For the first time Smalley poses the question:

> Under such conditions does not the concept of timbre become so general as to be meaningless? (Smalley 1994:40)

Smalley attempts an answer in his concluding remarks.

3.11 Smalley's Concluding Remarks

In his concluding remarks Smalley rightly confesses that he has not been concerned with the acoustic nature of timbre, nor with its psychoacoustic properties, but with its apprehension, identity and functions in musical contexts from the listener's point of view. Timbre has become the *timbre complex* which has been spilt open to allow its essence to seep through musical discourse.

Smalley seems to provide an answer for Monro's question regarding acousmatic composers' attitude to note-based (pitch-based) composition. (Monro 2000)

> Composing with timbre, composing within timbre, means confronting and enjoying its dissolution. This can only be really pursued in an *acousmatic* electroacoustic music. In contrast, adventurous contemporary instrumental music, and works which mix instruments with acousmatic element, are rooted in the umbilical security of instrumental source-cause coherence and directly apprehended sound-making gesture. This equates not with a burning desire to explore timbre, but with a hesitant reserve about cutting loose in order to pursue a freer exploration. (Smalley 1994:47)

Re-assuring us that traditional modes of working and listening are still valid, Smalley concludes:

> There is no reason why the traditional notion of timbre should fade away. A notion of musical timbre will always exist alongside its dissolved attributes. In keeping with this ambivalence I can summarise this discourse in six words:
>
> Timbre is dead. Long live timbre.
>
> (Smalley 1994:47)

4 Developing an Analytical Framework for the Music of Denis Smalley

4.1 Identifying the theoretic concepts

First of all let us examine the important Smalley Concepts, and then we will go on to attempt to establish relationships between the concepts.

Source Bonding

Sounding experiences outside the work.

Extrinsic Matrix

Both sounding experiences and non-sounding phenomena (real and imagined).

Spectromorphology

The temporal unfolding and shaping of sound spectra.

Definition of Timbre

A general, sonic physiognomy whose spectromorphological ensemble permits the attribution of an identity.

Source-Cause Levels (Instrumental)

Imminent level - the ongoing, intrinsic musical context where we encounter the instrument (eg. the violin). Associated with the imminent level is *registration* - the articulation of note objects and their chaining in phrases over a continuum of registers.

Cumulative level - our previous experiences of violin source-causes for the same music and other genres and styles.

Extended level - extends the source-cause base to include the immediate family of stringed sources. (eg. viola, ' cello, double bass)

Dispersed level - spreads over the widest possible range of source-causes to include all bowed and plucked string instruments for all cultures.

Source-Cause Texture

All levels combined to contain the total long-term experience of imminent registrations, in many musics, across space and time.

Source-Cause Levels (Electroacoustic Music)

Imminent and Cumulative levels – as for instrumental source-causes. (For electroacoustic music *registration* - see below.)

Extended and Dispersed levels – much more difficult to identify in electroacoustic music. The sounding area of the extrinsic matrix can provide a substitute for the extended and dispersed levels of source-cause texture (source bonding).

The non-sounding area of the extrinsic matrix is more problematic as source bonding does not apply. However non-sounding experiences and phenomena are evoked, so how is this accomplished? Smalley contends it is through spectromorpholocial attributes operating in a similar manner to instrumental gesture.

Registration (Electroacoustic Music)

Is concerned with variable spectromorpholocial attributes. I interpret his concept of registration in music as being the recognition and connection of events or phenomena in the music. Smalley says we must discriminate the incidental from the functional.

Establishing Identities (Recognition)

Existence

Duration of the phenomena may vary. Continuous transformation can become what Smalley calls a *registration generator*. Change becomes fundamental to existence and we apprehend identity as a consequence of change.

The notion of existence must be examined in combination with coherence.

Coherence

Coherence is associated with the integration-disintegration continuum.

Integration means that within a sonic physiognomy the distribution of spectral components and their behaviour over time should not be such that a sub-group of components can be perceived as an independent entity. A high degree of integration is required for timbral identity.

The distinction between coherence, with its integration-disintegration continuum, and timbral level is not clear by Smalley.

Timbral Level

Concerns the relationship between *duration* (short-term entity to longer term evolution) and *separability* (discrete object to continuing context). It would appear to concern the degree to which one can unravel an entity from its context. *Timbral Level* overlaps with *discourse*.

Discourse

Transformational Discourse

An identity is transformed while retaining significant vestiges of its roots.

It is important to note that electroacoustic music which avoids pitch phenomena and strong source-cause references will be most frequently concerned with contiguous relationships. Non-contiguous discourse can only be highly developed within the precise and detailed memorability of culturally imbedded pitch and rhythm systems.

Typological Discourse

Identities are recognised as sharing timbral qualities but are not regarded as being descendants of the same imminent identity – they do not possess a common identity base. Typological discourse is associative. Smalley invents the term *generic timbres* to describe larger groupings of timbres, e.g. noise, inharmonicity.

Source-Cause Discourse

Is concerned with the bonding play of specific or inferred sounding identities.

The relationship between Smalley's source-cause discourse and the non-sounding area of the extrinsic matrix is not clear. It would appear there is no relationship. In fact the relationship is between the non-sounding extrinsic matrix and some parts of the registration process. A 'something to hold on to factor' is required here!

Relationships between identities is defined by another three discourses.

Behavioural Discourse

The changing states of identities' cohabitation/conflict and dominance/subordination;

Motion Discourse

The relations of types of motion and growth and their directional tendencies;

Tensile Discourse

How the previous five discourses together create formal tensions.

4.2 Establishing Relationships Between the Concepts

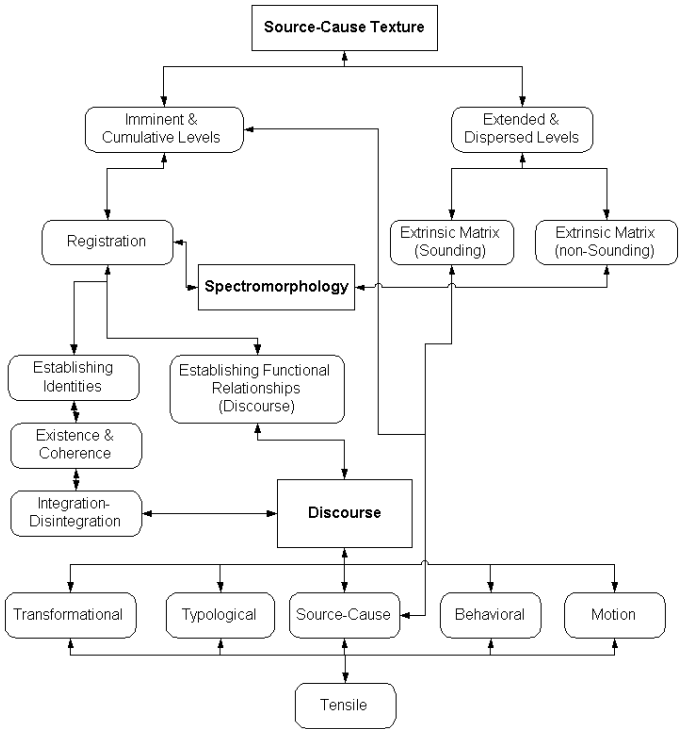

Figure 1 Concept map showing Smalley's concepts and the relationships between them. The connectors show arrows at each end denoting there is some sort of relationship but without saying what type of relationship. All the relationships are quite tenuous, and some overlap. The most tenuous relationship is between the non-sounding area of the extrinsic matrix and the registration process (via spectromorphology).

5 Developing an Analysis Methodology

We have reached a point where we can develop a protocol for the analysis of Smalley's music based on his own theoretical constructs.

An inside-out approach would look at the detailed unfolding of the moment-to-moment details of the music itself, and could begin by examining the imminent/cumulative levels via the registration of spectromorphologies. The steps may involve: Establishing the identities by looking at coherence, integration and disintegration; Establishing functional relationships between the identities; Identifying transformational, typological, and source-cause discourses; Identifying behavioral and motion discourses; Discussing the tensile ebb and flow.

An examination of the extended and dispersed levels would reveal more of the extrinsic nature of the work. The process would involve connecting the internal sound world of the work to external sonic manifestations and to the more ephemeral, non-sounding, conceptual implications.

The form of reporting this analytical work would then constitute a part of a future study.

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