

## SOUND, PATTERN, AND STRUCTURE: NOVEL METHODS FOR ANALYSING MUSIC-AS-HEARD

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### Introduction

Honored colleagues, dear students,

Last year I received a letter from UNIRIO that my work with musical analysis has been found to be of interest and relevance to graduate students at your University. Having worked for a few decades within a pioneering field of musical analyses where little so far has been done, I accepted the invitation with joy. So I am happy to be present with you here at *II SIMPOM – Simpósio Brasileiro de Pós-Graduandos em Música*. It seemed clear from the text that some of you already know my published papers and had availed yourself of the methods. I will therefore not spend time and attention to present my methods in detail. I will rather present some reflections on aural analysis as a method in the first half of the lecture, and then go into questions of composition and aesthetics for the second half.

I am myself a composer, and professor of composition, and the work I did on analysis was of course motivated by questions that I stumbled across while fining my way as a composer. The venerable tradition of Western Classical Music, which to me defined the role of a composer and which is the culture to which I basically belong as a musician, is somehow in the process of losing ground. The dodecaphonic music was the swan song of the great Western Musical Tradition; with it the connection between composers and their audience, broke. During the last 70 years, moreover, a number of composers have been engaged in making music simply with sound events – avoiding the use of intervals. For this approach there existed no notation since the old musical notation only represents *intervals*, i.e. qualified differences between sounds, not the sounds themselves. Pop music and jazz – the Afro-American traditions – entered the stage and took a predominant role, supported by mass media and commercial interests. Moreover, ethno music with its extensions into ‘fusion’ entered the scene, thanks to modern recording techniques.

For those of us who have our cultural roots in serious music (which encompasses both classical music and avant-garde music), the altered situation for music and culture brings up a number of foundational questions about the role of serious music, and its passage into the future. I personally have chosen to stick with the serious music, despite the limited possibilities for anything like a major professional career. I made this choice because I am interested most of all in existential questions, in spirituality, in philosophy and in rational

investigation of reality. As composer I wanted to maintain a number of the values that I found in serious music without copying the great classical masters. But I soon realized that the avant-garde music of the day suffered from a catastrophic lack of ability to communicate with audiences of music interested listeners, i.e. audiences that were not particularly interested in the avant-garde. While a score may be organized in a rational way, such organization is no guarantee that what the listener hears in a concert is perceived as a rational or logical discourse. So I concluded that what contemporary music needed was a strengthened focus on the rationality of the ear. I wanted to combine materials from avant-garde or experimental music with the organic forms of the great classical music. I started a quest for aural rationality – a process that necessitated a blind-folded search for musical gestalts in music heard in real-time. Thus my search- after a while research – went into the exploration of the aural mind, the aural consciousness with its correlates in the world of sound and of music-as-heard. Since the seventies I – together with colleagues and students, developed of a number of inroads into the analysis of music-as-heard. We worked out the analysis using some (post-) structural models. One of our models of theory formations was Claude Levi-Strauss – the anthropologist who took music as inspiration for his structuralist approach to the study of myths. However, the research that really gave us the key for our approach was Pierre Schaeffer, the father of *Musique Concrète*, and author of *Traité des objets musicaux*. Our research must be seen as a continuation of his work; I venture to say that my book, that I hope to publish next year, with the title of *Emergent Musical Forms. Aural Explorations* answers to a number of the questions that Schaeffer deliberately left open. We developed methods to analyze spectromorphology, as well as methods for form-building features, such as Time-fields (consecutive segmentation), Layers (synchronous strands), Dynamic Forms, and Form-building Transformations.

Schaeffer's theoretical work did – amongst other subjects – focus on the systematization of sound qualities. One technological condition made this research possible: the recording technology. It enabled a listener to hear exactly the same physical acoustic object over and over again. The listener discovered that the sound changed after several repetitions, and he could verify objectively that the acoustical sound had not changed at all. Having eliminated a physical cause, the only cause that remained, had to be sought after in the listener's own act of listening. Schaeffer unraveled the fact that listening is founded in listening intentions, and that different listening intentions constitutes different perceptual objects in the listener's mind. The sound-object that Schaeffer ended up postulating, is a sound heard with a specific intention: namely the intention to *hear sound as sound*. Actually

this requires an adjustment of natural listening intentions; we do not normally hear sounds as sound, but as something else. When you hear my words, e.g. you listen to the meaning of the words, and forget the sound impression very quickly. And when you hear my voice, you may infer something about the source of the sound, which is also not the sound itself.

The study of the intentionalities of the human consciousness and its relationship to the world through perception, language, and thought was dealt with in detail by Edmund Husserl, the founder of Phenomenology; and Schaeffer at a point recognizes this common engagement.

So what I am proposing to you is a new theory of music complete with a number of analytical methods, whose meta-theories can be rooted in structuralism (and its prolongation into structural semantics) and phenomenology (with its extensions into hermeneutics). This theory diverges significantly from traditional musicology in a number of ways. I do not declare traditional musicology as obsolete, but what I offer is a consistent method that gives access to a number of phenomena that could not be treated before, without being at variance with basic methodological dogmas of scientific objectivity. I think I can say now, that an alternative to the traditional musicological approaches does exist, one that has got a consistent and scientifically grounded theory. The new approach, which I called *Aural Sonology* (*Aural* to distinguish it from normal sonology which is more technologically focused) brings us much closer to the heart of music as a phenomenon that unfolds in time and sound than what methods that based themselves on the use of a score, would do. We get much closer to the reality of the musician, the interpreter, the composer, the sound designer in the modern electro acoustic studio. We have a method that can be used for a number of different music styles and aesthetics. With the use of the system goes a training of our conscious faculties as well, a training that increases the powers of *audiation*. With audiation I intend the precise imagination of sound in time; thus a hearing which is a hearing by the inner ear, not by the outer ear. Rehearsing the faculty of audition is of great use to composers, conductors and interpreters. In sum I would say that we developed a discipline of musical studies that have a potential both for scientific studies and theses, and for applied, artistic development.

I have soon spent 40 years developing this method. An integral publication is going to appear very soon. I hope that those of you who find the approach useful and enriching will write me, and stay in touch, since a network is needed for this approach to be known and generally accepted. It will certainly meet resistance, but I have also registered that there is a big need for a method like this. I hope this publication, then, will be a beginning, not the end. And as you go on to use it you will of course come across constraints and challenges that you

hopefully will seek to overcome in a creative way, using our methods as spring board, not as enclosing walls and limiting dogma.

After this introduction – which gives an overall vision of the theoretical work I have been doing, I would like to open a few points already mentioned for a closer scrutiny.

### Listening Intentions

Schaeffer listed four basic intentions, and to these he adds the reductive listening.

Abstract	Concrete	
IV. Comprehension oriented listening	I. Indexical listening	Objective
III. Selective listening	II. Unfocused listening	Subjective

**Tabela 1.**

[In the following music example the composer lets us wander through a number of listening intentions, and his means are first of all repetitions, then blurring which appears through successive phase shifts: → *Come out to show them*. Steve Reich]

When the first sentence occurs, we listen – all of us who know English anyway – to what the speaker says: This is a *comprehension oriented* listening intention. But we may also notice sonic qualities in the voice and the pronunciation that would give us indications as to where the man is from, and what social stratum he is from. In this respect, the quotation invites an *indexical listening intention*: listening for the source, inferring the causal background of the sound. We may also notice the nature of the recording itself, such as its background noise e.g., and then practice a particular listening intention that Schaeffer groups under indexical listening, namely an *écoute musicienne*, i.e. professional listening, often practiced by sound technicians.

However, as the sentence is repeated, and since the linguistic meaning of the sentence is absorbed quickly, we start to become aware of the sound qualities of the voice, the language. Spontaneously, then, the focus shifts into *reductive listening*, i.e. the listening that is necessary in order to unravel the sound-object. The piece does with us, what probably tape loops – or before the tape, the closed tracks on a recording plate – *sillon fermé* – did to Schaeffer; the sound changes with repetition. Of course, in Reich's piece the sound does not remain absolutely static; it changes slowly. As the piece proceeds, we now begin to hear relationships between the sounds, particularly rhythmic patterns, with a certain periodic pulse.

In this moment, the listening intention is again changed: from reductive listening, to *taxonomic listening*. The appreciation of relationships between sound objects, rather than the sounds themselves, is characteristic of the listening to articulation level two: i.e. that of orderly or structural relationships between sound-events. If we consider the relationships between structured chunks of sound, we are in fact observing form-building relationships; we employ another aspect of taxonomic listening intention to uncover the form-building relationships.

## Gestalt and Structure

Structure has long been the key word in analysis of musical works. A traditional, musicological definition of structure would read:

Musical analysis is the resolution of a musical structure into relatively simpler constituent elements, and the investigation of the functions of those elements within that structure. In such a process the 'structure' may be part of a work, a work in its entirety, a group or even a repertory of works, in a written or oral tradition... (BENT with DRABKIN, 1998: 1).

The definition does conveniently avoid situating the concept in concrete reality: Do we speak of the structures that generate the music, or the structure of what we hear? Or a structure of order imposed on music, like we do when we analyze pitches with Forte's Pitch Sets or Schenker's system of harmonic analysis? Molino's semiotic tripartition is a useful help in situation the analysis properly; however, I would propose to extend it:

**Tabela 2.**

Esthetic domain		Poietic domain	
<i>Hermeneutical side of the esthetic domain:</i>	<i>Neutral side of the esthetic domain:</i>	<i>Neutral side of the poietic domain:</i>	<i>Hermeneutical side of the poietic domain:</i>
'Immaterial aspects' of the listening experience (e.g. feelings, associations, related world views) as constituted through different reception behaviours.	'Material aspects' of the listening experience as supported by phonograms: sound heard as sound, music heard as sound- patterns	'material aspects' of the creation of a piece of music as documented by material traces (sketches, computer programs, performers' annotations) as well as interviews etc.	'Immaterial aspects' of the production aspect of music (interpretations of composers' or performers' intentions, feelings, ideas, world views etc.)
(Identification of hidden meaning)	(Identification of manifest features)	(Identification of manifest features)	(Identification of hidden meaning)
<b>Speculative theory based on observable, material aspects or traits of music (scores and phonograms)</b>			
<b>Neutral domain</b>			

As you may see, we have extended the *neutral domain* into occupying a region of the *poiëtic domain* (that of music making and production) and of the *esthesis domain* (that of music listening and appreciation). The neutral domain is that one which has the characteristic of being the observable, ‘material’ aspects of music. For an analysis to be meaningfully made and have a scientific relevance we need to anchor it in a material representation of the piece. For our approach it is the phonogram: the fixation of sound in time on any medium that provides the neutral domain.

Where can we situate our analysis of *music-as-heard*? We are making certainly making an esthetic analysis. Moreover, since we base the analysis on a temporally stable support, that of the phonogram, we will situate it in the neutral side of the esthetic domain.

Having situated our research precisely, there are still questions to be asked concerning the meaning of the term ‘structure’, now used in the esthetic domain. Can we state objectively that a certain piece has got a particular structure having listened to it with taxonomic listener intention? Does the ‘structure’ belong to the music or to the listener? Is it justified to use the term about the music as such? To resolve the question we introduce a distinction made in Phenomenology: the distinction between *attribution* and *predication*. When I see a wall I see its color, its surface pattern, its shades, and its placement in a singular act of consciousness. This immediate seeing of a number of properties is what is called attribution. When, however, I say: this wall is brown, this wall is curved etc., I make predications; i.e. I make specific statements about qualities I abstract (such as color), then glue the quality back on the object by saying the wall IS brown. Now we listen to music and sound – normally without making predications at all. Music is understandable without explanations, without naming. A number of ethnic music traditions attest to this fact. Thus, in listening we may perceive orderly relationships by using a taxonomic listening intention; such orderly relationships are then observed through attribution. The ordered units we identify, we have named *gestalt* – using the German terminology. In making an analysis of form-building features, as we do in aural sonology, we are, however, making *predications*. On the level of predication, we are justified in speaking about structure. The structures, consisting of a priori patterns of organization, exist in an ideal world of syntactic abstractness. The aural analysis consists exactly in *the interpretation of a gestalt as a structure*. Predication makes music *comprehensible*. But comprehension will always be a smaller, narrower, than *musical understanding* on of the level of attribution.

## Emergent Musical Forms

In the opening paragraph of his book on musical form Hugo Leichtentritt makes the following statement:

Form in music may be conceived in two different aspects. First, in a general sense, a composition possesses form when it is so constructed that it is consistent with musical sensibility, containing neither a measure too much nor too little, exhibiting in all its parts the right balance and the right symmetry. In its second and more special sense, form may mean a musical structure conforming to a particular traditional type, such as a simple song, a march, waltz, polonaise, rondo, sonata, or fugue.

Form in its general sense cannot be the subject of a systematic study. It is a matter of musical instinct, of taste, and of artistic intuition. In its second, special sense, however, form can be clearly demonstrated by examples. This distinction can also be expressed in other words: form cannot be the object of systematic study, but only the forms themselves. Form is something abstract, comparable to the Platonic Idea, whereas forms are concrete examples of the idea. As idea, form is unchangeable in every style and age, an element and guiding principle of all creative endeavours. (LEICHTENTRITT, 1967, p. 3).

We notice that Hugo Leichtentritt makes a distinction between *form*, which is dependent on artistic intuition and as unapproachable as Platonic ideas - and *forms*, which refer to the concept of traditional form categories that have for long time been the subject of traditional musicology. In our approach we have avoided the traditional *forms* - the musicological categories of *schematic form*- and only concerned ourselves with *form*. But is this to say that we are dealing with Platonic forms, and that we thus are involved in absurd speculations about intangible and metaphysical entities? The answer is certainly no: What we are dealing with is exactly what we have termed *emergent forms*.

Emergent musical forms present themselves in perceptual evidence. As sonorous gestalts they exhibit certain gestalt *qualities*. Such qualities certainly have their share in the constitution of the traditional categories of musical form, but, not unlike Platonic forms, they are of a more general or universal nature. The gestalt *qualities* found in the making of schematic forms are not identical to their style-bound embodiments; they can be abstracted from their stylistic context and be given a more general, structural presentation. We have aimed at revealing the inner logic involved in joining concrete, audible entities into greater musical wholes, and are therefore engaged in the translation of gestalt qualities into structural relationships through a process of abstraction and conceptualisation. We are concerned with explicating the very process of aural thinking involved in the perception of aurally perceived forms, both the traditional ones and new ones.

### The form of music-as-heard

Our project is to explore the possibilities and the limits of the ear, not only with regards to perceiving sonic objects, but also with regards to perceiving greater musical forms – and of course pre-eminently the emergent forms. How are major forms conceived – when experienced in real time and in sonorous motion? The question has no obvious answer, the reason being that the perception of musical forms are dependent upon memory, which is a capacity that listeners possess in varying degrees. The function of memory as an entirely foundational element in human consciousness cannot be overemphasised – so let us pursue this faculty in some detail, again taking our recourse to Edmund Husserl and Phenomenology. Here temporal perception is seen as shown in this graph:

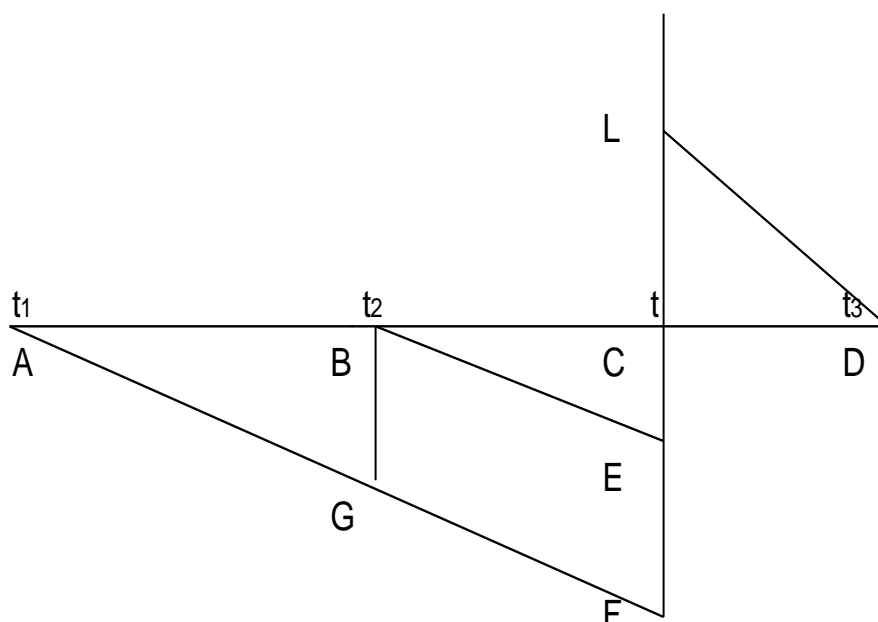


Gráfico 1.

Itzhak Miller explains this as follows:

The horizontal line AD represents both the time interval S, and the continuous sequence of *primal-impressions*, which, according to Husserl, are had by me at  $t_1$ ,  $t_2$ , and  $t_3$  respectively. The diagonally descending lines AF and BE, not including points A and B respectively, represent two continuous sequences of *retentions*. The sequence of retentions represented by the descending line AF, not including point A, are retentions, ‘modifications’ of the primal-impression A had by me at  $t_1$ ; whereas, the sequence of retentions represented by the descending line BE, not including point B, are retentional ‘modifications’ of the primal-impression had by me at  $t_2$ . The *magnitude* of pastness which any given retention attributes to its tone-phase is represented by the *vertical distance* of that retention from AD. Thus, although G and F (in being ‘modifications’ of the same primal-impression) are retentions of the same tone-phase, F attributes to that tone-phase twice as much



pastness as G does. The vertical line GB, not including point B, represents the continuous manifold of retentions had by me at  $t_2$ . The retentions along the vertical line GB are, ‘collectively,’ a ‘modification’ of the sequence of primal-impressions along AB. That very same sequence of primal impressions is ‘modified’ at  $t$  by the manifold of retentions represented by the vertical line FE. The vertical line FC, not including C, represents the continuous manifold of retentions had by me at  $t$ . ‘Collectively,’ these retentions are a ‘modification’ of the sequence of primal-impressions along AC, not including point C. The vertical line CL, not including point C, represents the continuous manifold of *protentions* had by me at  $t$ . This sequence of protentions corresponds anticipatorily to the sequence of primal-impressions along CD, not including point C. (MILLER, 1984, p. 122–3).

Three important concepts emerge: Primal impression (the sensory stimulus in the exact moment), Retention (the lingering of the just-gone-by as a background feature of the mind), and Protention (the implicit consciousness of what is to come next). Thus what we call a ‘moment’ is not just the primal impression; it is a horizon that extends back into the past as well as into the near future. Without this feature of the consciousness, there would be no consciousness at all. And mind you, we are not yet dealing with memory, in terms of remembered entity of the past. The model shows only time in a small scale. However, information that is not perceived in this small scale will have difficulty with being remembered on a larger time scale.

Spoken language involves a lot of retention and protention. A linguistic moment may be an entire sentence, between two full stops. The retentive and protentive faculties of the mind are supported and extended through syntax.

In music these are the same: In a completely random context (one could think of the music of the later John Cage), the possibilities of retentions and protentions are strongly inhibited. “Each moment presents what happens” (CAGE, 1969: 109). On the other extreme, a symphony by Anton Bruckner succeeds in building a perceivable form lasting 20-30 minutes. My interest certainly goes in the direction of the organic musical construction, thus in the direction of making larger forms a meaningful reality for the listener. What are the aural preconditions for the larger forms? Having thought about this for a long time and experimented myself in my music, I have ended up with the following conclusions:

Musical form is the aurally perceived organisation of lower level sound-patterns into composite entities with emergent qualities. Organic musical form extends features earlier described as related to the moment (with retention, primal impression and protention) into a much larger time scale. This expansion of the mind’s natural constraints necessitates specific ways of organising the musical discourse, especially those that involve different kinds of prolongation, which permits larger time segments to be condensed and kept in memory so that at any

moment during the unfolding of music, present musical events are appreciated in light of a simplified idea of preceding segments.

In other words, extended time segments in retrospect become condensed into a memorable ‘summary’. Such a summary retains the features that give the past elements a *function* in relation to the element unfolding in the present. The same condensation may also imply certain expectations or uncertainties with regard to what is to happen next. The term *function*, used with regard to forms, can be compared to an interval on the level of compound sound-patterns: formal functions can be defined as a limited number of fixed, aurally perceivable categories of relationship between form-segments.

We could formulate the above in as follows: For the immediate perception of greater scale form to become a reality, the segments that constitute the form, must, to a great extent, be ‘time-collapsible’, i.e. their immediate, and more complex and manifold appearance, must be capable of being wrapped up into a simple ‘summary’ remaining in the aural memory of the listener. The memory to which we are referring is not simply the ‘retention’ implied in the immediate perception of single time segments. It is on the other hand not the kind of memory that we use when trying to remember something and bring it before ourselves as a mental image separate from the sensation of the physical present. It is a memory that has preserved some of the properties of the retention, but has extended this to longer temporal distances. Thus, it is not a memory that is perceived as memory, but is more like a horizon, only staying in the background of the unfolding musical experience and colouring it, and orienting our present listening.

For a larger formal pattern to be condensed, we may presuppose that there is in the background of the musical dialectic a feature more slowly evolving that unifies the different musical events of the surface, and advance the unfolding of the formal discourse in a slower layer pace. This is exactly what the listener would need as a memory support. (LASSE THORESEN, 2013).

These conclusions about musical form lead again to questions pertaining to the musical organisation itself: How to create musical gestalts that allow for the perception and understanding of forms larger than the single sound-object. And exactly the uncovering of the sound-object, be it with Schaeffer’s *musique concrète* or with John Cage, has posed major questions about the organisation of cohesive musical discourses. The reason is that from having a tonal and rhythmic way of organizing the discourse that actually had incorporated sufficient features of prolongation, catering to the need of extended protension and retention, the sound-based music of the post-war period had lost these qualities. To reconquer the possibility of creating coherent contexts has become an important quest for musical research, one that also underlies the *Aural Sonology Project*. A few words about strategies for integrating sounds in a sound-based context may be useful.

## Sound-values and Sound-characters

In a lexicon item in Larousse 1957, Pierre Boulez presents his criticism of *musique concrète* in the following terms.

Apart from the malicious wording of the criticism, Boulez may actually have put his finger to a problematic feature of the sound-based music: the lack of values to support a structural discourse. While this criticism certainly hurt Schaeffer deeply and caused him to regard Boulez his enemy for life-time, – an enmity which did not diminish when Boulez was given the role as a leader of IRCAM – it may also have prompted him to address the conditions for structural values to emerge – not between pitches, but between sounds with no clear pitch. Only sounds with a clear pitch quality can form musical intervals, which in turn is what notation and musical structure traditionally is based upon. A whole ‘book’ within his *Traité des objets musicaux* is consecrated to questions about structure. His idea of the research to be carried out in the continuation of the first decades of *musique concrète* was centred on questions of the conditions of forming musical structure with sound objects. The research was never carried out systematically, and was probably an impasse. Composers went on to compose sound-based music in a more intuitive way, and now 60-70 years after Schaeffer launched his project, we may return to some of his ideas and assess if they nevertheless had a degree of validity. One of his concepts well worth pursuing is that of values vs. character. He defines character as follows:

*a quality of perception common to different objects (...) enabling these objects to be compared, arranged and (possibly) put into calibrations despite the dissimilarities in their other perceptual aspects.* (SCHAEFFER, 1966, p. 303. John DACK’S translation).

Michel Chion adds further clarification to the concepts by saying:

In other words, value only exists from the moment when there is more than one object, and when in several of these objects there appears a *difference* in one aspect, one property, which is common to them all. The resemblance in *character* among the sounds assists us to perceive the value which they carry by helping to: ‘weaken the interest which could be taken in identifying objects which would otherwise present as a series of heterogeneous events’. (CHION, 1983: 70-1; SCHAEFFER, 1966: 303. John DACK’S translation).

The resemblance in character is likely to be through common sound-quality/timbre, and the timbre is that which is repeated for every new statement of the element in the pattern; it forms a homogenous ground for the emergence of the pitch dimension. The repetition of the same instrumental timbre has the effect of neutralising the attention that otherwise would be spontaneously directed towards the identification of the concrete cause of the sound (indexical

listening). The instrumental timbre functions as the supplement - the ground - that allows abstract values to emerge. The character in its prototypical definition is therefore the first abstraction of the instrumental timbre in the direction of a generalised musical function. The couple character/value is modelled on the play of a musical instrument. In Schaeffer's definition, a musical instrument is any device that is capable of producing a set of varied sound-objects while maintaining the idea of a unitary cause of the sounds.<sup>1</sup> Thus, the perceptual pattern of permanence in timbre combined with variation of an emergent sonic feature is founded on the experience of the musical instrument.<sup>2</sup>

I have made a notation (a 'RegEx' or 'regular expression') to represent this relationship, very much like a fraction with the common denominator (the character, abbreviated c) under the line, the differential values (v) above:

$$\text{I hear}_{\text{tx}12} : \frac{v_1 + v_2 + v_3}{c}$$

However, the concept of character is capable of still further abstraction; the function of character can be maintained without a concrete timbre as a common cause. This occurs when objects of a compound sound-pattern are integrated not by one specific timbre, but by a common category of sound-objects to which all the objects belong. This category will have to be defined solely through perceptual similarity; for instance sounds from different sources (and therefore in a sense having different timbres in so far as the sources could be identified by their timbre), all having a percussive type of timbre as their common denominator, would be able to form a character in this way.<sup>3</sup> We could represent this as follows:

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<sup>1</sup> 'Every device from which a varied collection of sound-objects - or various sound-objects - can be obtained, whilst keeping in the mind the permanence of a cause, is a musical instrument in the traditional sense of an experience common to every civilisation'. (SCHAEFFER, 1966, p. 51. John DACK'S translation).

<sup>2</sup> 'The *fact of the instrument* is, therefore, the first fact of all traditional music, its concrete basis, a precondition even to musical systems and languages. These systems and languages themselves are closely linked to the types of instruments which allow them to be expressed. Do the new musics bring this basic fact into question? Does what is replacing it (the studio, synthesised sound) promise enough to justify abandoning it? This is the question which is asked in the *Traité*. The answer which it gives suggests a *broadening of the notion of the instrument*, which would be retained and redefined within the framework of the programme of musical research : a music which would articulate suitable objects of the same genre, located and calibrated according to *perceptual fields*, by *calibrations of criteria*, this music would rediscover, by new ways and causalities, the basic laws of the instrument, stated as the laws of all music : permanence of characteristics[character], variation of values.' (CHION, 1983, p. 54. John DACK'S translation).

<sup>3</sup> The description of characters that unite different objects is based on reductive listening. However, differential sonorities may also be united by the idea that they come from the same source. Denis Smalley (1994) has introduced the term source-bonding, which in addition to being synonymous with our definition of Indexical Listening, also refers to 'The natural tendency... to relate sounds to each other because they appear to have shared or associated origins'. E.g. when listening to a recording of standard Jazz or Rock music, we presume that the percussion sound are connected and coordinated by one player, despite the fact that the sounds of cymbals and drums in are of a very different from the point of view of spectromorphology.

$$\text{I hear}_{\text{tx}12} : \underline{v_1 + v_2 + v_3}$$

$$\{c_{1.1}, c_{1.2} \dots c_{1.n}\}$$

in which  $\{c_{1.1}, c_{1.2} \dots c_{1.n}\}$  suggests that similar timbres function as characters by the fact that they belong to a similar category ('genre') of timbres. For the sake of brevity, it may be notated:

$$\text{I hear}_{\text{tx}12} : \underline{v_1 + v_2 + v_3}$$

$$\{c\}$$

Here the new kind of brackets is used to indicate that  $c$  is a class of objects, not a single instance of an object.

There is one problem with Schaffer's idea of the differential values being pertinent features in sound-based music: Perception favours intervals as pertinent features. Mere sonic differences are not intervals. We define an (absolute) interval as a particular category of difference between sounds: *its specific aural quality must be preserved under transposition, and it must be a category that has the status of a culturally shared 'object'*. Thus a listener will notice, and mentally correct a false note, since he has knowledge of the correct interval prior to the actual sound of the music he is hearing. The *pitch classes* of Western art music belong to this category, as well as rhythms based on (some kind of) periodicity.

The fact is that in sound-based music, it is not the values, but the sound characters that tend to dominate and thus serve as the pertinent difference. However, to establish meaningful relationships between sound characters remains a major challenge for contemporary composers. One solution was presented in my paper ---- published in *Organised Sound* ..... This solution is a centric organisation: A rich sound object is exposed prominently, and the other sound-events are fragments or partial aspects of that central object. Another way is to add to different characters a common secondary characteristic, such as a soft hiss, a recognizable granular quality.

## **Musical examples of the use of values and characters**

### *1. Sound-character as a class of timbre; interval-based music*

Anton Webern's pointillist instrumentation of J.S. Bach's six-part 'Ricercar' from 'Das musikalische Opfer' is an example of the last case: Here the differential values clearly are pitches, while the melodic line is distributed between different timbres as they are played by different instruments. However, all the instruments have timbres that are clearly *pitched*,

i.e. producing unambiguous fundamentals. The unifying character, then, is the *class of pitched timbres* to which all the instruments belong.

## 2. *Sound-character as a class of timbres; sound-based music.*

The pointillist instrumentation became of great importance to the composer Helmut Lachenmann, who has been a pioneer in what we could call *musique concrète instrumentale*.

As an example of a music that is neatly organized according to the differential pattern of values and characters I play you a movement from Helmut Lachenmann's *Das Mädchen mit den Schwefelhölzern*:

[Figure: Spectromorphological transcription of part of Lachenmann's *Schallz...*

→Music example]

We could proceed here to present a detailed analysis written. The analytical method has been clearly and completely described in three papers in *Organised Sound* (Thoresen 2007, 2009, 2010). Instead of showing you a detailed transcription, I will focus on the sound-characters, and their paradigmatic presentation. There is a distinct number of sound-characters that shape the musical discourse: -----

[Figure]

Representing these sound-characters with a letter, the form of the piece may be represented as follows:

[Figure]

## 3. *Growth-pattern as integral character; sound-based music*

Denis Smalley has followed up the work of Schaeffer with regard to spectromorphology. One part of his work published already in the 1990ies sets up a typology of growth-patterns. These categories lend themselves the description of musical character. Applying his model to ours, we may set up the following hypothetical example of a specific integral sound-character (designating the sound-character as integral we ensure that the temporal behaviour of the sound is included in the description of the musical character):

<b>Integral sound-characters</b>	<b>Description of sound-object</b>	<b>Description of growth-pattern</b>	<b>Description of constraints</b>
Values/Play:	Pitch of the particles of the accumulation, dynamic (waves).	Occasional descents	Relatively narrow bandwidth of impulses
Character:	Accumulation, complex objects, sharp attack.	Ascent	

Tabela 3.

A case study of a description of a piece in which a growth-pattern is an evident structuring force, can be taken from Ondrej Adamek's 'Endless Steps'<sup>4</sup> (from appr. 2'30 and onward). Here the growth-character is more evident than the timbre-character. The growth pattern is *Undulation*, occasionally partitioned into only *Ascent* or *Descent*. The timbre character is that of an iterated gliding sound. The *play* that makes the music alive is the breaking up of the continuity of the Undulation into layers placed in differing registers that nevertheless move in the same direction. The layers are also orchestrated with orchestral colours of highly differing character; thus the timbral substance of the gliding iteration which forms the character, has no got no constant:

<b>Integral Sound-characters</b>	<b>Description of sound-object</b>	<b>Description of growth-pattern</b>	<b>Description of constraints</b>
Values/Play	Change of timbres Differing speeds of iteration- from regular gesture time till flutter time	Undulation broken up in several registers: choice of register. Occasional superposition of two undulating curves	Generality of sound events conform to the overall direction controlled by the undulation.
Character	Mostly iterated , gliding sounds	Undulation/Ascent/Descent	Slow regular movements

Tabela 4.

[→Sound example]

4. *Gesture as a means to give importance to the play with values in sound-based music*  
 From the sound-object there is a logical line that proceeds through taxonomic listening on the two next articulation levels. However, there instead of listening reductively to the sounds, one may listen with an indexical intention – in which case the sound-qualities are traced back to their causes – real or imagined. If we regard the sound-events in this way, we may again

<sup>4</sup> The piece was premiered at Lucerne Festival 2008 and conducted by Pierre Boulez.

consider the mutually interdependent couple of character and value. If the character is understood in an indexical way, the physical source of the sound becomes our focus – we the sound is caused by a metal item, e.g. If, however, the indexical interpretation is focused on the values, it is the play with the object itself that attains our focus. We will imagine or observe what kind of movements or gestures that could cause the variations in sound. In the case of a human agent performing the gestures, they may be further interpreted as being caused by human emotions not only by objective bodily movements. We obtain a situation of listening very close to that of playing an instrument: The timbre remains the constant, but the gestures of the player will carry semantic information.

We mentioned that a problem with Schaeffer's definition of the relationship between character and values was that in sound-based music there are only differences between sounds, not intervals. The intervals in pitch-based music tend to be perceived as pertinent much more readily. One of the first to criticize Schaeffer for overlooking this fact was the composer Guy Reibel, who then wanted to reintroduce the emphasis of play into sound-based music. As a consequence he developed *musique concrète* approaches to vocal music improvisation – his work is documented through a book and videos.

[→ video of *Jeux Vocaux* improvisation, Guy Reibel]

Visual and theatrical elements may be helpful in lifting to importance the gestural play with sounds. Mauricio Kagel's music theatre is an example. This approach is now much favoured also in multimedia contexts. Also, the use of elements of scenography may serve as tools for focusing on meaning-laden actions and gestures of performance. The next video-clip shows a scene from the Norwegian Morten Cranner in which two protagonists – from Hamlet by Shakespeare, actually – display their intentions one towards the other. The scenographical element is a piano string placed across the stage- and its sound is amplified. The two protagonists move along the line with small guitars. The basis sound of the encounter produced by the piano string forms a sound character. The changes in sound on the string result from the movements of the actors. If we were to listen to this music example blindfolded, we would not perceive the psychological intention behind the sound-values; the sound is not sufficiently subtle to convey the semantics of the actions. However, since this is a theatre piece, the body language of the actors displays the semantics clearly, showing feelings of aggression and fear, of attack and flight. The sounds emphasize the actors movements and enhance the drama of their interaction.



[→Video from Morten Cranner's staging of Shakespeare's *Hamlet*, as part of the project *The Acoustical Act*.]

### **Between interval-based and sound-based music**

We have discussed the almost irreconcilable difference between sound-based and interval based music – irreconcilable because they depend on different listening intentions. Nevertheless, most composers of contemporary music try to do so, often with dismal results. A number of the aesthetic dilemmas of contemporary music are in actually connected with the question of how to integrate or resolve sound-based and interval-based music.

Are there meaningful unions of the two opposite orientations? Let me suggest two cases of intermediary positions between the extremes that seem to make sense.

- Spectromorphologically enriched interval-based music (e.g instrumental lines where an active inner dynamic is allowed to modify the timbre radically)

[Example: →Traditional Japanese Shakuhachi music]

- Spectromorphologically modeled textures/ sculpted interval-based chords. (e.g spectral music that works on pitch collections/chords that merge and become like timbres)

[Example: →Spectral music]

However, there are to my idea also problematic cases:

- Dodecaphonic/Serial music where an overcharge of the listener's capacity to process a great number of pitches in real time often reduces the overall impression to sound-based music.
- Instrumental part writing (polyphony e.g.) that cause the parts to merge into vague spectromorphological categories in an uncontrolled way. This is often connected with a lack of focus (relationship between foreground and background has not been articulated; the composer seems to have lost control of the effect of his part-writing approach.
- Sporadic, often expressive use of spectromorphological sound types in a music that is generally pitch-based, and in which the unusual sound lack justification or proportion. There is no valid syntactical legitimation on a deeper level for the sound-events as such, and the pitch-based or tonal logic is broken.

I am myself a composer that has no wish to let go of the use of intervals and pitches. The question of making an integration of the two worlds has preoccupied my during my work as a composer. My music could demonstrate a number of strategies and experiments, and I can only share with you a couple of examples.

1. *Example of spectromorphologically enriched interval-based music*

I will present the third movement from a major piece I wrote in 1990, called Narrative for Saxophone Quartet. The movement comes after a dramatic dynamic climax, and its role in the overall form is build down the tension. The dynamic form will then have an formal archetype of the backward-leaning time-direction.

[Figure]

However, I wanted to work out that form in stages and steps. The movement then is subdivided in 5 smaller sections. To make the form clear, I decided that the beginning and end of each section had to be on the same energy-level. Moreover, I wanted the détente not to be quite linear, so while the first one starts on a high energy level, the second section is lower than expected, the third one between the first and second in energy, and the two last ones successively softer. This gives the following form:

Now the first movement is shaped as a chord with *incidents* (a spectromorphological category) that accelerates into a trill (*composite sound-object*) which again is transformed into an *accumulation* of single notes that retards and spreads before the process is reversed. The pitches are organised in a sets that employ a chromatically modified diatonic scale.

The second movement starts with a brusque attack before a double impulse, which then develops into melodic lines that enter into essentially a rhythmic logic of transformations, based on contractions and expansions. These contractions and expansions modify the melodic lines that in terms of their repetitive patterns define some kind of a flexible metrum.

[Sound example: → *Narrative for Saxophone Quartet*, movement 3.]

2. *Example of spectromorphologically modeled textures/ sculpted interval-based chords*

In an aural, phenomenologically oriented approach the chord, regarded in isolation, becomes a kind of sound-object. It has a characteristic timbral quality, the result of a synergy

between its interval-content, its register, its texture, and its instrumentation. All of these factors are relevant for the assessment of a chord as a sonically embodied entity, rather than as an abstract collection of notes.

*The chordal sonority* is comparable to the *spectrum* of the elementary sound-object; spectral music has profited from this and made chords that resemble dystonic sound-objects because of the strong internal fusion of their constituent tones. When a selected chordal sonority is used with consistency in a composition the interval timbre gets the function of a character that serves as an integrating factor between the chords. The chordal sonority is largely determined by the interval-content of a chord; to keep it constant, it is necessary to preserve the interval content of the chord in chordal progressions. The strategy of reducing interval contents to *pitch-sets* (Forte 1973) will not do: when a chord spaced out in register is condensed to its tightest possible organisation (which is how a pitch-set must be ordered per definition) almost all the timbral qualities that may define the chordal character are lost. Instead we propose the definition a *chordal class*: *a chordal class contains all chords that consist of the same (non-inverted) intervals in any order.*

Moreover, the timbral quality of the chord is dependent on register placement; in order to maintain the constancy of a chordal timbre the placement of a chord in a very low or high register would necessitate adjustments of the constituent interval of the chord.

To regard a chord as a sound-object means that its interval-content can be regarded as the spectral component of the object (Fr. 'masse'); that it has an energetic profile in time such as any sound-object must have (including an onset behaviour and a termination, may be gait and grain) and possibly a temporal profile in dynamics and/or register placement.

From the spectromorphologically oriented composer's point of view, the sonorous substance of the chord (technically its interval content) can be sculpted, as it were, by assigning to it an energetic, temporal profile. From musical tradition different ways of doing so has been called arpeggiations, grace-notes, tremolo, acciaccature etc. A fully embodied chord needs a type of entry (soft, hard; from high, from middle, from low), it needs a way to disappear (notes simultaneously or not; soft or hard; with or without written-out reverberation). Provided it has a certain duration it needs a *way* to continue its presence, such as being sustained or iterative and having a gait (pitch, dynamic, spectrum); it may have different granular qualities; it may have a spectral profile in which particular elements of the chord is focused through a dynamic or timbral alteration. In short, the whole spectromorphological apparatus presented in chapter four can be activated in the sculpting of a chord, or in its description. The choral like texture to which chords usually are associated, is

only a special case of texture convenient for theoretical abstraction. Thus all the categories of sound-objects described in chapter four can serve as models for sculpting the texture of a chordal substrate.

In the following music example you will hear a succession of spectral chords sculpted in a spectromorphological way. Now the over-all disposition can be described as having the following dynamic form shape:

[Figure]

The first chord (with a quick interior iteration) serves as an suspense, and eventually as an upbeat for the explosion that follows. In this chord the attack happens in the high register, and it releases an accumulation that descends through the next chords in a ritardando. The fundamental of the first chord arrives after a little delay, and then a one hears clearly the gait of pace of the chords in the horns. Thus the musical textures are modelled on sound-objects. Differently from the first spectral music that made analyses of specific sounds, or the use of generative algorithms their mode of approach, here the spectromorphology serves as a palette of suggestions that the composer uses at his liberty.

[→ Music example: Opening of *Les Enluminures* by Lasse Thoresen]

### Ending Notes

My paper and a presentation has taken the form of a journey through different possibilities and impossibilities, all released by the approach to listening that was initiated by spectromorphological research and study. It proposed to seek in the idea of sound-character and value a formula for creating organic contexts in sound-based music, and it suggested approaches to the integration of spectromorphology and interval-based music. The time and the context did not allow for a more detailed presentation of methods. I hope to finish a publication during the next half year or so. The title of the book will be: *Emergent Musical Forms: Aural Explorations*. It will come with a web-page with musical examples. I will encourage you to send me a mail to register for the mailing list. You may find my mailing address on the web: [www.lasethoresen.com/](http://www.lasethoresen.com/).