

From Composition to Reception, Identity of Meaning and Significance

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Abstract

On listening to an electro acoustic work for the first time, the listener's attention is initially captivated by the novelty of the sounds he hears. Our researches into the field of aural perception (Terrien, 2005, 2006, 2010) have shown that the composer's intention was almost always discernible by the listener. Relationships between the aesthetic and the creative elements (Nattiez, 1975) emerge fairly spontaneously through the verbal expression of emotions delineating the aural experience of the listener (Imberty, 1997, McAdams, Bigand, 2004, Levitin, 2010). These verbal descriptions amount to clear evidence proving the existence of sonic indicators or signposts (Deliège, 1997) and semantic features (Le Ny, 1975) which enable the listener to apprehend and to comprehend the music that the composer has created.

Our contribution rests on a study currently being undertaken of fifty listeners (amateur musicians as well as non-musicians) for whom we have drawn up a listening test based on the work *Sonora* by Francois Bayle, taken from the album *Fabulae* (1998).

Our enquiry lies at the heart of the programme proposed for this symposium, and if the subjects of analysis, semiotics and semiology are pursued in the light of our contribution, we claim for the latter the title *On Listening: Intention and Reception*, since our research and present contribution deal specifically with the problems of the listener's perception and interpretation seen in relation to the intentions of the composer.

Introduction

What prompted our research was not the frequently-made observation that listeners to music (specialists and non-specialists alike), were able to recognise and name the main indicators which make up a musical work in terms of their emotions, impressions and feelings. This led me to ask why and how this was possible. What exactly emanated from a work and enabled the listener to recognise its main 'musical' characteristics? And how do they become conscious of them?

To this we should of course add an observation about the musical characteristics of a piece. The latter are generally deliberately chosen by composers for the purpose of writing a musical discourse. Musicians choose them believing them to be essential and think of them in musical terms. It remains to define such musical characteristics while noting that they represent in one way or another intentions of the composer. Do connections actually exist between the features

of works and aspects of the emotions? In an earlier piece of research (Terrien, 2003), referring to a large number of studies on the psychology of perception and knowledge (McAdams, Bigand, 1994, Deliège, 1992, Le Ny, 1979, 1989, Imberty, 1979, 1981, et al.) I had examined the possibility of connections between what we perceive and what we feel. Following other research I have attempted to clarify the process by which the musical characteristics becomes indices (Deliège, 1992), the attributes of semantic landscapes (Le Ny, 1979) which trigger off emotional reactions in the listener. Arising out of the work and giving it form, these indicators have been set up by composers by way of organizing their musical discourse. These are heard by listeners whose emotions are thus aroused. The musical characteristics appear to constitute the connection between composer and listener insofar as they share the same source, the emotions experienced and the feelings expressed¹. But it depends what one means by the word term 'emotion'. In the field of psychology (Rimé, Scherrer, Frijda, 1996) and the neurosciences, there exists an abundant bibliography on the subject of emotions. I have concentrated in my research (Terrien, 2003) on the diagrams of emotions produced by Imberty (Imberty, 1979, 1981) and especially on the work of Damasio (Damasio, 1995, 1999, 2001). Since which there have been new advances in this field (Imberty, 2001, 2010, Damasio, 2010, et al.).

I set up the hypothesis (Terrien, 2005) that it was possible to understand a musical piece to the extent that it conveyed the emotions that listeners perceived and that by expressing them through words listeners would make their understanding explicit and in so doing establish new areas of knowledge about music. In order to test the hypothesis my study consisted in establishing from the outset the different musical characteristics of the work in order next to attempt to understand the nature of the experience that they bring out. By means of a musicological analysis of the piece, assisted by a tool of didactic transposition (Verret, 1975, Brousseau, 1998, Chevillard, 1985, Terrien, 2010), it is possible to differentiate between these indices, or attributes, and to set up an inventory of them. I had carried out this initial task using pieces composed in tonal language (Terrien, 1999, 2003), but had never done so working with other kinds of musical languages, other musical 'grammars'. This present study is the opportunity for me to verify the hypothesis of a correlation between music and emotions in acousmatic music, as it is known, based on the fourth part of *sonora* by François Bayle, extracted from *Fabulae* (Bayle, 1990-1992).

To this end I shall begin by recalling some definitions of emotions, their nature and function in order to establish a theoretical context. After which I shall give an account of a number of the characteristics of acousmatic music, and more specifically of the ideas of François Bayle, together with an analysis of the piece. I shall lastly describe the research protocol and give an analysis of the results.

I. Emotions: nature, function and elements

I. 1. Definition of the notion of emotion

'Between emotion and affectivity' lies the inner slope of psychological life where the self may be possessed; while between 'movement and intelligence' lies the outer slope where the world can be grasped. Expression constitutes the crest that joins the two slopes and that by bringing them together affirms an individual being. (Wallon, *in* Osson, 1983, p. 947)

¹ We should note that the distinction between emotions and feelings is based on the fact that the former are physical expressions of an experience, whereas the latter are the expression of that experience 'made conscious' by a movement or word (Damasio, 1999).

Etymologically ‘emotion’ means ‘movement towards the outside’. Thus emotion results in an external physical expression, taking the form of gestures or of the more elaborate form of words.

A variety of definitions are offered by medical doctors, psychologists, philosophers, or artists (Terrien, 2006, pp. 47-95). For Jean-Paul Sartre “it is the transformation of the world [...], the body directed by conscience that changes its relationship with the world so that the world should change its qualities.” (Sartre, 1995, p. 79), and for Antonio Damasio: “... the simple definition of emotion as a specifically caused transient change of the organism state.” (Damasio, 1999, p. 282) and he goes on to say that “emotions automatically provide the organism with behaviour aimed at survival”. And finally the psychologist Nico Frijda: “emotions are states of preparation for certain types of actions, those are precisely actions which define systems of behaviour.” (Frijda, 1989, p. 47), but the cognitivist psychologist adds that: “It is cognition – what a person believes to be the cause of the activation – which determines the emotion experienced.” (*Ibid.*, p. 23).

Emotion is an external physical or physiological expression which results from a perception of outside elements:

It is the result of the processing of data during which an objective is pursued while the individual person appreciates or assesses the significance of events and of the availability of its energy or motor programmes for a better adaptation. (Frijda, 1989, p. 23)

This consists in processing the data picked up by the senses of an individual in order to carry out a specific objective. As applied to the listening process this would mean that the listener would draw upon these kinds of knowledge in order to organise them and thus respond to the question raised. By this means we slip from the realm of emotion into that of cognition, which suggests that it is perfectly possible to organize this movement.

Emotion is a physical expression that is made possible by the bringing together of previously acquired pieces of information, which express themselves and take shape as our senses receive data. The initial stage of expression in words is the result of a metacognitive reflection by means of which listeners organise the entire body of their knowledge in order to enunciate a word. The premise behind this approach comes from the work of L. Vygotski who criticised traditional psychology for breaking the connection between the intellect and the affect (Vygotski, 1925, 1931, 1998). In his view the connection between emotional situation and intellectual situation works through an inner language.

That said, are all emotions alike?

I. 2. The nature of emotions

	Enjoyment	Surprise	Fear	Anger	Sadness	Disgust	Contemp	Distress	Interest	Culpability	Shame	Love
Darwin	x	x	x	x	x	x						
Woodworth et Schlosberg (1964)	x	x	x	x	x	x	x	x				
Ekman et Friesen (1975)	x	x	x	x	x		x	x				
Izard	x	x	x	x	x		x	x	x	x	x	x
Schwartz et Schaver (1987)	x	x	x	x	x							
Damasio	x	x	x	x	x	x						
Dictionnaire	x	x	x	x	x	x						x

Table 1 : Primary emotions (Terrien, 2006, p. 64)

Different forms of emotion exist, namely:

- primary emotions
- secondary or indirect emotions, pseudo emotions or vicarious emotions
- background emotions

Primary or universal emotions are preprogrammed, they are inscribed and instinctive (Damasio, 1994). It is unnecessary to have an experience in order to feel an emotion. Thus there is no need to have known fear in order to feel fear, the same goes for the emotion of surprise which remains a surprise! They are transmitted to our descendants (a case of phylogenesis serving ontogenesis). Lastly the amygdala (the so-called primitive or reptilian brain) constitutes the seat of our emotions and triggers off a physical state (Damasio, 1999). What is interesting to note is that emotions come mainly from a part of our brain which is also happens to be the seat of our abilities to treat lengths of timing (tempo, pulse, rhythm, march) (Levitin, 2006). This verifies the connections between emotions and movement.

Secondary or 'social' emotions are produced by the primary emotions but are equally the expression of our adaptation to an environment. They are the product of experiences mediated through cultural objects (in the broadest sense): the things we listen to, books we read or art itself, etc. In Damasio's view experience modulates them and they in turn modify our cognitive state. They evolve all through our lives. They are cultural. But in the case of art they also produce and organize the work of art (Scherrer, 1989, p. 97). In other words the work is the product of emotional processes turned into objects. This means that it is for the audience to discover, interpret and make explicit the work with its own cognitive tools. Thus in the perceiving subject the perception of the work sets up indirect or vicarious emotions, also known as pseudo emotions, which had been programmed and intended by the artist. It would be quite 'normal' for anyone listening to a piece of music to feel and understand what the composers had decided to put into their music. What is interesting about secondary emotions is the fact that these offer two levels, one didactic and the other informative (or communicative).

On a didactic level anyone can repeat an experience in order to differentiate, or make explicit the elements which made it up:

These are the starting point for their individual consciousness by means of the group into which the elements have been brought together and through which listeners will receive the different formulae for action and the intellectual instruments. Without these they would be unable to make the distinctions and set up the classifications necessary to the knowledge of things and of themselves. (Wallon, 1999, p. 122)

Now as regards the second level, that of information, this allows the subject to collect data on objects, for subjects possess an increasing amount of cognitive-physiological information which enables them to anticipate situations that may turn up:

The gradual refining of cognitive information regarding the emotions, the increasing interaction between motor systems and the cognitive system, and the increasing differentiation in the intensity of emotion depending upon specific situations should all lead to a real change of life. (Wallon, 1999, p. 299)

Lastly comes a third category of so-called 'background' emotions, such well-being or feeling unwell, feeling at peace or tense. The emotions are expressed or experienced through small details in the attitude of the body, the speed or contour of movements of the subject (Damasio, 1999).

In order to "reconstruct the world that surrounds us, our brain not only draws upon what we see and what we know but also what we feel." (Vincent, 2000, p. 30). This means that we use our feelings to reconstruct what we have perceived, to organise our knowledge and to make sense of what we have just perceived. The reconstruction concludes with an expression in words, as a result of which the elements that produced them are made explicit.

Now, for the term emotion, a number of synonyms are in use, among them: feeling, passion, humour, affects, impression, and so on. Whatever the term used, in the sense we understood earlier, feeling is the result of emotion as Christian Manuel pointed out: "In its final state feeling is a mental experience that is conscious of an emotion, it can be expressed in words and thus become a part of the level of consciousness .../... feeling is directed towards the inner world" (Manuel, 2001, pp. 37-47). For Damasio, emotions are actions whereas:

feelings are personal and subjective. These are experienced by the individual and he or she alone, we are not talking about forms of behaviour but about thoughts [...] It is through feelings, directed to the private inner world, that the emotions, directed to the public and outer world, begin to make a full and lasting impact, Consciousness is indispensable for it is only when the sense of oneself occurs that the individual who experiences feelings finally becomes aware of these. (Damasio, 2001, p. 45)

We may thus understand that though emotions constitute the outer expression of events received by our senses, they are not necessarily inscribed in what may be described as a consciousness of these expressions. This results from the internalisation of the causes which aroused the emotions, in other words the phenomenon of the thought process which gives form to feeling and therefore to an initial explanation of the origins of our emotions. It is not so much the expressions of emotion among the listeners as the putting of their feelings into words that need to be observed. This process is the consequence, indeed the result, of the cognitive processes of perception which identify the indices and the musical elements in order to express them in words and phrases². The putting of feelings into words is the first expression of what they have experienced and what they know.

² We should remember here that the distinction between emotions and feelings is based on the fact that that the former consist in the physiological expression of an experience whereas the latter are the expression of the experience made conscious by a gesture or a word.

I. 3. Functions and components

We shall now consider the functions and components of emotions which are generally to be found as verbs of action.

Functions	Components
Evaluation of the environment	Data processing
Regulation of the system	Neurophysiological process
Preparation of the action	Trends (tendencies) of actions
Communication of the intentions	Driving expression
Reflection	Subjective emotional state

Table 2 : Functions and components of emotions (Terrien, 2006, p. 72)

The table presents a number of functions and components of emotions as determined by cognitivist psychologists (Rimé, Scherer, 1989). Each function and each component takes part in the construction of an emotion. The expression of a feeling, its expression in words, constitutes the consequence that is the putting into words of the functions and components of emotion. When listeners use words about an extract from a piece of music they hear they make use of the verbs of action that appear in the first column on the left. Whereas the function of emotion is to assess, prepare, communicate and reflect, we can imagine then that the function of feeling is to put into words, or musical gestures, those elements which describe the scheme of these different verbs. For example during a listening session listeners will assess the information linked to their environment and perceived by their senses. They will adapt their behaviour to the listening session and prepare a series of actions in order to communicate and develop their reflection. In my previous studies (Terrien, 2003), I had tested this hypothesis for the field of tonal music and the results confirmed the existence of relations between the functions of the emotions and the functions of the indices of the musical work.

The other aspect about the functions of emotion is that each verb (to assess, regulate, prepare, communicate, or reflect) sets off in each listener processes which activate the competences acquired, in other words the pieces of knowledge. The function of assessment activates processes of differentiation of the auditory elements, while the function regulating our system organizes the elements perceived and gives them a meaning, and finally the function of preparation provides us with the intention to carry out a movement or express an idea, and so on and so forth. These functions which are triggered off by the process of listening acquire a conscious form through the verbal expression of feeling. These functions are the result of the characteristics of music.

The components of an emotion also emerge when feelings are explicitly put into words. As feelings are only the consequence of emotions, the listener conducts and expresses the processes which the feelings bring out.

The identification of the functions and components of emotions makes it possible to understand more easily the musical processes which trigger them off. Which recognizable musical elements set off the processes? How can they be identified in a work? And if listeners can recognise them, do they not acquire knowledge and skills? Of this there can be very little doubt. Nonetheless these characteristics actually stem from the musical pieces themselves and it is the process, first of analysis, followed by didactic transposition that brings them to light.

II. The work, a product of the emotions

II. 1. The nature of sound: from Schaeffer to Bayle

Musicians compose their works on the basis of the emotions, or feelings which they have constructed through their long relationship with the world of sound. As Schaeffer put it (Schaeffer, 1966) sound is a wave produced by the mechanical vibration of a fluid or solid medium propagated thanks to the elasticity of the surrounding environment. Consequently the sound object comes from the very same source which produced it. "Sound has always been associated in time with the phenomenon of energy which produced it, to the extent of being taken for it" (Schaeffer, 1966, 75) and it is only accessible through the sense of hearing. Our ear only perceives the sound source itself. But for musicians on the other hand, Schaeffer tells us, what concerns them is not the way the sound is produced but the way in which it is perceived. In other word musicians work on their relationship with sound to construct their musical objects. And their relationships are based on the feelings they experience when listening to a particular sound object, and also on representations or mental images which they construct when working on the sound object. The aim of the musician will therefore be to characterise the object by detailing its different qualities.

I have set my own approach here in the particular context of acousmatic music, which is no longer that of the 'traditional' kind consisting of 'piles' of notes and interpreted as differentiated pitch levels rather than sounds treated as an object. François Bayle describes a new kind of object, the 'i-sound' which can be defined by the sense of hearing "without appearing isomorph at the source of the sound" (Bayle, 1993, p. 186). The composer explains that the "i-sound may be distinguished from the sound-source by a double disjunction, first a disjunction of a physical nature caused by the places of the causes being changed round and secondly one of a psychological nature caused by the change to the areas of the effects: the awareness of a simulacrum, an interpretation, a sign." (*Ibid.*, p. 186). The i-sound is a manufactured object and Bayle defines three types of i-sound:

- the iconic *im-son*, referential;
- the diagrammatic *di-son*, indicial;
- the *mé-son*, metaphorical.

Without going into further details of the composer's explanations, it is already clear enough that composition no longer has to do with actual notes but with what constitutes a recorded sound, a sound object. The composer works on an image-of-a-sound (*Ibid.*).

II. 2. The sound object

A sound object is a sound whose source cannot be identified. It is purely related to our listening and to what we do with it, and it is "fully contained in our perceiving conscience" (Schaeffer, 1966, p. 96). A sound object may consist in a transposed object, a sound object whose original source has been recognised and which has been modified by manipulations, or else an original sound object for which the listener has no point of reference, which is unheard-of. For Schaeffer the sound object results from our subjective state in relation to perception being made into an object (*Ibid.*). The sound object allows the listener to hear the indices which organise and arrange the various sound impressions (*Ibid.*, p. 268), "I direct my attention to the sound itself, that is what I identify." (*Ibid.*). The recorded sound object "will appear unchanging throughout the various perceptions which I experience each time I listen: it will always appear the *same*, transcending all individual experiences..." (*Ibid.*, p. 269). When listeners first hear the sound object this consists in referential listening, a listening that

they attempt to perceive in terms of their experiences as listeners, whereas listening to the sound object compels listeners to return to basics, with a fresh awareness of the nature of the *indices* heard. Schaeffer asks these questions: “What are the perceptions from which I have drawn these indices? How did I manage to recognise this particular voice? How can a gallop be described purely in terms of sound? What exactly have I heard?”. When listening to the sound object, listeners must make an unnatural effort “to perceive what had previously determined their consciousness without their realizing it.” (*Ibid.*, p. 270).

These are a few examples of Schaeffer’s ideas, which confirm the hypothesis that musicians draw upon their listening experiences to construct their knowledge and to create a sound object. This proves the hypothesis that composers start off with their experiences of sound objects, whose sound and musical characteristics they learn to differentiate through their listening and thus construct a new body of knowledge.

For Bayle the nature of acousmatic music is founded upon three formal schemes: capture, flight and simulation (Bayle, 1993, p. 58) which he describes as a game mode, an acousmatic mode and a manipulative one³. In this manner the composer moves on from the nature of acousmatic music (capture, flight, simulation) to the elements that make it up (percussion/attack, resonance/dissipation, maintenance/repetition, for example) in order to validate the process of measurement of perception/significance. This led him to establish correspondences between the dynamic formal entities, the semantic entities and the working processes⁴. The desire to describe the compositional modes of acousmatic music confirms the hypothesis that subjective feelings must inevitably be formalised and that they belong to a musical semantics which has become a verbal semantics. It is at this level that comes into play the relation between listener and composer, when the work becomes the interface between the two of them.

II. 3. The example of the 4th movement of the *Sonora of Fabulae*

Sonora is the fourth part of *Fabulae* composed between 1990 and 1992 and first performed at the Festival *Aujourd’hui Musiques* of Perpignan in November 1992 and subsequently performed again in the Cycle Acousmatique of the Maison de Radio France on 15th February 1993 (Mary, n.d.)⁵. The four parts are as follows:

... *fabula* might be the singing of the bird in the fable, and the wind that carries it ...

... *onoma* might be the projection of five pictures, naïve scenes of magic lanterns (‘vitromagie’)...

... *nota* might be playing with the movement, broken down, of notes caught by surprise in full flight...

... *sonora* could be mixing colours, space and rhythms in a dance both light and grave...

The piece is the result of a cross between analogical and digital work in which the loops, the superpositions and reinjections, created using magnetic tapes, are linked with audiodigital technology and the first versions of *Syter*⁶.

³ See table 1 “Classement des projections auditives en types de prégnance dynamique”, Bayle, 1993, p. 58. We refer the reader back to the tables collected in François Bayle’s book (1993), mentioned in the bibliography.

⁴ See table 3 “Correspondances entre les entités formelles dynamiques, les entités sémantiques et les procédés opératoires”, Bayle, 1993, p. 60.

⁵ Mario Mary’s text was very kindly furnished to us by François Bayle, during our interview with him.

⁶ Acronym for *Système de traitement en temps réel*, a tool for hardware and software created and developed at the GRM in the 1980s, an alternative to the 4X of the IRCAM.

Sonora like the first part of cycle, *fabula*, requires a group of several dozen loudspeakers. This constitutes a homage to sonority, and the idea came originally from a work by Debussy, *L'étude aux sonorités opposées*, whose analysis by Messiaen at the Paris Conservatory Bayle had attended. Mario Mary notes that it is the composer's favorite on account of "its mystery, its chiaroscuro, the surprises of its digressions, the space, and the climate of its sonorities." (Mary, n. d.). On the occasion of an interview the composer told us that the theme of *Fabulae* was inspired by a book by Umberto Eco, *Lector in fabula* (Eco, 1989), "which talks of the narrative thread; the things that tell their own story. The remaining story is just a trace of a story one wanted to tell, it only partly reflects the project of the story, it is the bones of this story, or sometimes just a fragment of the bones." (Bayle, 2012)⁷. The work illustrates this approach. The analysis of Mario Mary is testimony of this. "The problem at issue in *Fabulae* is the narrative thread: how narrativity can feed the narrative thread and do so all by itself, how it is possible to construct several levels of listening, either as images or else relating to auditory behaviour." (Mary, n. d., p. 1).

The remark is an interesting one for it can help us to achieve a better understanding of the connection between the work and the listeners. For what we are going to study is not so much the idea of narrativity which is an interesting path to explore but rather the idea of image-like levels of levels of listening or levels linked to sound behaviour. Mary then goes on to redefine the project of the work:

in *Fabulae* an underlying thread of narration accounts for what happens:

...*fabula* tells the story of a fabulous bird in an enchanted forest. You enter the territory of the fabulous creature which expresses itself through its song. Then it disappears leaving behind the winds that blow steadily. It's a fairytale.

...*onoma* consists of five brief landscapes, five postcards, like a set of contrasting pictures which describe the impressions felt by a single person however.

...*nota* plays with the idea of the note.

...*sonora* explores 'opposing sonorities'. This is a homage to sound.

The booklet accompanying the record was published in 1993 (Bayle, 1993, pp. 12-13) and includes a text by François Bayle who presents *sonora* in the following terms:

The fourth part – *sonora* – ends with a variation of form, a refrain serving as motif which in five places progresses from light to serious, from bright to sombre, to reach and confirm a resolution which is both suspensive and soaring, that of the bird in the initial *fabula*.

In the apologues then one hears the voice which speaks in the earlier language of sounds and describes the land of birth – the land of the unconscious. And thereby one perceives one or other parables:

... *and now go and dance* ...

As well as:

... *movement alone cannot lie*... (*Fabulae*, 1993, p. 5)

Two other texts accompany that of Bayle: that of Dominique Druhen and that of Jean-Christophe Thomas (Bayle, Thomas, 2008)⁸. I only repeat here the lines linked to *sonora*.

In connection with *sonora* Dominique Druhen wrote the following:

The naive character of *Fabulae* becomes less marked from *nota* onwards.

⁷ Author's interview with François Bayle, May 2012.

⁸ Jean-Christophe Thomas is the co-author with François Bayle of the book *Diabolus in Musica*, published in 2008.

Even so, in the *sonora* there reappears an organ motif that punctuates and marks out the entire piece. A motif which on this occasion consists of descending patterns of notes, slowing itself down, which renders even more clearly than in *Fabulae* the sound of compressed air in pipes.

This motif reappears on five occasions, each time in a lower and graver register (speaking both physically and psychologically), becoming increasingly dampened, as though forcing itself each time to hold back and providing its own accompanying figures.

The seven refrains are interrupted by couplets; then the guitar (guitar-harpsichord-harp *onoma*) makes a new break in the middle of the work which interrupts the flow of narrative, a superb hole in the mass of sound, a prodigious effect of staging; in the background there plays in a subdued tone a children's nursery rhyme on an imaginary xylophone whose bars constitute horses' hooves. The end of the work is no longer bathed any more in naivety. Wisdom has become sombre, the mood has become grave. A broad chord, with double octaves marks the final point of the fable with iridescent shrieks up to the higher pitches. That's all. (*Fabulae*, 1993, p. 9)

Christophe Thomas suggests in his text the idea of an imaginary orchestra, an instrumental feeling, suggested by "bars of muscular sound like the bars of a xylophone." For him *Sonora* and *onoma* are the "unruly, bitter side of a substance both refined and present" in which "sounds, images of senses, actually become (in the author's words) 'images of sounds': an image of images of images." (Bayle, 1993, pp. 12-13).

Speaking about analogical music M. Mary says that it is a form of music that is oral, just as surrealist painting is an oral form of painting. It comes from the body, it gushes out (Mary, s. d., p. 2). At the same time Bayle does have recourse to samples of flute, percussion and guitar which he has drawn from various sound sources for this piece.

Bayle fears that the acousmatic works may disappear for good if they are not provided with a guide for listeners, a synoptic plan. He therefore offers a temporal time plan for the whole of the work as a substitute for the guide that he had not yet had time to prepare for the listener.

Sonora then consists of four parts: 4'08, 4'20, 5'17, 1'52, making a total length of 13'57. It is composed around two sound processes which run throughout the piece, the first of which is a continuous process (an unending loop with incidents occurring from time to time), and the other an intrusive process produced in real time on a digital keyboard with three different samples which carry out a number of actions, in particular quick arpeggios or glissandi (Mary, no date, 13). The form of *sonora* with refrains contains "an allusion to the sonorities of Brazilian music which is repeated at regular intervals and provides the opportunity for very free digressions." Bayle explains that he has preserved the color of *bossa nova*, which is more something that "just happens rather than being produced on purpose" (Mary, n. d., p. 13). The fourth part of the fourth movement is made up solely of *bossa* which is one of the three elements, together with surge and bracketing which alternate throughout the whole of *sonora*. *Bossa* consists of sounds that recall the flute and other percussive and digital sonorities producing arpeggios or diatonic glissandi on a keyboard.

Here are some of the key terms taken from some of the writings and from the analysis of *Sonora*, published in the CD booklet:

loops, arpeggios, glissandi, xylophone, flute, melody, motif-cum-refrain, brilliant, gloomy, soaring, organ motif, descending features, slowing down, guitar, harpsichord, hole in the sound mass, double octaves, images of images, gushing out, body, samples, bossa...

We are now going to check if we find these terms in the texts of the students undergoing the test.

III. The listening protocol and the results

III. 1. The protocol

The listening protocol is the one we have already used in our preceding research (Terrien, 2003, 2006). The listener hears the same extract of a work three times with a minute's silence in between. The instructions for each extract are announced before each listening session: first set of instructions: write down the impressions, emotions and feelings you experience during this first listening session; second set of instructions: give a list of the musical characteristics, the musical elements which produce these emotions, impressions, and feelings; third set of instructions: add any other characteristics. The listeners are not allowed to take notes during the listening sessions. After each listening session they have just a minute to write down on a sheet of paper the words that correspond to what they experience followed by the musical characteristics.

We conducted the test with students from the department of music and musicology at the Université Catholique de l'Ouest, second- and third-year undergraduates and first-year graduates, making 20 students in all. At the time of the test the students had not as yet received any special training in acousmatic music. The students concerned were amateur musicians, with differing levels, from first-year music academy level all the way to those completing their dissertations (3rd cycle), but who had not received any training in electroacoustic composition.

Two kinds of response emerged, concerning first what was experienced and then the musical characteristics relating to those experiences. We shall attempt to test the validity of our hypothesis regarding the relation between impression, emotions, sentiments on the one hand and the musical characteristics reported on the other. To begin with, our analysis will deal with the terms which concern experience, subsequently we will look at those related to musical characteristics, and lastly we shall try to verify the relevance of the link between experience and musical characteristics. To help us carry out this analytical task we used the semantic analysis programme, *Tropes*⁹, which makes it easier to assess the quality and quantity of certain responses.

III.2. Results and an initial analysis

III. 2. 1. Experiences

Out of the twenty students involved all complied with the first set of instructions, and this made in all 97 items reflecting the varying experiences of the subjects. The items were of different kinds (common names, nouns, and adjectives). The words recorded were seldom representative of primary or universal emotions (Damasio, 1995, 1999) but constituted rather a translation of secondary or background emotions, connected with states of well-being, calm or tension, as described by the neurosciences. These might be items linked to an impression of movement (such as the flow of water, swarming, activity, agitation, and movement)¹⁰ or they could describe some imaginary world (magical sounds, dreams, the fantastic world, the world of the dream, a fantastic landscape, etc.), or an exotic location or situation (islands, the exotic, the steppes of Mongolia, Asian, oriental landscapes, etc.) not forgetting those items expressing color. The responses collected can equally be analysed in terms of the three groups of schemes set out by Imberty (Imberty, 1979, 1981), that is to say the scheme of kinetic and

⁹ <http://www.tropes.fr/>.

¹⁰ See the Annexe.

postural tension and release (panic, agitation, excitement, great excitement, and so on), the schemes of emotional resonance (loose and cotton-like, strangeness, embarrassed laughter, shyness, and so on), schemes of spatiality (spatial, flashing, brightness, cascades of colour, and so on).

Following the first listening session the subjects put into words sentiments generally related to movement, or to a music which has movement, and where an impression of verticality dominates with words like falling, going down, stairs, sinking. Other forms of experience express a sense of being elsewhere, ranging from a sense of being in some unfamiliar place to a display of pure imagination (such as exotic, Asian, oriental landscapes, fantastic landscape, star, space, planet, fantasy, imaginary, magical sounds and flashing). The expression of these words constitutes the expression of experience, emotions, which pass from a physical or physiological state to a mental image put into words, which constitutes thought. What now need to be tested are the connections that exist between these verbal expressions of thought and the work itself, or in their absence what composers themselves say even if, as Mario Mary points out, composers may “overstress intention” in the description of their work. We may note that no word describes a primary emotion (see table, p. 4 and annexe) and this seems to suggest that the listeners do perceive a new form of music, an unheard-of musical world and this forces them to express what they hear in words by making use of different kinds of sound references. The terms used derive from a more sophisticated language register and this shows that the listeners have drawn upon their more immediate cultural knowledge. They use vocabulary with more images and this certainly corresponds to their idea of electronic music.

The *Tropes* software confirms the predominance of movement, for it reveals the presence of a dynamic process of staging and action through the presence of verbs describing these movements. The analysis of the categories of responses in terms of the succession of words used also brings to light references which have greater significance. Thus space and water are significant indicators as is sound itself. Each one of the three references is associated with the others, as is shown by the diagram that follows and this seems to confirm the existence of close links between the verbal representations of experience and the musical characteristics of the piece.

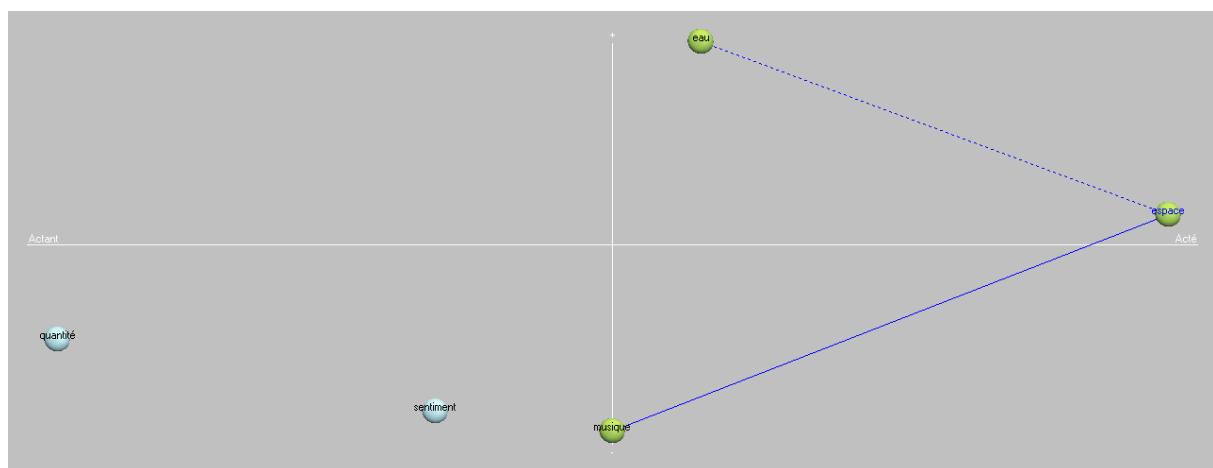


Figure 1: Diagram extracted from the *Tropes* program.

We now pursue our description and analysis of the data.

III. 2. 2. The musical characteristics

It should be remembered that the results obtained for these musical characteristics are the result of two listening sessions 2 and 3 taken together, and that the listeners express the characteristics that they believe are connected to their experience. After the second listening session, the impression of movement is conveyed by the adjectives “descending (8), ascending (5), chromatic (4), and so on”, the speed at which the instruments play with “repeated note (15), tremolo, trills, glissando (4), and so on”. Some listeners mention electronic music (7) and the use of synthetic sounds or sounds produced by the computer (5). Many recognize the “timbre” of a flute (8), of a xylophone (7), or a violin. A first conclusion to be drawn is that the listeners situate the musical genre among electroacoustic types of music (12), one actually using the term “acousmatic” (1). A second result concerns the identification of the ascending and descending movements such as glissandi (17), set in opposition to the stability of a sound that is associated with the flute in the form of tremolos and trills. Lastly, the listeners report the use of electronics and the treatment on sounds using these materials.

As regards the third and final listening session it may be observed that the listeners provide a detailed account of their understanding of the work, ranging from some quite general descriptions to a more detailed and technical account. Listeners may use general terms about music such as “ascending and descending movements, repetitions, short melodic motifs, and so on” progressing to altogether detailed expressions “synthetic timbres generated by computers, timbre created by many string, wind, percussion instruments, and so on”, or else they may progress from “descending note, strange sonority” to “xylophone, flute, heavy percussion, resonance, the sound of the instruments suggests the sound of a synthesiser”¹¹.

What the responses following these two listening sessions demonstrate is the fact that the listeners provide details of their ideas and thus display their cognitive resources and knowledge. While it comes as no surprise that musicological students should be using a specialised terminology, it may however be observed that they use this to identify a work and a musical genre about which they had never previously received any specific information. It may also be noted that these listeners will identify the various strata of the musical discourse and its organisation, without being specially trained to analyse such types of music. The first listening session serves as an introduction to the discovery of acousmatic types of music.

The description of musical characteristics indicates that the listeners possess a knowledge allowing them to put into practice strategies of perception. Though they have not been trained in acousmatic types of music, their sensitive listening to the work influences their ideas. Putting experience into words affects other forms of expression, such as a more refined style of language, and underlines the fact that this music uses new characteristics and a new organization of sound which they are able to describe both by affect and technique. The terms used for the expression of “emotions” (impression, experiences, feelings) are the expression of secondary emotions relating to movement, to a sense of unfamiliarity, and to the world of the imagination. The piece invites the listeners to abandon their “traditional” emotional schemes in order to describe their experience and thus to draw from a culturally more sophisticated language register. In the same way the expression of musical characteristics reveals the possession of a general knowledge about music which enables the listeners to organize a coherent and pertinent discourse about the work, without at all being specialists of

¹¹ See table of correspondences of responses, in the Annexe.

this kind of music. The present study confirms the semantic correlation between the writings of the composer, those of the authors of the CD booklet and the expressions used by the listeners. This work is only the beginning of the research which we hope to develop concerning the perception, reception and comprehension of electronic music among "uninitiated listeners" in order to study the correlation between the emotions and the construction of a body of knowledge of music and the connections established between *poietics* and *esthetics*.

Conclusion

In this study we have been able to confirm through a number of cases¹² the connections between what the work actually conveys as emotional potential and the capacity of the listeners to perceive this potentiality.

The emotional potential of the work is revealed through the sound and musical characteristics which are described through the analysis of the music both in terms of syntax and semantics. The tools, the indicators, and the materials which composers use to construct their work are capable of description. The syntax of the composer's discourse is also open to analysis, as described with the tools of Le Ny or those of Deliège. The musical discourse in its linear dimension, which takes into account the organization of sound indices in all its dimensions, is understood by the listener. For instance the fourth part of *sonora*, which is organized around the *bossa* element and is described as "flutes and other percussive and electronic sonorities making arpeggios or diatonic glissandi on a keyboard" (Mary, no date, 14), is heard precisely that way by the listeners as this study confirms. They also understood the goal, the finality of this work, "a kind of study 'with opposing sonorities'" and recognized the allusion to Brazilian music, and the reference to Debussy, a composer dear to François Bayle (see annexe). Though the listeners may lack the know-how of the acousmatic musician, they possess knowledge which enables them to make sense of what they hear. The vocabulary in which they express their experience does affect their thought and does confirm in a different manner this quotation from Damasio. "The collections of neural patterns which constitute the substrate of a feeling arise in two classes of biological changes: changes related to body state and changes related to cognitive state" (Damasio, 1999, p. 281). In other terms the word is the result of a process which leads from emotion to feeling through thought. The emotion which served for the composition of the work is perceptible to anyone who listens to the piece with a minimum of attention. Finally by taking into account a capacity for sensitive listening this approach to musical study enables the listener to recover knowledge, whether musical or not, and to construct new body of knowledge about the music of today by means of the verbal interactions between the members of the group.

Translated from the French by Philip O'Prey

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¹² The analysis of these results needs to be presented in detail, which is outside the actual scope of our article.

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ANNEXE

Auditeurs	Eprouvés, 1 ^{re} écoute	Éléments musicaux, 2 ^e écoute	Éléments musicaux, 3 ^e écoute
Master 1	1. rêve, sons magiques, cotonneux	1. Unicité des timbres, traitement électronique, réverbération, filtre de fréquence, modulation de fréquence, supprime ou enrichi le timbre, répétition de cellules mélodiques descendante et ascendantes, côté aléatoire, note répétée très rapidement, trémolo, musique électronique, musique des années 80-90, musique plutôt tonale, note pôle.	1. flûte pas sûr ; percussions, marimba, xylophone ; frissonnement de son ; une nouvelle cellule apparaît ; un signal en <i>mib</i> ? ; note tenue un timbre de flûte ; jeux sur les ambitus commence avec note medium <i>mib</i> , fini par son modulé de grave, électronique
	2. agité, chargé, pression permanente, impression de fouillis	2. parties piano et xylophone très chargées mélodiquement : piano : trilles, registre grave dans l'ensemble, traits en triples croches ; xylophone : très virtuose avec des mouvements conjoints ascendants et descendants en permanence sur des quadruples croches ; donne cette impression de lourdeur et de densité	2. partie de flûte traversière qui apporte de la légèreté et de la lumière dans cet atmosphère lugubre et lourdeur : notes tenues, trilles, notes piquées, marge du vibrato sur tenue renforce le côté lugubre ; plan formel et rythmique, impression d'irrégularité, notamment à cause de la densité de la masse sonore ; liberté d'interprétation par des départ qui semblent inappropriés, part d'aléatoire contribuant à la description de cette atmosphère
	3. fourmillement, activité, agitation	3. mouvements ascendants et descendants, répétitions de notes, courts motifs mélodiques, utilisation de nombreux registres de grave à l'aigu, superposition des motifs mélodiques	3. timbres de synthèse générés par ordinateur (timbre de violon) ; timbre créé à partir de nombreux instrument à cordes, à vents, percussions ; écriture/composition polyphonique (plusieurs voix) à partir d'instrument au timbre complexe ; me fait penser à des travaux de création de timbre de l'IRCAM
	4. électronique, nouveau monde, imaginaire, échapper à la réalité, papillonne, choses qui tombent, bulles, jolie pierre	4. électronique : sons d'instruments virtuels ; choses qui tombent : mélodie descendante ; bulle : aérien (par de l'aigu vers le grave), sons répétitifs ; pierres précieuses : jeu précis, entend bien toutes les notes même si plusieurs glissandos en même temps, précision des notes, articulation ; imaginaire : tessiture plutôt aigue, répétitif qui tourne emmène à penser d'autres choses	4. cordes : plus vers le milieu de l'œuvre, par bribes et jeu « agressif » et fort ; flûte : 3 sons, un son posé à la fois ; imitation vibraphone : répétitif ; au fur et à mesure : ressent une accélération de la manière de jouer, formation instrumental plus complexe (tous jouent en même temps) ; va des extrêmes : son à la fin pour le vibra (très grave) ; nuance identique ; nappe sonore

Auditeurs	Eprouvés, 1 ^{re} écoute	Éléments musicaux, 2 ^e écoute	Éléments musicaux, 3 ^e écoute
Licence 2	1. Impression de descente, eau qui coule, rotation, spatial, extraterrestre	1. note descendante, sonorité étrange	1. xylophone ? ; flûte, percussion lourde ; résonance ; sonorité des instruments fait penser à un son de synthétiseur
	2. imaginaire, fantastique, univers onirique, dessin animé	2. gamme par ton, joué par tous les instruments, imitations, instruments à vents et xylophone, marimbas	2. vibrato expressif sur les instruments à vents ; tenue d'une note récurrente ; le mode par le ton donne un effet atonal et très planant, presque stressant ; jeux sur la tessiture
	3. steppes de Mongolie, chutes d'eau, paysages orientale, asiatique, quelque chose qui tourne sur lui-même	3. tempo rapide, montées et descentes chromatiques très rapide (sur xylophone ?), instrumentarium original et exotique, longue tenue de note par rapport aux autres, motifs et phrasés musicaux récurrents	3. sonorités non-occidentales ; utilisation de flûte de matériaux différents ; sons presque informatiques (critiques ?) ; début sur une note, la fin sur un decrescendo assourdi (dû à la machine ?)
	4. étrangeté, étoile, planètes, escalier, langage exotique, brillance, scintillement, instabilité	4. gammes par tons, résonances/échos, répétitions de mêmes motifs, timbres des instruments pour le langage exotique	4. dissonances avec les échos ; contretemps avec instruments à vents ; polyrythmie ; modalité ; sons modifiés/bande sonore
	5. eau qui coule, insectes rampants, fou rire, vidéo à l'envers	5. bois et marimbas (lames de bois), trille et descente et montée, mouvement perpétuel de notes, traitement informatique de la bande sonore qu'on a imaginé	5. musique électronique : boucle, modification de la hauteur, panoramique, renversement de la bande ; musique non mesurée
	6. beaucoup de couleurs, mouvant, agissant	6. descendante chromatique et ascendante, répétitions chromatiques descendantes, aigu/grave	6. RAS

Auditeurs	Eprouvés, 1 ^{re} écoute	Eléments musicaux, 2 ^e écoute	Eléments musicaux, 3 ^e écoute
Licence 3	1. hésitation, timidité, découverte, paysage fantastique, eau qui coule, animaux peureux, espace, planète, chute d'astéroïdes	1. paysage fantastique : dissonances et glissandos ; hésitation, timidité et découverte d'un animal peureux : notes piquées, subites et courtes ; l'eau qui coule : glissandos au xylophone ; l'apparition de notes aiguës puis de tenue change le décor qui est plus aérien	1. RAS
	2. mystère, inconnu, danger, pénombre	2. musique électronique en partie, glissando aller-retour, utilisation des vents, sons de timbales réguliers, inspiration d'une musique sud-américaine ou africaine	2. RAS
	3. jazz, musique minimaliste, décousu	3. thème (motif), choix des instruments, thème/motifs répété, chaque instrument semble faire une partie à part entière, thème, motif de deux notes, choix d'instruments difficile à déterminer	3. musique paraissant loin, le son semble dispersé : sons d'ordinateur ? ou de synthé
	4. aquatique, répétitif, extra-terrestre, stressant	4. musique « lisse »/impression d'une musique non mesurée, thèmes récurrents, sons synthétisés/travaillés sur ordinateur	4. le timbre d'ensemble paraît feutré (les percussions et cordes semblent également fluides comme les vents) ; les motifs chromatiques descendants et ascendants m'évoquent le <i>Prélude l'après-midi d'un faune</i> de Debussy