

Music Analysis and Reception Behaviours: *Sommeil* by Pierre Henry*

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ABSTRACT

Sommeil, from Pierre Henry's *Variations pour une porte et un soupir*, provides the basis for an investigation into listening strategies. Methodological problems raised by the analysis of acousmatic music are considered, followed by a discussion of the three types of listening behaviour revealed in a study of eight subjects' responses to the piece: taxonomic listening, empathic listening, and figurativisation. Three further, complementary listening behaviours are also considered, and the implications for music analysis outlined.

We are going to read some analytical descriptions about a piece which is particularly simple. From the very first listening one can easily distinguish what this music is about. One has no difficulty in perceiving a structure, and a reasonably informed listener will be able to guess accurately the origin of rounds, the ways they have been treated, and the compositional processes used. At this point some readers may think that in choosing to analyse Pierre Henry's *Sommeil* I have sought to avoid difficulties.

However, such simplicity is deceptive. In actuality we shall observe that, even confronted with a piece so apparently clear and purified, listeners have divergent opinions: they do not hear the same thing, they group differently the sound units they perceive, and finally, because of the type of listening they adopt, they do not construct the same form. This observation is the more unsettling since the work does not appear ambiguous. One might expect the divergences to be even more obvious in a more complex music. The main objective of this study is therefore to differentiate and describe reception behaviours, which can then lead to some more general observations about music analysis.

*Translated by Christiane ten Hoopen and Denis Smalley. This music and a transcription can be found on <http://www.inagrm.com/sites/default/files/mini-sites/acousmographies/co/sommeil.html>

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QUESTIONS OF METHOD

One cannot tackle an analysis of electroacoustic music without indicating various methodological options. As has often been remarked, this type of music presents the analyst with all problems simultaneously: no score, no system, and no "pre-segmented" discrete units like notes. We are confronted with "music in its most general guise" compared with which all other musics (notated musics, traditional musics) seem like simplified particular cases. Consequently, theoretical discussion about the analysis of electroacoustic music is even more important since it can provide a starting-point for a wider reflection on music analysis.

Which Object Does One Analyse?

As a rule the discipline called music analysis focuses on two kinds of objects: one graphic (scores), the other sonic. The analysis of electroacoustic music is obviously concerned with the latter, as is the analysis of music interpretation, popular musics (rock, etc) and traditional musics. If transcriptions are made in these cases, they are only tools — the object of analysis is sound. Consequently, one should start with a discussion about the nature of this object. Is it concerned with an acoustic signal such as that fixed on magnetic tape and visualised on an oscilloscope, or is it the sound object in the Schaefferian sense?¹ Schaeffer (1966) was very insistent about the fundamental difference

In present analytical terminology the term "sound object" has three distinct meanings.

- (1) As opposed to the score, the sound object designates the music in sonic form. In this sense one can say that any acoustic trace is a visualisation of the "sound object". To avoid confusion with the next meaning it is better to speak of a "material sound object" or an "acoustic object", or even, like Camilleri, 1993, of a "sonic text".
- (2) Schaeffer uses the term "sound object" in two different ways. In the first case (Book IV of the *Traité*) a sound object is defined as opposed to a physical signal: a sound object is what one hears when "reduced listening" is put into practice, which means that causal and associative meanings of a sound are deliberately ignored. "A sound object occurs when (...) I perceive and identify the sound itself" (p. 268). In this first Schaefferian sense (in its wider meaning) there is no fixed dimension: an entire work can be heard as a sound object.
- (3) The same does not apply in the second case when it is a question of describing and classifying sound objects in terms of a typomorphology with a musical use in mind (Book V). In this case, in order to demarcate objects, Schaeffer proposes the law of "articulation-appui" "which should allow us not only to identify but also to classify, and thus select, sound objects" (p. 365; see also Chion, 1983, pp. 114-116). This rule leads to morphological units which are defined by an attack, a continuant phase and a termination, comparable with the syllables in a language. It is generally this latter sense (the restricted meaning) that people think of when they refer to the sound object "in the Schaefferian sense".

between the physical signal and the phenomenological object constructed by perception. The former has a material existence that can be directly observed with the help of laboratory equipment, the latter, the sound object (in its wider meaning), exists only in the mind of the individual. In this sense it is considered by Schaeffer as "intersubjective", which means that it "transcends individual perceptual experiences" (Schaeffer, 1966, p. 269. See also Chion, 1983, pp. 21-35).

A tradition established by Schaeffer, followed by, for example, Michel Chion (1988) and Lelio Camilleri (1993) and to which I myself have contributed (Delalande, 1972, 1976), is concerned with the analysis of the sound object as heard and apprehended through listening. However, it seems logical to me to adjust this position by proposing, on the contrary, that the object of analysis is really the physical signal itself,² the material object, the result and trace of the material acts of the composer, even if the method of analysis relies largely on listening. There are two reasons for this choice. The first is practical. For some years we have had access to software³ which allows a quick and easy visualisation of the signal, a kind of interactive exploration of this material object from different "angles" and with different "magnifications". This has greatly changed the practical conditions of acoustic analysis. It is not so much a matter of measuring (pitch, duration, etc.) but of "music imaging" (like "medical imaging"). Of course, these technological facilities do not change the theoretical problem: the machine cannot tell us which image to choose from the many different possible images of the same fragment. The majority of these images do not make any perceptual sense. With the infinite characteristics and configurations that one can create with this software, only external information such as an investigation or a verification of reception or production (as we shall see later on) can establish what is pertinent for a "music" analysis.

Thus we must address the theoretical level, and it is here that a second argument supports the choice of the acoustic signal as the object of music analysis. We should distinguish a poietic analysis (the production point-of-view) from an esthetic analysis (the reception point-of-view). With the former it could happen that "music imaging" makes visible realisation processes which would not have been revealed so clearly through listening. Here are two examples.

(1) An image of *Sommeil* showed that the general envelope decreases in a continuous, linear way from the first to the final second of its 2'40" (Fig. 1).

² The physical signal is either the electrical signal obtained by reading the analogue recording, or the sound file in the case of digital recording, or the acoustic wave emitted from the loudspeaker. These signals are theoretically isomorphic, apart from the distortions caused by converters and loudspeakers.

³ Notably the Acousmographie at the GRM.



Fig. 1. Linear decrease in amplitude.

It is highly likely that Pierre Henry, while mixing or making a copy, was careful to lower the potentiometers in an absolutely progressive way. If one listens carefully, detecting that the work finishes less loudly than it began, one is nonetheless still some way from being able to appreciate aurally the precision of this manual gesture.

(2) In the following movement of the *Variations pour une porte et un soupir* (*Balancement*) certain sounds and fragments are duplicated by copying.⁴ This can be heard if one pays attention, but one would not know just by listening whether this is a question of resemblance or actual identicalness. It is only the strict superimposition of the signals and all their acoustic representations which allow us to conclude that it is indeed a question of duplication through copying. It should be said immediately that these two cases are exceptional and the method that Nattiez (1987) calls inductive poetics, which consists of deducing production strategies from the material object, seldom provides such precise information. However, this does not matter since these two examples are sufficient to justify recourse to the physical signal for poietic analysis.⁵

⁴ See the partial transcription that I have made (Delalande, 1976, p. 88).

These remarks could seem to rekindle the debate about analysis at the "neutral" level in electroacoustic music. In fact if one believes that what makes this analysis impossible is solely the absence of a score, one might hope to find in these "acoustic images" a suitable substitute. However, the criticism of the concept of neutral analysis is much more fundamental; the concept is based on three precise propositions which are not equivalent:

- (1) The object that one analyses has a material existence ("neutral" in the sense of material).
- (2) The analysis can reveal (through whatever representation of the object) noteworthy shapes without prejudging their pertinence (the "neutral" as "foundation" or as "fragment").
- (3) The analysis requires a representation of the object on a supporting medium. It is only in particular cases that it is legitimate to merge these three neutrals, notably in the case of written music, but even then with an approximation that needs discussing. But this is certainly not the case we are concerned with, where an infinite number of visual representations corresponds to one acoustic signal, and where it is not possible to find noteworthy shapes without being guided by a selection criterion such as (in the quoted examples) a knowledge of production practices. (See Delalande,

For the esthetic dimension it is clear that the object of investigation is "what one hears". But this "aural given" should certainly not be confused with the sound object in the Schaefferian sense (even in its wider meaning), which is closely related to a particular way of listening, called reduced listening, that consists of "filtering out" any significations in the sounds. At the very most one could attempt to define a "raw sound object" not dependent on any particular listening behaviour, but resulting only from the elementary listening act which consists of *isolating* the object from its context, that is, isolating it from any preceding or following silences or noise, and possible interferences. But even this basic act is neither independent of listening strategy nor competence. So once again it appears that the physical signal, defined as the material product of creative work, provides a more general base for comparative study of esthetic constructions.⁶

A Critique of Morphological Analysis

The first idea which might occur to someone who wants to analyse a piece of electroacoustic music is to listen to it a number of times and try to distinguish the units (neither too large nor too small) which make up the music. Quite soon one will need to take pen and paper to sketch some kind of transcription from which one will subsequently try to pick out shapes, symmetries, and some sort of organisation. Building on this base it may be possible to make observations about form, realisation processes or the significations evoked. We have all begun like this. However, this "method" invites several comments which greatly diminish its value.

(1) Without being aware enough of it, the analyst practises a particular type of listening (which we call "taxonomic listening"), selecting characteristics and units, and extracting configurations which depend directly on this particular way of listening.

1986, for a more developed criticism of the concept of neutral analysis, and in the particular case of written music, Delalande, 1991b.)

⁶ This problem (which object?) is close to that of the "score". The word "score" designates on the one hand an object on paper where the pages are covered with black signs, and on the other hand the totality of pitch and duration relations represented by these signs. In so far as it concerns modern notation (but not too modern...) these two views are more or less equivalent for a competent reader, and the analyst is free to declare that he is analysing a "score" without specifying which view is being taken. But when the choice needs to be explicit it seems preferable to me to take the material object as the object of analysis. This is a "score" in the material or physical signal sense. In an analytical strategy this preliminary elaboration is carried out by the reader or listener based on knowledge of production practices. (For a more in-depth discussion of notated music, see Delalande, 1991b)

(2) Which criteria does one use to isolate the units? If the music is made up of easily identifiable sources (voices, instruments, natural sounds) they will be regarded in a particular way. But it is above all the remaining sounds, those without identifiable cause, where the problem arises. In many cases these represent the totality of the piece. One therefore applies morphological criteria, looking for contrasts, discontinuities in energy, thereby isolating "sound objects" in the limited Schaefferian sense. There are problems of application which we shall not address here: as Schaeffer had pointed out, if one considers an object in greater detail it may become a structure made up of smaller objects; above all, Schaeffer's descriptions need to be revised, completed and adapted to the types of sounds now more commonly used in music. (See Smalley's very useful proposals, Smalley, 1986.)

But it is on the level of epistemological justifications that a morphological analysis can in general be subjected to criticism. What is the aim of music analysis? What would one like to demonstrate, to know about a piece of music? There are many possible answers to these questions and it is up to the analyst to decide on an objective. However, there is one type of answer which would be unacceptable — one which aims to demonstrate what the music *is*, or what *the* form or *the* structure is. One must dismiss the illusion of the *definitive unique* analysis. Anyone who has tried to analyse electroacoustic music (or even a slightly complex sound) knows very well that one can reveal an infinity of morphological characteristics and therefore configurations of morphologies. This general remark applies not only to every piece of music but also to every object. Whether explicitly stated or not, an analysis always implies a *reduction*. Only certain characteristics and configurations are selected from among all those available. The question is to know how to do this. One answer, which is not the easiest to justify but is undoubtedly the simplest to carry out, is to apply an a priori framework: a list of descriptive categories (morphological or acoustic) adopted for the simple reason that they are available, or to use some kind of physical apparatus. The question of the objective of the analysis and the pertinence of characteristics in relation to this objective is thereby evaded.

We shall of course propose the opposite course of action. The objective of music analysis is to bring to light configurations which either reflect the choices (implicit or explicit) and actions of the composer, or which are needed to explain the reception behaviours of listeners (we shall see later the vastness of the programme involved), or both at once. Here one clearly recognises the two fields which Molino (1975) has called poietic and esthetic analysis.⁷

⁷ Camilleri (1993) excludes poietic analysis from the objectives of music analysis: "Even if information on the production strategies can represent a useful instrument of cor-

There are two points about this definition:

(1) The choice of this objective is presented here as arbitrary. In reality my conviction is that what we currently call music analysis is always devoted, more or less explicitly, to this end. Any other form or formulation which either does not reflect in any way the choices or actions of the composer or is not perceivable by listeners, will be considered as excluded from the field of music analysis.

(2) The word "music" in "music analysis" is important. For other purposes it would be justifiable to make statements about a piece of music which do not correspond to these criteria. For instance, a technician could re-create the dynamic peaks of a piece with the intention of making a copy without saturations. This is an analysis but not what we call a music analysis.

Once an analytical objective is chosen it becomes possible to derive a criterion of pertinence. Without again bringing up the application of this classic concept of phonology to music analysis we merely remind readers that the concept of "pertinence" is linked to that of "point-of-view".⁸ A characteristic is pertinent from a certain point-of-view when it permits the description of an object considered from that particular point-of-view. For example, the colour of a car is pertinent from an aesthetic point-of-view but not from the point-of-view of performance. Classically, in an analysis inspired by a functionalist approach, the points-of-view in question are not arbitrary but are chosen to take account of certain operations, indeed functions of the analysed object in the context of the practices with which it is associated. In the case of the music, these practices are production and reception.

We shall see later how these premises allow the definition of pertinence and a methodology for esthetic analysis. But for now let us apply them to a critique of morphological analysis. What is the pertinence of a morphological analysis? On a general and theoretical level there is no reason why pertinent units should coincide with morphological units. The best example comes from language where the phoneme, a functionally pertinent unit, is generally not a morphological unit and where, conversely, the syllable, a morphological

robore analytical information stemming from listening to the piece, it is not a principal part of analysis". This is a choice which is all the more justifiable, because the more musical practices have evolved, the more "music is made to be heard", as Schaeffer expressed it (which undoubtedly would not have been so obvious for a Baroque musician). However, besides the pedagogical significance of poetic information which Camilleri indicates, it seems to me justifiable from an anthropological viewpoint to regard "the musical fact" (Molino) as an articulation of objects and human behaviour which consist of making just as much as listening (or more generally "receiving", whatever the modalities of this reception might be).

⁸ For a more in-depth discussion see Delalande (1976).

unit (in the sense understood here — a sound object in the restricted sense) is generally not functionally pertinent. The morphological analysis of electro-acoustic music (based on a resolution into sound objects) is a "syllabic" analysis, which does not provide the means of highlighting pertinent configurations either poietically (a "trace" of compositional strategies) or esthetically (contributing to explaining the behaviours and representations of listeners). Thus we do not consider a morphological analysis to be a music analysis.

However, one must make some reservations about this general remark. It is not impossible that a music has been imagined and realised as an assemblage of sound objects. (This is undoubtedly the case with the *Étude aux Objets* by Pierre Schaeffer.) The poietic pertinence of a morphological analysis would thus be assured (but it must still be proved). More generally, differentiations among sonic units resulting from production processes (montage, mixing, filtering, etc) can in certain cases coincide more or less with morphological differentiations, which would therefore have a poietic pertinence.⁹ It may also be possible that certain listening behaviours are based on a differentiation between sound objects: this is the case of what we shall call "taxonomic listening". In such cases morphological analysis is found to be locally pertinent. Nonetheless, the fact remains that as a general rule, an analysis which begins by segmenting the music into morphological units of sound object-types (in the restricted sense) in order to see how the listener organises them or how they reflect the choices and strategies of a composer, would generally lead to an impasse. (That is, it would not respond to the objectives considered here).

There is one final reservation (to temper the effect of this somewhat dogmatic statement). We should clearly distinguish morphological *units* from morphological *characteristics*. Schaeffer's sound object (restricted sense) is a unit isolated from its context by Gestalt laws of continuity and contrast. It is the analysis into perceptual units of this type that we criticise here. But Schaeffer, in order to describe these objects, introduced a series of "criteria" (which I prefer to call "morphological characteristics") such as "*masse*", "*allure*", "*entretien*", etc.* which one can usefully expand or update (as Smalley has done). As a last resort the description of pertinent units, whatever they may be, always hinges on the description of such characteristics. If one wants to take

⁹ The GRM devoted its 1994-1995 research seminar series to the study of relations between operational and descriptive categories at the morphological level.

* Translator's note: *Masse*, *allure*, and *entretien* are Schaefferian concepts for describing sound objects. *Masse* denotes the way a sound object occupies the pitch-field, *entretien* designates the way in which a sound object's energetic progress is maintained and *allure* denotes a kind of undulation (or vibrato) of the *entretien*. The reader should refer to Michel Chion's *Guide des objets sonores* (1983) which comprises a collection of 100 Schaefferian notions.

account of the "hardness" of an "impact" (esthetic categories used by listeners) this would be explained in terms of attack, texture of mass or any other morphological (psycho-acoustic, or indeed acoustic) description (just as the phoneme is described with the help of characteristics borrowed from phonetics).

In order to express myself in a more intuitive way, I would say that a morphological analysis which is not guided by a search for pertinences either does not contribute a great deal or gets lost in absurdity. It is a bit like trying to analyse Leonardo da Vinci's *Mona Lisa* by noting that the painting represents a three-quarter bust of a woman, with hands crossed, countryside in the background, and by pointing out geometric spaces which differentiate the descriptive characteristics which spring immediately to mind, such as light vs dark, sharp vs blurred, close vs distant, etc. All this does not mean much. Analysis begins beyond this, when one looks into the problems in much greater depth. But which problems? One could enjoy oneself examining forms that demarcate a colour spectrum contained between two arbitrarily chosen frequencies. Leonardo da Vinci himself, despite his known liking for speculation, did not venture this far. Moreover it is certain that no viewer will perceive these forms. This is one example of detailed morphological analysis among thousands which we shall ignore due to their absurdity. By contrast, one could pay attention to certain pertinences, such as the look, the smile, the workmanship, the perspectives, because one knows or hypothesises that they will shed light on the fascination the painting exercises over certain people, under certain conditions, or else (or both) because they respond to the intentions, speculations, influences, techniques, etc. of the painter. To analyse these pertinences one will rely on morphological descriptions. For instance, one will describe the faraway look by noticing that the dark patch of the pupil is displaced in relation to the axis of the eye. But one would never have sought out this morphological characteristic of "decentralisation" if one had not been guided by a search for pertinences. From this comparison (a bit absurd and for which I hope I shall be excused) one can learn three lessons:

- (1) that the number of morphological descriptions which can be applied to an object is infinite;
- (2) that the descriptions selected are choices according to extrinsic criteria and are intended (in the case of an analysis with an artistic aim) to elucidate production and/or reception;
- (3) that the characteristics and morphological units on which these pertinent descriptions rely would not generally have been discovered without being guided by a search for pertinences.

Having criticised the programme of morphological analysis (the simplest and most commonly found kind of analysis) it remains to propose and illustrate another. This is what we shall now attempt.

Search for Pertinences

From the above remarks it follows that the search for pertinences lies at the heart of what we call "music analysis". Analysis will consist of relating external observations, focused on production or reception, to internal observations about the object under consideration. Usually this relating process is carried out in a very intuitive way based on a diffuse knowledge of production processes, or by trusting in one's own reactions which one believes represent those of the competent listener. But this poses some matters of conscience to a scrupulous listener. For example, Denis Smalley, at the end of a particularly detailed analysis of a movement of Parmigiani, asks himself about the status of this analysis: "In trying to analyse electroacoustic music aurally there is always the fundamental problem of uncovering pertinent criteria. What I find depends on what I hear, what I strain to hear, what I choose to hear" (1992, p. 433).¹⁰ The above attempts at definition and the following attempts at application are aimed at trying to base the determining of pertinent criteria on something other than the personal judgement of the analyst.

There are two main ways to proceed. The first is by means of "external inquiry", by questioning the composer or listeners — or by filming them or capturing their physiological responses, gathering all kinds of information about their modes of behaviour — in order to deduce *what the analysis must account for*. The second way is by hypothesis and verification, by discovering particular features in the object, which one imagines must be the result of choices or strategies of the author or the cause of certain responses in listeners. Normally, one must *verify* this. One thus enters into a kind of experimental methodology (cf Delalande, 1991a). The relation that one seeks between object and listening behaviour, and which forms the basis of pertinences, is actually always causal. The specific features of the object which are considered pertinent are those explained through compositional strategies and choices, or those which contribute to explain certain listener responses.¹¹

¹⁰ We should point out that Smalley's analysis is not morphological, contrary to what the term "spectromorphology" (which marks his contribution to theory) might suggest. It is more semiotically inspired ("Ultimately I am concerned with uncovering those criteria which are carriers of signification" (Smalley, 1992, p. 423)). The criterion of identification of units which he calls "source bonding", which consists of associating sounds with their source, real or imaginary, or of relating sounds because one imagines a common source (what Chion, 1988, has called a "thing"), deliberately ignores Schaeffer's reduced listening in order to search for signs and icons. Moreover, Smalley proposes a "behaviour network" model to describe the functions of larger units, which is reminiscent of the "actants" of the semio-narrativity of Greimas, as used by Tarasti (1989).

¹¹ It may seem shocking to encounter a cause-effect relation between music and listeners' responses when one knows that the listener is quite free to choose a listening atti-

It is now the particular case of esthetic analysis that we are going to tackle, by searching out pertinences through an external inquiry process.

Esthetic Approaches: Listening Behaviours

One of the difficulties of describing music as heard is that we never hear it twice the same way. The general idea that guides this study is to search for consistencies, not directly in what listeners hear but in the way they listen, that is to say, in their listening behaviours. As has been quite rightly said by Smalley: "What I find depends on what I hear, what I strain to hear, what I choose to hear". In listening attentively to a piece of music one adopts, more or less consciously, a goal: one expects something at this moment of listening (which becomes clearer during listening), which determines a strategy and specific focuses on this or that, contributing not only to the forming of a perceptual image of the work with its symbolisations and meaning, but also to the provoking of sensations, and eventually emotions, which in turn reinforce or reorientate expectations. It is this act, where objective, strategy, perceptual construction, symbolisations, and emotions are mutually dependent and progressively adapt to the object, that we call "listening behaviour".

One would have thought (and I thought it some years ago) that listening behaviours were just as variable and personal as any impressions that occur to listeners. This is true at the level of what one can call "actual behaviours", which depend on circumstances and individual states of mind at the time of listening. But it seems that one can find consistencies in these actual behaviours; there is not an infinite number of ways of listening to a piece of music and, more precisely, actual behaviour can be considered a choice or alternation between different "behaviour-types" which are perhaps not unlimited in number.

My initial project was to break down actual behaviours into behaviour-types chosen almost arbitrarily in such a way that the observed behaviours could be considered combinations of these types (a bit like how all the vectors of a geometric space are a combination of three appropriately chosen basic vectors). But it now seems clear that the types have a *psychological reality*, as attested by the existence of *conflicts* between *incompatible* listening strategies. The listener can practise listening behaviour A or B, moving from one to the other, but cannot practise both at once.

tude, references, etc. Naturally the "response" is not absolutely determined by the musical "stimulus". However, one could only conceive of responses as being completely independent of the music if they occurred regardless of the work in question. Therefore the music is one of the factors which determine the listener's responses.

The question is to know whether an ensemble of such listening types is relative to a work and to a specific group of listeners, or more generally, to a profile of listeners and to a musical genre, and finally what degree of generalisation they represent. For the time being caution requires that we assume these listening types to be relative to the circumstances of a given experience. But a disconcerting correspondence inclines one to imagine the contrary. The observations discussed in this study were carried out and analysed (with Jean Christophe Thomas) between 1979 and 1988, when we were led to distinguish, in our corpus of testimonies, the six listening-types described below. It turned out that we had to delay publication in order to carry out an analogous experience with a work by Debussy, which, a priori, does not have much to do with Pierre Henry's *Sommeil*. The listening-types resulting from the Debussy presented many analogies with the *Sommeil* types, to such an extent that we decided to give certain of them the same names. Might they have a certain universality? This is the question which justifies the publication of this study.¹²

APPLICATION TO THE ESTHESIC ANALYSIS OF "SOMMEIL"

Inquiry Protocol and its Limits

Eight subjects were asked to listen to this short movement by Pierre Henry and to account for their listening.¹³ Four are electroacoustic music composers (of whom two are well-established), three are musicians and amateur followers of this type of music, and one is a relative novice to this field. Each of the eight was separately invited to listen in comfort, as if at home, over good listening facilities. After that, Jean-Christophe Thomas, the only one present during the listening session, urged each to comment both on listening approach and on the work as heard, stimulating this testimony by asking questions, the whole being conducted as a relaxed interview. Three subjects listened once, two subjects twice and three subjects three times. All these testimonies (16 in total) were recorded and transcribed (first document, 56 pages). This corpus was analysed several times by J.-C. Thomas and me, firstly subject by subject,

¹² The reader is invited to compare this with the study of Debussy (Delalande, 1989).

The documents related to the study of *Sommeil* are collected (and are available for consultation) in 3 volumes of unpublished research in the internal library of the GRM: no. 10: "Témoignages d'écoute sur *Sommeil*"; no. 11: "Analyse des témoignages d'écoute sur *Sommeil*", by Jean-Christophe Thomas; no. 39: "Session d'étude sur *Sommeil*", by FD and JCT.

¹³ They are: François Bayle, Marcelle Guertin, Ménehould Hémard, Alain Léobon, Philippe Mion, Marie-Noëlle Moyat, Guy Reibel, and Christian Tantale.

not very systematically, noting down the terms and metaphors used, and trying to describe the listening and discourse strategy adopted, the image perceived, and the implicit objective (second document, 111 pages). Then cross-checks and syntheses were tempted (third document, 68 pages).

One must admit right away the limits of this study. Eight listeners is a small sampling, too small for claiming to draw the slightest statistical conclusion. But this was not the aim. One suspected that there would be divergences. The question was rather to know if we would observe convergences. We did find some, especially regarding three listening-types that were adopted, at least at one moment, by three subjects.

There is no logical objection to drawing on only eight subjects as long as one does not seek to generalise the observations. What we demonstrate here is solely that:

(1) There is a coherence in listening behaviour, that is to say that expectations and specific interests determine a strategy, and therefore focuses, selections, and a specific perceptual construction. This is as much a matter of the form as evoked significations and aesthetic appreciation. To be precise, it is enough to be able to contrast two different behaviours in a sufficiently coherent manner in order to show the constructive role of a behaviour.

(2) Even with such a restricted corpus, analogies between certain testimonies emerge clearly. What is disconcerting is not that different people say the same thing about the same music (after all this is rather reassuring), but that at the moment when they are sensitive to the same musical aspect (which is translated, for example, by comparable metaphors) they select the same elements to construct a form. Besides, they do not even notice certain differences which for another group appear very evident. One readily notices the sketching out of a typology of behaviours which is also a typology of forms attributed to the piece.

(3) It is therefore not difficult to take each of these behaviours as an analytical point-of-view. Each behaviour is already a point-of-view of the object, resulting in a selection of hierarchically organised, descriptive characteristics. It suffices to adopt this selection and hierarchy and apply them systematically to the whole of piece. Even this modest corpus suffices to contrast three points-of-view which are sufficiently well described so as to lead not to one, but to three distinct analyses.

The real weak-point of this study on the methodological level is not so much the number of subjects as the interpretative role implied by definition in an analysis of verbalisations. One can make three major criticisms:

(1) A verbal testimony is a more or less a faithful account of what happened during listening, undoubtedly influenced by the self-image of the listener.

(2) Free discussion follows a conversation dynamic, and thus a differently conducted discussion would without doubt have led the listener to insist on other points.

(3) Once these testimonies have been collected and transcribed, the comparisons carried out are the result of the analyst's appreciation.

What one can reasonably draw out from a testimony is what the listener has heard and not heard (which can easily be verified by complementary questions), the groupings constructed, and the metaphors used to describe the sounds. This data is already very explicit, and one does not need to venture into risky interpretations.

One could think about applying a more orthodox, scientific method. There are two possible directions. The first would consist of collecting simpler answers, which would be easy to treat in a systematic, even automatic way (questionnaire, grid of adjectives, segmentation task, etc.). But this would deprive us of the richest information which permits a detailed description of listening behaviour. Therefore it seems to me that the second direction is the one which ought to be adopted in future music analysis. This consists of testing experimentally the pertinence of esthetic analyses. If it is correct that there is a psychologically explicable relation between a listening-type and a form attributed to the object, which can be described by analysis, then this analysis has a predictive value for reception. Thereafter it is theoretically possible to validate the analysis. But we shall not go as far as that within the boundaries of this article where our goal is none other than to differentiate points-of-view and thus analyses, based on the description of listening-types.

FIRST POINT-OF-VIEW: TAXONOMIC LISTENING

Taxonomic Listening as a Behaviour

We shall begin with the taxonomic mode of listening even though it may be the most artificial, indeed artefactual. It responds to the listener's desire to have a global, synoptic vision of the work. For us analysts, this synoptic vision will be a useful reference-point for the other analyses.

Attitude and strategy

Taxonomic listening is manifest through the listener's tendency:

- to distinguish sufficiently large morphological units such as sections or chains and to make a mental list of them;
- to qualify these, but just enough to distinguish them from each other;

- to notice how these units are arranged in relation to one another;
- to try and memorise all this data.

Listener F: *I had the impression of hearing three different sounds: this kind of white breath sound, dull (I do not know if this is what one calls white noise, it is in my own jargon) and then over this, higher up, came these kinds of bright water drops (...) and between the two, a much lower sound, like a pulsation. And at the very moment where this low pulsation disappeared — there was only the breath sound and the bright drop — the breath changed (..): from dull it became a bit brighter, a bit more coloured...also higher, (...) and closer. The cyclical movement came closer.*

The concern to construct and memorise a global image of the work, which respects its proportions, suffices to explain the different characteristics of the strategy applied.

Segmentation

The morphological units are grouped into sufficiently large ensembles so as not to be too numerous and so as not to exceed memory capacity. The listener immediately realises that he should not focus on over-detailed contrasts which would create too many units.

As a general rule, listeners either give a detailed description ignoring entire moments or entire chains, but comment abundantly on what they decide to talk about (as one will see with empathic listening), or else they talk about all moments and all chains equally. Taxonomic listening falls into the latter category. With taxonomic listening segmentation can be almost arbitrary, hardly correlating at all with morphological contrasts. The listener finds it necessary to introduce discontinuities, even if morphologically the transitions are continuous: there is a search for contrasts. *Sommeil* is segmented into successive "parts". One subject even talks of a "first movement".

Descriptive metaphors

The metaphors used to describe the sounds have a labelling function. In contrast to comments arising from empathic listening, where varied metaphors are used to describe approximately sensations which are difficult to express, with taxonomic listening the image once chosen, is systematically used to designate the same type of sound.

The ensemble of descriptions of the "bright water drop" by listener F (first listening):

kinds of bright water drops
bright water drop
brighter pulsation

*water drop water drop water
drop water drop, this bright
sound*

Taxonomic listening, a means of orientation

This is a listening behaviour that leads to the most neutral perceptual image possible in the sense that the subjects who practice it aim: (1) to give a complete picture with little detail, a map on a large enough scale without distorting the design; (2) to parenthesise subjective characteristics which might affect the true image of the object.

For these subjects, as for us, it is a canvas on which one will subsequently be able to plot more personal observations. It is conceived as a practical reference and this is why we ourselves, following the example of our subjects, shall make this taxonomic image of the object the base on which we set out our different interpretations.

It is possible that these ideas of pictures, maps and scores — graphic representations on paper — correspond to what happens in listening. Paper as a medium, is associated with a double function: (1) a memory aid; (2) an analytical tool for laying out the relative nature of units. Is there a mental transcription in taxonomic listening?

Taxonomic listening, an experimental artefact?

Taxonomic listening is undoubtedly an artefact produced partly by our own experiential mechanism. The subject, called upon to verbalise, seeks to retain a complete and truthful image of the object in order to make a good impression. Maybe on his own, in more spontaneous conditions, he would listen differently. There are several responses to this objection. Firstly, it is by no means certain that this listening behaviour is not actually practised in other circumstances. Certainly this particular circumstance induces it, but other circumstances may also do so. For the present it is not our prime objective to know how people listen spontaneously, that is, in the circumstances they encounter in their listening lives. Our objective is to list types of likely listening practices. This particular artefact is awkward not because it adds an artificial listening behaviour to the existing list but because it prevents the appearance of other behaviours. But although this bothers some subjects (listener F) because it conflicts with another listening behaviour, it does not prevent other behaviours from appearing in the totality of observations. (In general, taxonomic listening operates in combination with another listening behaviour.) Therefore, even if this artefact influences and modifies listening behaviour, thereby creating a combination of behaviour-types, it does not affect the list of types. (It must be included anyway.)

Construction of the image

(1) The taxonomic listenings to Sommeil isolate three distinct and contrasted chains, which do not have a hierarchical relationship: chain 1, high impulses; chain 2, low impulses; chain 3, breath sound. Listener C: *"Three elements are clearly differentiated here (..) as a function of their tessitura, their thickness, their spatial perspectives":*

Three distinctive characteristics are put forward here. The second, "thickness", probably designates spectral bandwidth, reinforced or mitigated by the brevity or stretching of duration (as described later). Listener C: *"Spatial perspective, presence: the high hitting sound is evidently further away (reverberation, artificial space, distancing) even if the attack is close. The breathing is quite close. The other hitting sound, low and regular (which one doesn't hear right up the end) is practically in the membrane [of the loudspeaker 1".*

(2) The subtle variations within each of these chains have not been noted in so far that they do not assist the identification of successive parts. Neither has the gradual evolution from forte to pianissimo been noted (for the same reason).

(3) One or two changes are noted which determine a segmentation of the work into two or three parts.

First change (letter B): the disappearance of low impulses, modification of the breath chain, modification of spatial perspective. Listener F: *This low pulse, towards the middle of the piece, one doesn't hear it any longer; moreover, right up to the end. At that moment, the breath sound has another...another colouring (..) a bit less like white noise, also a bit less full. And I have the impression that it comes closer. (...). I still perceive the water drop in the same way: in the background (this water drop has a resonance).*

Second change (letter C): new change in the breath sound and spatial distribution, such that one can distinguish "three panels" (Listener C).

Aesthetic appreciation

Taxonomic listening is more laborious than pleasurable (it is a response to a task that the listener sets himself), and may begin to conflict with more spontaneous tendencies. However, here it is sufficiently rewarding inasmuch as the work lends itself to such listening: it is short, it unfolds in easily differentiated chains and is clearly articulated. Listener C: *Simplicity, legibility, purely because of the choice of materials (...). He superimposes materials which create sufficiently strong contrasts so that each one is very perceptible (...). This is a very typical Pierre Henry "orchestration":*

Taxonomic Analysis of *Sommeil*

For the time being we shall continue with an analysis based on the same criteria adopted in these listeners' analytical sketches.

Formation of "chains"

The first observation which an analysis must account for is the ease with which the taxonomic listener groups the sound objects (in the sense of morphological units) into three macro-units which we shall here call, according to French electroacoustic usage, "chains". A chain is a particular case of "auditory flux" which groups objects in a reasonably extended temporal ensemble. (One can speak of a chain of objects starting from 5 to 10 seconds.) These objects (1) resemble each other closely enough to be grouped together; (2) contrast as a whole with the context in which they are heard. (A chain can also comprise only one extended object: "trame", "accumulation"....)* The chain thus presents an internal morphological *continuity* distinguished from simultaneous events by morphological *contrast*.

(a) *Continuity*. Here the continuity of each of the three chains is determined by the quasi-periodic repetition of quasi-identical sound objects.

(i) Chain 1: "high-impulses"

From the first to the penultimate second of the work, the high impulses follow each other at medium time intervals of 4 seconds (4.1 seconds). The time intervals between two successive impulses (represented by the height of the vertical lines in the diagram below) vary from 2.2 to 6.3 seconds, but 36 of the 38 intervals (about 95%) stay within a 3 to 5-second range. One notices that successive intervals are almost never identical (Fig. 2).

All these impulses, probably created from the same instrumental source (a flexatone?), are "tonic" (i.e., fixed pitch) percussion-resonances and are of quasi-identical pitch (stationary frequency varying from 2350 Hz to 2150 Hz, less than a tone). Their common duration is in the order of a second including the resonance but they are generally "anamorphosed", to adopt Pierre Schaeffer's expression. That is to say, the foreseeable nature of their resonance tends to be shortened at the very moment of attack.

Almost all the impulses have reverberation. One will notice two exceptions which play a role in the articulation of the sections: (a) the absence of rever-

* Translator's note: According to Pierre Schaeffer's terminology both *trame* ("weft", "web" in English) and *accumulation* are types of eccentric sound objects. A *trame* consists of a texture of superimposed, evolving components of similar nature. An *accumulation* consists of a fairly unified texture of rapid, discontinuous micro-objects. See Chion (1983).

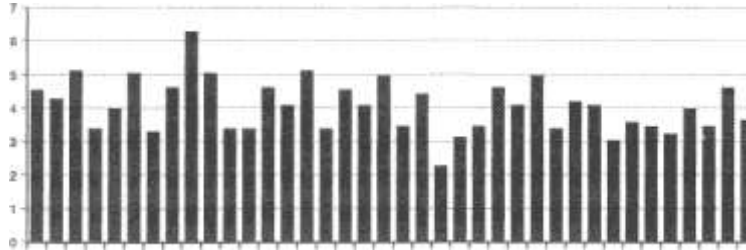


Fig. 2. Quasi periodicity of high impulses.

beration (and even a resonance cut-off) on the last impulse of section A, which probably helps taxonomic listeners in their perception of the transformation of chain 3 (breath sound) and the disappearance of chain 2 (low impulses); (b) the accentuated resonance of the last impulse which announces the end.

(ii) Chain 2: "Low impulses"

The 17 low impulses determine 16 time intervals, which are probably rigorously isochronous, with a duration of 4.8 seconds. The apparent duration fluctuations in the diagram below (in the order of 0.1 second) correspond to the approximation of the sonogram's graphic plotting (with the exception of one of these intervals, which is 3.6 seconds) (Fig. 3).

This observation has hardly any relevance at the level of reception because it is almost impossible to estimate or to experience the precision of this regularity. On the other hand it is very likely relevant at the production level. One can imagine that Pierre Henry either played back a tape loop, or (less likely considering the circumstances of the creation of this piece) used a generator. The irregularity of the 39th second could thus indicate a "splice" carried out after mixing. Moreover, as far as one can judge by listening, as with the observation of the fines, these impulses appear identical (apart from the decrease

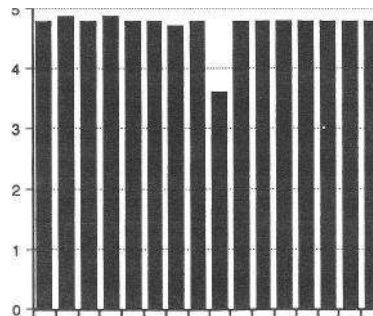


Fig 3. Periodicity of low impulses.

in amplitude). Each comprises two very close micro-impulses. The combined conditions of continuity, which go beyond what is necessary, determine that the taxonomic listener will group these 17 impulses as a single unit (a chain).

(iii) Chain 3: The "breath sound"

Unlike the previous chains, the morphological units which make up this chain are all different, yet sufficiently close to each other to be regarded as similar in material and profile. They are overlapping, malleable forms of complex nodal mass, with pitch profiles (probably created through filtering).

As certain listeners noticed, there are two changes which demarcate three sections.

(A) These fluid forms are stretched out in time, with a frequency of occurrence of about once every 2.7 seconds (26 times in 70 seconds). The melodic profiles sweep over a fairly broad range (about two octaves) which is subsequently restricted at about 26 seconds (to about a fifth).

(B) The swept frequency band shifts into a high register and the overlapping of the forms becomes systematic, creating greater continuity. However, one distinguishes the entries and exits of the superimposed units through their initial or final glissando, in a rhythm that might appear faster than previously (about one entry or exit per second) were this flux not to be segmented by silences, making the groupings longer (an average of 3.8 seconds: 12 times in 46 seconds).

(C) The breath chain now splits in two. One is in the same tessitura as the previous breath sounds (which it therefore seems to continue) but is segmented into distinct objects separated by silences (on average one every 3 seconds: 10 times in 30 seconds). The other is lower, of fixed pitch (except towards the end) but always of nodal mass, and is also segmented into separate objects which occur predominantly in the silences of the higher chain (thus providing continuity) at approximately 3-second intervals.

One notices that different devices are used to provide a relative continuity and unity in this chain despite changes: a constant pitch-play (even if this concerns complex masses), no silences which are too long (thanks to the overlappings) and a relatively stable average periodicity (about 3 seconds).

(b) *Contrast.* The three chains are clearly differentiated from each other. We note here in detail the three distinctive characteristics noticed by taxonomic listeners.

(i) Tessitura

One cannot imagine a more evident spreading of registers: the "low impulses" although of complex mass (i.e. non-identifiable pitch) are in the extreme low

register, much lower than, for example, the low registers of orchestral instruments; the high impulses are in the region of d6 whereas the breath sound sweeps across the whole middle register.

(ii) Spectro-temporal "thickness"

The perceptual criterion of "thickness" seems to result from the association of two acoustic characteristics: the spreading over the frequency spectrum, and the spreading of events over time. Set out as a graph of frequency as a function of time these three sounds present highly differentiated shapes (independently of their tessitura) which can be represented on Fig. 4.

The high impulses are relatively spread out in time (over about one second, two seconds with reverberation, no disturbance in the sustainment phase) but very restricted in the pitch field since for the most part they are limited to a pure frequency (except for the attack) — no harmonics visible on the sonogram. Conversely the low impulses are contracted in time (two impulses of approximately 100 ms with a 250 ms delay) and for this reason they have a very spread transient frequency spectrum. The breath sounds present a "calibre de masse", to use Schaeffer's term, very stretched out from low to the high, spread out over 1 to 2 seconds. These three types of sound represent the most contrasted spectro-temporal combinations possible within such a duration range.

(iii) Presence

The arrangement of the three chains in three depths of presence, from very close to distant, is a discriminating factor. But the distribution in space, which changes during the course of the piece, further contributes to explaining the perception of a segmentation into three sections (appropriate to this type of listening). We shall examine this in the following section.

Segmentation

Although this piece can be heard as very continuous, almost repetitive, taxonomic listening listeners perceive it as consisting of two or three successive

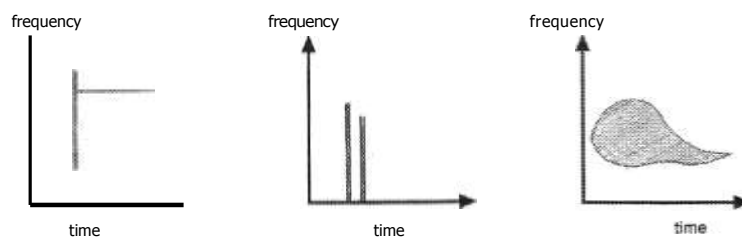


Fig. 4. Spectro-temporal shapes of the three types of sound.

sections. Here we shall only systematise the application of segmentation criteria as reported by such listeners (Fig. 5).

The taxonomic analysis of spatial distribution is represented in Figure 5. During the whole of section A (from 0" to 1'16"), the three chains are heard from the left loudspeaker, distributed in three depths of presence: the "low impulses" are "in the membrane" of the loudspeaker, as if the loudspeaker were itself the source, the "high impulses" are perceived in the distance

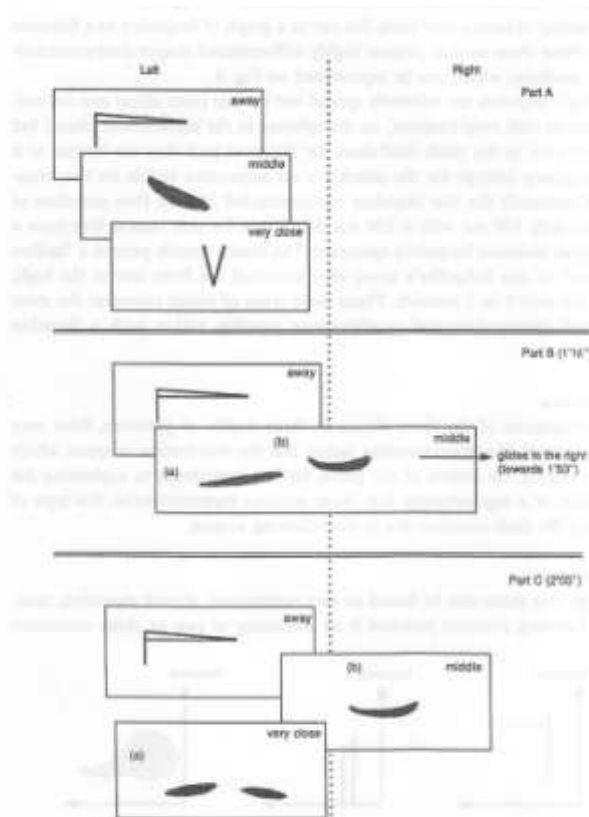


Fig. 5. Spatial representation of Sommeil according to taxonomic listening.

(because of the associated artificial reverberation), while the breath-chain floats in an undefined middle distance.

At **B** (1'16"), the low impulses disappear while the series (a) of breaths heard on the left (whose profile becomes flatter) are joined by another series (b) in the middle, in approximately the same tessitura and the same middle distance. (They are differentiated in large part by their localisation on the left/right axis.) A little before C (about 1'48"), the breath-chain (a) acquires a lower pitched component and (towards 1'53") chain (b) glides to the right.

At C (2'05") the disassociation becomes more marked; the series (b) is on the right and the (a), remaining on the left, comes to the fore, thanks to a clear, low component.

A careful examination of the transitions as perceived by a taxonomic ear reveals their ambiguity. Transition **B** is prepared by a particular treatment of the last two high impulses: the penultimate one is dry (without reverberation), and the final one is even more so (shortened resonance). One might imagine that this preparation underlines the change and this is undoubtedly what happens with taxonomic listening where the subject lies in wait for the change. On the other hand this can explain why in a different listening behaviour (we shall see this with empathic listening) the listener, struck by this unforeseen salient feature, fails to hear the transformation or disappearance of the other elements.

As for transition C, this is sufficiently progressive (in three stages as we have just seen) so that listeners, according to their listening orientation, hear either a demarcation or perfect continuity. In this work the decision whether or not to segment is a clear means of differentiating types of listening. The taxonomic listener divides into parts; we shall see exactly the opposite tendency with empathic listening.

SECOND POINT-OF-VIEW: EMPATHIC LISTENING

Empathic Listening as a Behaviour

Attitude and strategy

(1) The listener who adopts this attitude is attentive to sensations, which are spontaneously described as the "physiological" product of the sound. These types of commentary firstly focus on the level of feeling. Listeners talk of blows, impacts, slides, not as if they have witnessed a scene from a distance but rather as if they have been subjected more or less to these movements themselves. There is a kind of empathic involvement in this dynamic of materials. Listener A: *That touches me physiologically: these sounds have impact,*

you are dominated by the impact, and the setting in which this stomach-blow occurs is of no importance. Listener E: For me this impact is something you can do nothing about. You move aside, you turn around, it activates you, but it stays like that. Listener G, 2nd listening: The attack, the first attack (..) I really felt it; hit me.

(2) In order to deepen the sensation, attention is concentrated on the *present instant*, without seeking to establish relations with previous moments. Duration is perceived as a kind of insistent stasis. Listener A: *For me it is a parenthesis, it is a space, it is a duration. And within this duration [what one hears] is more or less the same thing in various guises.*

If listeners notice a slight change in repetition, this is for them a way of scrutinising the sound and its accompanying sensation with renewed attention rather a means of differentiating successive parts. Listener A: *If it changes, it is simply so that you can continue to listen in the present, it is not so that you can see how it changes. Listener G (second listening): He (Pierre Henry) seeks to construct diversity (...), you prick up your ears.*

(3) As a corollary to the above this listening behaviour makes no effort to "score" the music, in the sense of segmenting it into parts, whether successive parts or superimposed chains. Thus, this behaviour contrasts radically with taxonomic listening. The perception of parts is blurred or leaves no memory trace. Listener G (second listening): *I said to myself but the "booms" which you called the beating heart [and about which this subject had a lot to say after the first listening], do they exist or have you invented them? I said to myself I would love to listen a third time in order to know if this "boom, boom, boom" exists or not.*

One sees that there is an incompatibility between the taxonomic attitude and this typical way of focusing on a sensation. Listener A: *Bit by bit one notices that behind there is this scraping, this shhh sound, which is not immediately understood and which you grasp progressively (...). If you do not notice it, if it does not register, this is because you are dominated by the impact.*

Even if a listener reports a sensation of lightening at the end, this change in sensation is not attributed to a change in the object. Listener E: *There is a kind of weightlessness at the end. It becomes much more abstract. Besides, it is very intriguing. I cannot grasp what has been modified. It seems that nothing modifies and then it abruptly changes character. This happens rather swiftly. I do not know what happened there.*

This remark is important on a theoretical level because it demonstrates the difference between a perceived characteristic and a characteristic which is pertinent to perception. The subject here has not clearly perceived what we should call, in the language of taxonomic listening, the disappearance of the low impulses. However, he notices a difference in sensation between the periods

preceding and following this disappearance. One must therefore consider this morphological change as pertinent to this listening behaviour, characterised as it is by a concentration on sensations.

One also notices that to isolate a characteristic pertinent to an empathic listening to material one cannot merely record the testimony of a listener who has not himself perceived the characteristic. One is obliged to confront this type of listening with another, in this case taxonomic listening. This is, moreover, what the subject will himself do if he wants to comprehend where this sensation of lightening comes from. He will listen again with a different approach (by adopting, for example, a taxonomic strategy) and will confront his first perception with the second.

Metaphorisation

Metaphorical construction proceeds into two levels. On the first level one finds descriptive metaphors which are relatively close to the object. These are almost typo-morphological descriptions of sounds but are already interpreted through subjectivity. Listener A: *Muted blow; impact; very dull; compact versus scraping; shhh sound.* Listener E: *Very hard impact; awl or hammer hit versus smears; scraping; supple layers; compact but mobile; heaviness; thickness; jumble, although clearly defined.* Listener G: (second listening): *Blow.*

These metaphors which aim to describe the morphology of the sound (its material and its form) are specified in terms that indicate *actions*, making more explicit the sonic properties or the ways in which these sounds function. Sounds are not simply pointed out, they act on each other, and, in a symbolic way, also act on the listener. Listener A: *One is dominated by the impact; blows in the stomach; violence of impact.* Listener E: *Something that falls from above, vertical, stands out. Awl hit, hammer hit, that knocks against something scraping but even so is moving forward; something that sweeps.*

On a second level these metaphors of the object are articulated (by two of the subjects) in more complex, narrative images, which clarify relations and convey metaphors for the object more explicitly. Listener A: *it is like a kind of ..karate in slow motion (...) like the demonstration of a martial art. Like the demonstration — very formal — of imaginary blows thrust at you by a wooden sabre...* Listener E: *It makes me think of geological concepts (...). Layers which act on each other, in a restricted field (a rubbing sensation, which seems to resist, which does not move forward as such). And then this impact... There are rocks, like ones which are unchipable: flint, diamond. Resistance is a geological term... there are relations of resistance which create a play of forces...*

On the first level the listeners' metaphors are very similar, often even identical (blows, impact versus scraping). On the second, they diverge in order to become organised in more personal images (karate, geology).

Probably it would be wrong to regard this construction of images as the decoding of a semantic content of the music. Such a formulation would signify that accessing meaning is a purpose of reception behaviour, as well as being the purpose of analysis. Metaphorical description is a way for listeners to deepen the object/subject relationship, which is translated in terms of sensation — such a deepening of sensation is the real purpose of this listening behaviour.

One has no way of knowing if the image elaborated (which we call a metaphor of the second level) is already present during reception or if it is only an artifice used by the questioned listener in order to make clear both to the questioner and himself what he experienced at the time of listening. The image occurs only during the second stage, in the course of explaining sensations expressed in the first stage. But one can surmise that verbalisation progressively uncovers an image that was already latent and imprecise in listening, an image susceptible to crystallisation in more personalised scenarios (karate, geology). All this happens as if this image had already directed the formation of a mental representation of the object in terms of a play between contrasting elements, of slowness, of resistance.

Construction of the image

(1) In contrast with other listenings empathic listening to sound material (as three listeners testify) is restricted to a single opposition between two dynamic categories, impact and scraping, to borrow once more the terms of our informants. The two types of short sounds which had been distinguished by taxonomic listening are thus mixed here. Listener A: *I search for a word that properly corresponds to this type of sound: it is something... compact, there you have it.*

— *You are talking about all the sounds?*

— *No, no, I am of course talking about the accentuated part, about the very, very rapid movement with a muted blow and this varying sound.*

This listener is thus capable of hearing two distinct elements ("muted blow" and "varying sound") if led by a taxonomically oriented question. But in the listening behaviour this listener practises, they are grouped as a single composite unit: "the accentuated part". This is confirmed later when he is talking about the scraping: *It is simply the inverse of the compact sound.* Similarly for listener E: *There is (...) something scraping but even so moving forward, and then there are these impacts, very hard (..). For me, it is this contrast between these two things that dominates.* After a second listening she is more specific: *The muted blow at the beginning gives a basis for the high impact (..). At the beginning I imagined them as a single element.*

The same for G, who asks himself about the existence of a third sound (which he had, however, commented on after a previous listening of the "fig-

urative" type): *I have the impression that, if it exists, this low resonating sound ("boom") is closely connected with the attack of the high sound: as if there was a fall and an impact. Now I am almost sure that it exists.*

(2) Listening "in the present" does not favour the perception of successive sections. Form appears as a *pseudo repetition*, whose function would be "that one can continue to listen in the present" (A): a "disrupted cycle" ("it is not a loop") that generates "variety" ("diversity"). Listener A: *There is no evolution (...); I hear much more a variety (...), I note that the presentation of the elements and their cycle is continuously disrupted.* Listener G (second listening): *He seeks to construct diversity (...). It is not a pure and simple redundancy, it is not a loop.*

However, should one be aware of the "lightness" felt by E towards the end, and thus of a certain evolution which this Listener could not attribute to a changing in the object? Listener A agrees with E when he specifies: *If it changes (...) it is not so that one can see how it changes.*

(3) Our listeners hear two dynamic categories which interact, but not a polyphony, which would suppose a construction in two voices, capable of imitating each other. Listener E: *No, I do not perceive this piece as a music of chains; to me it is a totality even if I know that these are chains.*

The play between these morphologies is of a different nature. For A it is a simple contrast that underlines the foreground, the impact. Listener A: *What is very interesting is the broad scale of this type of sound (...). Little by little one becomes aware that there is, behind, this scraping, this shhh sound (...). It is simply the inverse of the compact sound.*

For E, these two dynamics cross each other as vertical and horizontal. Listener E: *The sweeping, I perceive as going in a horizontal sense and I have the impression that everything else fans from above... a vertical sense...*

Impact, scraping; foreground, background; vertical, horizontal: it is the contrast between these types vying with each other that organises the perception of the work.

Aesthetic appreciation

Listener A: *What strikes me... is... the stamp of this music, its authority. Not the construction since it does not have a constructed air, but the authority in the choice of sounds.*

Thanks to the feeling of slow-motion (A: "it is a kind of karate in slow motion"; E: the metaphor of geological movement) the sounds are appreciated for their individuality. Listener G (second listening): *This whistling, this [imitation], I found beautiful. I can say that aesthetically it pleased me (...). Simply for its form... it pleased me. So I thought about its beauty: "It's beautiful this sound, it's not bad, it's well made":* Listener A: *At first it functions as a clear aesthetic intention to show the bursts of sound.*

The minimalist character of the composition is highlighted. Listener A: *It is a very modern layout of a sound detail which suffices on its own; it needs only an extremely basic environment (..), a minimum presentation... That interests me as a minimal art.* Listener E: *The strength is all the greater because it is a very, very punctual presence... It's just the bare minimum that is stated.*

Empathic analysis of *Sommeil*

Organisation on two levels

For this behaviour it is meaningless to make a transcription of *Sommeil* along a time axis since the piece is perceived as an instant, as a single and same continuing image without temporal form. What "transcription" can represent the perceptual organisation that emerges? The problem is not very different from the one which one encounters, for example, with repetitive musics in ethnomusicology. Very often it is enough to transcribe a cycle, indicating that it is repeated, and then to study the margin of variation, and the way it begins or ends. This is close to the "model" which guides the musicians in performance.¹⁴

As we have seen in the testimonies, this approach is not concerned with the succession of parts. It is the opposition between two types of sound, distributed on two levels that organises perception of the work (Fig. 6).

The sounds of the first dynamic category are in "close-up" and "fall" vertically. The dynamic dimension of this high/low movement, essential for this listening, is represented by an arrow. The sounds of the second category are represented on a horizontal plane, like "scraping," and they are "behind". Again, an arrow indicates the perceived play of forces.

The reader will possibly think that this spatial representation is more to do with imagery, more associative and ultimately more fanciful than that proposed for the perception of space from a taxonomic point-of-view, according to the right/left and close/distant axes (cf. Fig. 5). This is not necessarily the case. If it is true that the right/left distribution has an incontestable acoustic and electrical foundation, it is not the same with the perception of presence perspectives. The high impulses (flexatone?) could very well have been recorded at the same distance as the low impulses, but the artificial reverberation which affects them makes one think, by association, of a distanced source. Conversely, it is quite possible that the low impulses are in fact obtained by cutting out two "grains" of a creaking door previously transposed to the low register, and that it is the artificially abrupt nature of the splice

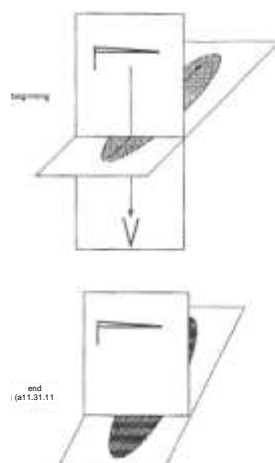


Fig. 6. Spatial representation of Sommeil according to empathic listening.

that suggests a presence "in the membrane". The listener, through association with already known acoustic phenomena, interprets morphological singularities whose real cause is unknown. He constructs a plausible spatial universe through the imagination, relying on false indices; he symbolically reconstitutes a coherence.

The symbolic constructions of empathic listening are not fundamentally different. Once listeners have accepted (for reasons we shall see directly) that the high and low sounds constitute the same, close figure, it is not surprising that certain of them perceive it on a vertical plane. This association of the high/low trajectory with verticality is here no more far-fetched than in the whole of music writing (and it is by no means certain that this is arbitrary). Moreover, the compactness of the low sound, interpreted as signifying a fictional blow, is completely compatible, in its coherent constitution, with the idea of fall and impact.

As for the sounds which contrast with them, perceived as behind (we shall see this), these carry possible indices of scraping, like, for example, an object on a table top or on the ground. One need only take an object and scrape it on thin plywood, varying the pressure and the speed of the hand, to become conscious of the *realism* of this association. Here also, as with the planes of presence in taxonomic listening, the representation can be interpreted as the search for a fictional causal coherence. In neither case should one imagine that listeners believe that it is really a matter of vertical impact and horizontal scraping, or of acoustic sources really distributed over three planes of presence. In all cases, listeners select morphological singularities from which they construct imaginary, fictional signs.

"Impact" and morphology of sounds

That certain listeners are immediately sensitive to the "impact" of the low sounds, which hit *them*, is not surprising. Heard at the right level and close enough to loudspeakers which reproduce the low register properly (as was the case in this experiment), they have an effect not only on the ears but also on the cutaneous receivers and the abdominal lining. It is probably the first sound (since the level decreases regularly) which induces in some listeners this empathic attitude. On the other hand, it is more surprising, that listeners associate the high sounds with the low ones in one, same, composite figure — "the compact sound" — perceived in "close-up". We recall that the taxonomic listeners heard the high impulses in the distance.

The explanation for this contradiction is probably that these two listening types do not select the same morphological characteristics. The majority of the high impulses have a reverberation which places them in the distance, but an abrupt attack, generally characteristic of a close sound, makes them similar to the low impulses. The attack of both is similarly represented on the sonogram by a vertical line which occupies the whole spectrum. (A taxonomic listener specified this as — cf. The construction of the image -: "The high hitting sound is evidently further away (..) even if the attack is close".) We can verify this fundamental observation according to which each listening type, and more generally each point-of-view, selects, from an indefinite collection of available morphological characteristics, those which give a specific form to the object.

Likewise, the description of "compact", which expresses very well the effect of the low impulses (restricted in time and limited by an attack and a fall, one as abrupt as the other), is more surprising for the high impulses. But it is probably their attack that is dominant, and one recalls that the majority of these impulses are "anamorphosed" that is to say, the foreseeable nature of their resonance tends to be shortened at the very moment of attack. Maybe one must hear the "compactness" equally in the sense of spectral thickness, since these high impulses, except for the attack, are reduced to a fine frequency line.

Once these two types of impulses are associated in a single, close composite figure (which globally contrasts with the "smear", the "inverse of the compact sound"), it is not surprising that this figure, which sweeps from high to low across the whole pitch-space, is perceived as a trajectory designated by its extremes, or as a movement (linked to the impact sensation) that creates images of force and energy (karate). We shall see later why this movement is in "slow motion". Why are the "smears" (the "breath sounds" of the taxonomic listeners) "behind"? Undoubtedly because they are not immediately perceived since one is "dominated by the impact". They appear as a foil, as a back-

ground, which by definition is behind. These smears also represent movement — strength and resistance, friction. The large width of the spectral band is one which could be obtained by scraping, and the variations in spectral density and register thus correspond to variations in pressure and speed. We should note that the attacks are extremely gentle (without impact if one thinks of scraping), as opposed to the compact figure (Fig. 7).

Change in continuity

Although it is not appropriate to speak of form perception, which would integrate the totality of the work in a global representation, one should note here differential perceptions, which are almost mathematical. That is to say, one does not observe the curve but its derivative, the variations *doser* and *doser* around an instant.

The figure in the foreground is constantly variable:

(a) This occurs firstly, because the relative arrangement of the two constituent elements is always changing in an unpredictable way. One element is periodic, every 4.8 seconds, while the other is almost periodic, on average every 4.1 seconds, but sometimes more sometimes less, without any sense of regularity. It progressively follows a phase difference, in itself irregular.

(b) Moreover, the morphology of the high component of this fluctuating combination is variable. One finds four types of high impulses which can be represented as follows (Fig. 8):

Type 1 fixed pitch with more or less reverberation (represented by suspension points);

Type 2 *idem*, with initial glissando (and stationary state slightly lower than the other types);

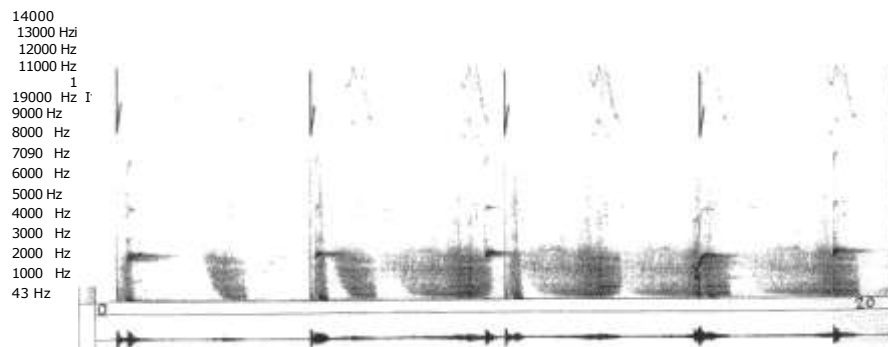


Fig. 7. Sonogram of the first 20 seconds.



Fig. 8. The four types of high impulses.

Type 3 two superimposed pitches;

Type 4 cut-off resonance, without reverberation.

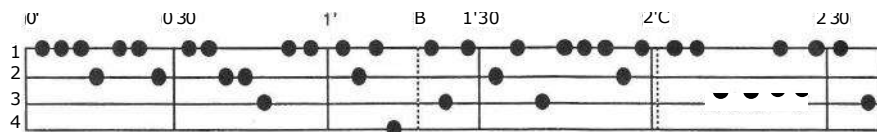
(One neglects here subtle differences, such as differences in reverberation time in types 1 to 3, the micro-differences in pitch, and the differences in the glissando profile of the attack for type 2.)

The temporal succession of these four types is also unpredictable (Fig. 9).

The figure of the second plane (the "smear", or the "breath sound" in taxonomic description) is constantly variable in its form (as one can notice by casting one's mind back to the similar representation proposed in the taxonomic transcription).

The sensation of "weightlessness" mentioned at the end needs to be considered as a change. It is very probably produced by (among other factors) the disappearance of the low blows. (There are undoubtedly a number of contributory factors: the progressive diminution of level, the rarefaction and then disappearance, after C, of fuller impulses with glissando attacks — type 2 -, to the advantage of the two-pitched impulses — type 3 -, which are maybe more diffuse, and very reverberant after C.)

One might be surprised that listeners who say they are "dominated by the impact" of the figure in the foreground are not capable of being clearly aware of the disappearance of these low blows. This is explained by the typical attitude of empathic listening which is entirely oriented towards sensations produced and not towards what causes them; that is to say an orientation based on the self, the listening subject, and not on the object. The quoted listener says: "You are dominated by the impact" and not: "Your attention is captured by the impact".



"Slow motion", "minimal art"

From the moment that sonic figures are interpreted as movements and are related to the body, they are compared with body movements, that is to say, with gestures. Indeed there is a temporal scale of gestures. The duration of a step, or of an arm or head gesture, does not generally exceed a second. This is why the rhythms observed here (more than four seconds on one level, about three seconds on the other) are extremely slow.

One listener practising taxonomic listening began his testimony with the judgment, expressed in an undertone: "a bit rudimentary...". It is typical that this minimalist character is valued from an empathic listening perspective. Clearly, if on starting to listen one initially prepares oneself by admiring the richness of a formal construction, one strongly risks being disappointed, particularly if one considers things from a distance, in three chains, in three parts.... Conversely, someone who savours a strong, original sensation dreads only one thing: that it will stop. In the duration of this singular figure, he experiences slowness, a compactness and strength. One can understand the poverty of repeating three sounds on a single channel, or the refinement of prolonging an indefinitely changing configuration made up of impacts and scrapings which acts on the senses. It all depends.

A completely different attitude is revealed by "figurativisation".

THIRD POINT OF VIEW: FIGURATIVISATION

Figurativisation as a Behaviour*A stage for "the living being"*

In this type of listening the listener tends to find the "figurative" in music, or more precisely, tends to think that certain sounds evoke something that moves, ultimately living. Figurativisation relies on a contrast between sonic configurations which are associated with the living being and other configurations which have a contextual function (decor, signal, scene). All is set ready for an action to develop: form is thus interpreted as a narrative.¹⁵

¹⁵ "Figurativisation" designates a "function" (a functioning) of reception behaviour. "Figuration" would designate a "function" of the music, as attributed by the listener practising this type of listening. In reality these formulations are equivalent. Music only has "function" (at least for music analysis) insofar as such a function is attributed to it by producers or receivers. I had the opportunity (1976) to develop this remark in connection with Jakobson's "functions of language": one attributes to language, by metonymy, a function which is in reality a function of the behaviour of the users

Metaphorisation of chains

The macro-units which we have called chains here take on rôles in a symbolic construction. The metaphors invoked are not simple designative labels (as for the taxonomists) but images which impose themselves upon the listener. On a first level these coincide for the three listeners concerned. (We shall see that they diverge on a second level when they are integrated into a narrative interpretation of the form.)

(i) Chain 1: "Respiration"

Listener D: A *"very organic" aspect... this respiration...permanent...* Listener G (first listening): *I thought this the respiration of somebody approaching, someone whose presence one sensed.* Listener C: *I experienced ail this in relation to sleep, respiration, heart.*

(ii) Chain 2: "Heart"

Listener C: *The low blow (...) evokes the interior listening of heartbeats; an organic, disturbing rhythm.* Listener G: (first listening): *These dull blows, it's the heart.*

(iii) Chain 3: "Signal"

Listener D: *The strident blows (..) are a bit like the whistle blows of a call to order.* Listener C: *Also a signal (...) whistling. At an extreme, it is the water drop, the tap which drips while one sleeps, something which marks time (..). It is an external element, an external sound (...). The two others would be internal.*

This semantic internal/external contrast gets an acoustic explanation: Listener C: *Two non-pitched elements, internal [the "respiration" and the "heart"] against tonic, external [the "water drop" signal].*

This idea connects with: Listener D: *This noise, a bit long and at the same time lively, shrill, fairly brilliant, can be very easily be localised in space: one sees a trajectory (..). There is a localisable object. Whereas the breath, by its form, and the Tact that it is white noise, is something fluid, for me, vague, inevitably less localisable.*

As well as there being an opposition between internal and external, already a precise interpretation, there is also an opposition between localisation and non-localisation in space, as with an object which one can see (thus external to oneself) or like a dripping tap. This opposition between a muted, low, complex mass (undefined pitch), "internally" non-localisable, and a tonic (defined

of the language. Object and behaviour constitute an indivisible bipolarity: each is defined by the other.

pitch), high, "externally" localisable, has already been encountered in another electroacoustic music work.¹⁶ Might there be a semantic recurrence in certain electroacoustic musics?

Form and narrative

(1) The "metaphorisation on the second level" are much more personal but dramatise this characteristic opposition between a living being who can be the subject himself in the "internal" image (listener C), or else a beast, and a decor or a context. Form becomes narrative. Listener D: */t is something that awaits you, waiting in ambush behind a bush, a sleeping monster or dragon; you move forward, you look over the bush and you discover it.* Listener G (first listening): *I thought of Fellini's film Satyricon and the beast in the labyrinth which should kill the hero; I thought this the respiration of somebody approaching, whose presence one sensed; these different corridors. The Minotaur, one only sees it at the end. But its presence is identified by the breath sound. And these dull blows represented for me the anxiety of Encolpius.*

(2) The idea of a progressive approach is part of the narrative (D: *you move forward, you look over the bush and you discover it.* G: *I thought of.. somebody who approaching*). And even more precisely, the idea of discovering (thanks to this approach movement) something hidden, in the background.¹⁷

(3) This idea is linked to an evolution from anxiety to relaxation. Listener C: *At the beginning... anxious respiration: because of the low blow [heartbeats] which one no longer hears towards the end: [as a result of which a feeling of] relaxation.* Listener G (first listening): *These dull blows represented for me the anxiety of Encolpius (..). Then since that relaxes...*

(4) Towards the end the theme of falling asleep imposes itself on all listeners, maybe partly induced by the knowledge of the title on the part of two of the three listeners. Listener G (first listening): *Then since that relaxes I thought (..) of the respiration of someone who was going to sleep, who had had a nightmare; he has returned to a somnolent state (..).*

— *You knew that this is called "Sommeil"?*

— *No I didn't know that.*

Listener C: *Towards the end (..) one has the feeling of someone sleeping.* Listener D: *You told me the title, Sommeil, but I think that one would have guessed it*

¹⁶ *Aquatisme* extract of Parmegiani's *La Création du monde*. See Besson and Delalande, 1992.

¹⁷ The analysis of Debussy's *La Terrasse...* (Delalande 1989) from a figurativisation point of view also revealed a pertinence of presence perspectives, and more precisely the discovery of something hidden thanks to an approach movement. Cf. this testimony: "...like this travelling of the camera across the hedge rows, arriving at the lovely castle, in the films of W. Disney". The analogy with cinema is equally present.

at the end of listening to the piece because there is a logic that one discovers at the last moment: there is this breathing intermingled with snoring.

The latency-signification conflict

These comments concern the end of the piece, where one hears something like a "snore". It is probably in retrospect that the breath sound, which was until then but a "living" element, evoking at an extreme, undertow as much as breath, is clearly interpreted as respiration. At least the last listener explicitly describes this retrospective re-interpretation:

... a logic that one discovers at the last moment: (...)

— The breath sound, had you picked it up at the beginning?

— No, flot at all... But at about the middle of the work. Without really hearing it one nevertheless perceives as something organic, a kind of pulsation.

One can thus ask oneself if the theme of discovery (*"you look over the bush and you discover it"*) metaphorically describes the musical form or indeed the adventure which the listener has lived during listening, discovering at a certain moment that what he was hearing in the background from the beginning, and which he had not clearly identified, was a respiration. In other words, does the discovery characterise the form (related to this listening type) or is it, rather, an actual listening? We shall reply that the form here is a kind of *programme* of the actual listening, that it induces a change of perceptual focus. Firstly, the listener is attracted by the more pregnant, short sounds, and then focuses on the sounds in the background because in this interpretation they represent the person in the action. The form therefore rests on a perceptual conflict between latency and signification. It results in an unstable balance, typical of this listening, between what one *voluntarily listens* to and what one *hears despite oneself* in the foreground, and which marks the background.

Listener D (second listening): *At the beginning (...) one's attention is captured by the whistling and these percussive sounds. One would prefer not to listen to them in order to know what is happening in the background; one would prefer to push away this omnipresent foreground which takes up all the space, in order to reveal the equivocal: what is happening behind? Breath, undertow movement? (...)* *One achieves the final revelation retrospectively (..). You discover that there was this breath and that it was masked by what happened in front of it, at front stage. [Note the stage metaphor.] This leads to a revelation of the rear stage.*

Listener G: *Right from the beginning I picked out this piercing sound; then this breath and the "boom":*

Listener C: *The low blow (..) something that one does not listen to but one perceives it, its impact (..). It marked me, I hear it, I submit to it (..)The high one, it varies in tessiture, it attracts attention because it changes. What I listen to the most [and comment on it: one third of the testimony] is the breath chain;*

very interesting. Towards the end, one no longer hears it [the low Blow]; there is no camouflage, one has the feeling of the respiration of something sleeping.

Figurativisation, a naive listening?

This music which presents characters on stage and tells a story may appear to be the sign of a childlike attitude as opposed to "scholarly" listening. However, one should note that this point of view is certainly akin to one held by Pierre Henry himself, if one can believe the title, *Sommeil*, and the general argument of the *Variations*. It is on the second level of metaphors that one notices an opposition between the uninhibited listener who does not hesitate to talk about the Minotaur in a labyrinth and the listener, more concerned about his image, who evokes the organic, the interior and exterior of the body. But the dichotomy of the first level, between the living and its framework, as a manifestation of the narrative interpretation of form, is common to both, and may be a frequent interpretation even among professional musicians.

One can think of two theoretical models which might be able to provide tools for a music analysis relating to this point of view. Michel Chion, who aesthetically has much affinity with Pierre Henry (see his "Pierre Henry" published by Fayard), has often argued for the recognition of the narrative or dramatic dimension in music. (See Chion, 1993.) He has proposed several analytical categories which seem to arise from figurativisation, notably the concept of "thing", and in the particular case where this thing is living — the concept of "étricule" (Chion, 1988):

At the same time sound is both a sound object and the sound of a thing. This thing, to which we cannot necessarily attach a name, can be represented as an imaginary body occupying the three spatial dimensions, and it has volume, walls, mass, density, and speed (..). Sound is the manifestation of states and activities, and sometimes the life of things (...). We can quote two typical cases of "things" in musique concrète. The first is what one can call the "étricule", in other words, the small being. It is Pierre Henry who has most often employed this in his music. He evokes a living organism of small dimension, always changing and always identical, heard against a background of the cosmos (...). The thing might sometimes be regarded as a sound character "personnage sonore", in the sense that Messiaen talked about `rhythmic characters' "personnages rythmiques") (..).

By referring to another model, we can ask ourselves if Chion's "thing" or "sound character" are not specific and concrete cases of what Greimas' semio-narrativity would call "actants". In *Sommeil* one would have three "actants" (four if one considers the splitting into two of the breath sound at

the end). The concept of "narrative path" is undoubtedly applied more easily here than to an instrumental work. It is not surprising that M. Graboz (1995), having studied Liszt, turned her attention to electroacoustic music. Narrativity is not only here a metaphor for form but also provides a model for perceptual construction which well and truly possesses that psychological reality which comprises figurativisation.

But this remark, at the same time that it tends to confirm the esthetic pertinence of the semio-narrative model, makes clear the limits of the model. Only the figurativist point-of-view is accounted for, and not the constructions which result notably from empathic and taxonomic listening, which are in no way narrative.

Aesthetic appreciation and emotion

The collected testimonies provide us with material which is useful for distinguishing two kinds of satisfaction (or pleasure) likely to appear in listening. The first is aesthetic appreciation, that is, a positive judgement which is an index of the interest and satisfaction which have accompanied listening. From the moment the breath has been considered a figurative element representing respiration, one can enjoy its stylised construction at the same time as appreciating a more or less realistic evocation. Both these appreciations are artistically intertwined. Listener C: *The respiration forms itself spreads out, follows its course (...) I like this respiration which is both natural and artificial. The intentional aspect of these forms: the interruptions are those of an intervention on tape. There is a distance compared with raw evocation.*

Of a totally different nature is the satisfaction of the listener who at a specific moment during listening suddenly understands that in retrospect, this diffuse air sound, which he perceived without really listening to it, is in fact the principal character in the action, and he re-interprets it as respiration. Listener D: *One has a revelation, the satisfaction to discover at the end that one was on the right track.*

Everything is suddenly cleared up, and it is probable that if one had captured electrically the electrodermal response of this listener, one would have discovered an emotional response at this precise moment.

Figurativist Analysis of "Sommeil"

The indices of "being" and "thing"

The categories of "being" and "thing", which are opposites in this listening viewpoint, are evidently very general... One has, here, to be satisfied with discovering which types of cues the listener uses to attribute particular meanings to the sound objects. Firstly, we shall note how this symbolisation functions.

As Michel Chion has described so well, behind a collection of successive sound objects which resemble each other (a chain) the listener imagines a single cause, being or thing, whose movements produce this series of related noises.

The living being. Before belonging to someone sleeping, the "respiration" indicates the presence of a living being. Taken in isolation, this chain could evoke another form of life or of movement (one listener speaks of undertow), but then how should one interpret the low blows and the high impulses? The figurativist approach tends to see a scene which includes a living being. It is thus this interpretation, bringing a figurative coherence to the whole, which curies perception along.

The indices which point to respiration are:

- (i) fluidity, that is, the smooth contours with neither attack nor abrupt decay;
- (ii) the substance of the sound material, close to coloured noise;
- (iii) periodicity.

We notice in passing a great difference compared with empathic listening. Empathic listening could interpret the breath chain as "scraping"; respiration and undertow are also scrapings, but they are periodic scraping. Empathic listening is a listening of the instant, which does not take account of the way in which the sounds occur in time, in particular their periodicity. For empathic listening the scraping could be that of "geological layers", which certainly are not periodic. On the contrary, figurativisation searches for traces of life, for the movement of things, and the pertinence of periodicity is evident for all interpretations: "respiration", "heartbeats," "tap that drips and marks time".

So we hear the respiration of a living being, but which living being? It is not surprising that for some it is a mythical being: "Minotaur", "monster or dragon". The context will add to the sense of anxiety ("heartbeats", "water drops...which mark time"), but already the "being" has a rather strange respiration. The normal respiratory movement of an awake, resting subject is a regular alternation of inhalations and exhalations of a periodicity in the range of 12 or 13 cycles (inhalation and exhalation) per minute. If one interprets the 26 sound objects of this chain listed during the first 70 seconds as sounds either of inhalation or exhalation, one obtains a respiratory frequency of a bit more than 11 cycles per minute, thus a slow but plausible respiration. It is with the alternations of inhalation and exhalation that interpretative difficulties begin.

A simple experiment is instructive here. If one records and observes a sonogram of a *sound* of respiration, the acoustic traces of inhalation and exhalation are more or less identical: if the subject has not modified the shape of his mouth during respiration (resonant cavity), there will be no alternating sweeping of the frequency field. Nevertheless, if one asks listeners to draw

this recording of respiration, one notices that they invariably represent an alternating rise and fall, manifestly influenced by their *kinaesthetic perception* of their own respiratory gesture.

That is the interest of the "respiration" of Sommeil — the playing with these two forms of perception, kinaesthetic and acoustic. At the beginning, the broad frequency sweeps are not acoustically realistic (and thus it is freakish if one hears them as the respiration of a being other than oneself). On the contrary, the respiration is close to a kinaesthetic representation of respiratory gesture if one interprets it as "interior". But there again, it is fairly enigmatic insofar as it is not a reassuring alternation of inhalations (upward movements) and exhalations (downwards). For example, at the beginning, one hears an exhalation, an inhalation, then three increasingly deeper exhalations, etc.

"Heart". The "heart" figuration lies between physiological realism and dramatic convention. A strongly beating heart sounds not like a periodically repeated beat but rather a repetition of a pair of two close beats separated by about 200-300 ms (diastole and systole), an accurate and realistic detail respected here. Two remarks: (1) One never hears anyone else's heart (except when one has recourse to a stethoscope) but one hears one's own in exceptional circumstances, which accounts for this "internal" association. (2) The periodicity (4.8 seconds) is completely implausible (it is normally of the order of a second) which relates this chain as much to a proprioception of heartbeats as to a dramatic convention found in suspense films. One can also sometimes find this convention in more stylised forms in music (for example, Satie's *La mort de Socrate*).

"Signal". We note that an imaginary cause, rather than the real cause, is evoked, consistent with the general representation of the scene. It is not difficult for a practitioner of electroacoustic music to guess that the high sounds could have been realised with a small percussive metal sheet, bent after the attack to obtain a glissando. But the imagination is not at all oriented in this direction: once a close living being is identified through respiration, the high sounds become a water drop, or whistle, or a signal which punctuates the action. The percussive attack is in fact the sound of a "thing" (in contrast to the smooth attacks of everyday sounds of organic origin) and the exact pitch easily allows its localisation in an external space. These two factors — percussion and high tonic pitch — ensure the incisive, pregnant nature of these sounds, which attracts or even diverts these listeners' attention (intrigued moreover by the living presence). It is probably this contextual function (as much as a resemblance to the sound of a small bell or a whistle) which leads listeners to qualify these sounds as "signal".

Symbolic topography

The action takes place in three scenes (which correspond to the three parts A, B and C as distinguished in taxonomic analysis). The beings and things which inhabit the imaginary scene are located and move within a space centred around a "me", symbolically represented at the beginning by respiration and heart (and represented by a circle in Fig. 10).

(A) As one has just seen, the heart is perceived in an internal way, in the same way as respiration, a succession of inhalations and exhalations, characteristic of a kinaesthetic perception. The signal is exterior.

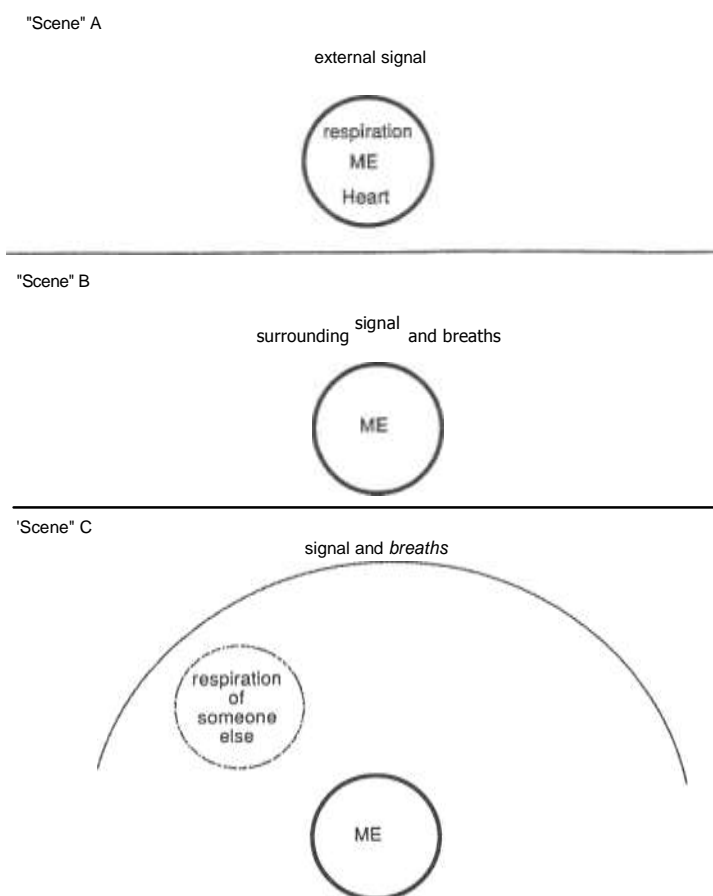


Fig. 10. A symbolic topography according to figurativisation.

(B) The heartbeats (proprioception) disappear, and the respiration becomes an external breath, which can no longer be assimilated as one's own respiration. There are three reasons:

- (1) There is no longer a differentiation between inhaling and exhaling characteristic of the kinaesthetic representation of respiratory movement. Inhaling and exhaling make the same *sound*; the perception is now acoustic.
- (2) The breath is divided over two channels, which prevents the listener identifying it symbolically with his own breath.
- (3) Finally, space appears (up to this point the diffusion was monophonic); the two breaths and the signal surround the listener.

(C) A realistic sound of respiration, such as one hears externally, is now audible. It is the respiration of someone else, of a character who occupies a definite place in the environment, and distinct from the more abstract "breath" (between "thing" and "being") which lives on. The "signal" (weaker and more reverberant) becomes distanced.

Emergences

Here I borrow from Jean-Christophe Thomas the term "emergence" which he has recently identified as one of the classic figures of an electroacoustic "musicality".¹⁸ Emergence is present here in three ways.

(a) Firstly, there is a progressive "exteriorisation". In the topographic description above, we adopted the metaphor of "second level" as an opposition between interior and exterior, and we analysed an "exteriorisation" which passes from the interior to the exterior of the body. If we had retained the metaphor of the animal in a labyrinth, we would have discovered an "exteriorisation" in a slightly different sense: the passage from an enclosed space (labyrinth, cave) to the open air.

(b) The second emergence is linked to the disappearance of masking. We recall that there is a conflict of perceptual focus between the organic presence of respiration, which holds interest through its signification, and the short percussive sounds which mask it because of their greater prominence. The respiration "emerges" progressively, firstly when a first masking sound (the low blow) disappears (in B), and then when the high sounds move away (by fading the level).

(c) This acoustic emergence, a simple consequence of mixing, serves to distinguish the emergence of the explicit, causal signification of the respiration. Up until 40 seconds from the end, if these flashes of white noise are interpreted as a respiration, this is thanks to the figurative coherence of the scene.

is only in C that one passes from the implicit to the explicit, and that one

¹⁸ Research seminar at the GRM on 13th December, 1995.

clearly identifies the sound of respiration. Thus, towards the end, the sleeping character emerges very obviously.

"Sleep"

Aside from the slightly anecdotal sounds of heavy respiration (which could be shocking if not considered in this perspective of emergence) the inducement of sleep is indicated by a relaxation and a progressive lull which correspond to the sensations felt by someone going to sleep.

Globally, the contrast between the beginning and the end is characterised by the following qualifications (discovered in the testimonies).

Beginning: *mechanical, tense, fast, contrasting, violent, implacable, anxious, worrying, aggressive.*

End: *relaxation, lull, something becoming less tense, the feeling that the forms are more spread out, distancing, loosening up, becoming gentler.*

One can analyse this progressive lull on four levels.

Disappearance of "stress-inducing" morphological configurations. The terms "mechanical, implacable, fast, contrasting, violent and aggressive" refer directly to certain morphological characteristics which are not difficult to identify and whose opposites are found in the descriptions of the end. "Mechanical" and "implacable" are certainly explained by the pseudo-repetitive *play of two types of impulse*. This repetition is not "fast" but the use of this adjective can be explained by the *brevity* of the figure, sometimes formed by the pair of impulses. Moreover, the respiration's glissandi are themselves fast, and with the other chains, form a density of events which is not easy to follow. (All figurativisation listeners indicate that they cannot listen to everything at the beginning.) These factors place the listener in a slightly stressful situation. "Violent" and "aggressive" describe the short, particularly high sounds (experienced as discomfort) because of their pregnant character (*abrupt attack*). To these morphological pertinences (here emphasising a characteristic) is added the *sound level*. All of these factors evolve by disappearing or diminishing.

Dramatic tension. At the imaginary level the dramatic tension ("anxious", "worrying") disappears with the "heartbeats" and more generally diminishes thanks to the exteriorisation analysed above.

Muscular relaxation. "Tenseness" evokes muscular contraction, and indeed, since the respiration at the beginning is interpreted as a respiratory gesture, one notices that it has a very wide amplitude, which diminishes to the point of "relaxation" (muscular) when one has "the feeling that the forms are more

spread out". The *amplitude* of the frequency sweep of the breath chain is pertinent here.

Loss of awareness. Listener C: [The low blow] *disappeared without my noticing it at the time (...) in the same way that your awareness of your own heartbeat disappears* (when going to sleep, for example). Likewise, the internal perception of respiration disappears (since it becomes external). To these fading proprioceptions is added the fading of the "signal," the last external marker which becomes blurred.

Falling asleep is thus rendered in two very different ways: firstly, it is experienced by someone who slips progressively into sleep (these are the four parallel evolutions that we have just seen), but is also rendered by the appearance of the breathing sound of a sleeper. It is a bit like those cubist portraits which show the same face simultaneously from two angles. Sleep is simultaneously shown from the interior and the exterior.

Breath style

One would not do justice to this work from the figurativisation point-of-view without recalling the criteria of aesthetic appreciation. We shall leave to one side the satisfaction of having found that emotions are produced (pointed out by one listener) as an accident of the subject's listening behaviour rather than an aesthetic appreciation of the object (equally a source of satisfaction but of a different nature). The judgements of appreciation focus here in particular on the principal character, that is, on the breath chain. Two main criteria appear.

Ambiguity. The ambiguity between realism and abstraction is frequently delighted in by composers with a concrete approach, one of the charms which attracts listeners to Pierre Henry. The breath oscillates here between a respiration sound and an abstract form, and only those who interpret it as a respiration (that is, those who practise this listening) can appreciate the divergence separating it from its realistic model, that is to say, its stylisation. But to this ambiguity is added another, the one between kinaesthetic perception — internal respiratory gesture — and auditory perception — external sound — here again the passage from one to the other is executed with finesse.

Diversity. One would like to analyse in detail the breath style and try to explain *why it is interesting*. We shall have to be content with underlining its diversity. It begins with patterns, strongly shaped in tessitura and amplitude. The forms are gentle, but very marked. It is an expansive monodic line (without mixing) which sometimes plays with the high and low impulses (as we shall see later).

Toward 52", a same type of form, duller, although attacked with a downward glissando, is repeated eight times (the last two are inverted), slightly overlapping, the variety coming from the spacings.

Then at B, with the appearance of a second chain and systematic mixing, the forms begin to blur, becoming more complex and less legible.

At C, a new principle: two very contrasting chains which respond to each other more or less in counterpoint.

This does no more than deliver a straight description; for want of a real analysis, one would simply like to encourage a detailed listening to this diversity. *"The respiration forms itself, spreads out, follows its course (...). One certainly listens to this chain the most attentively"* (according to listener C). One notes the considerable difference compared with an empathic listening for which this breath chain *"is simply the inverse of the compact sound (...). One is dominated by the impact"*, said a very attentive listener, *land the decor in which this stomach punch happens is of no importance"*.

Different attitudes, different foci, different hierarchisations of the chains, stasis against narrative: these are completely different forms which "construct" these listening types.

COMPLEMENTARY POINTS OF VIEW

We shall describe briefly three other listening types for two reasons: firstly, so that the reader does not think (although this has been said quite clearly) that there are only three ways of listening to *Sommeil*, but above all because the information collected about these listening types, although insufficient for an in-depth exploration and an "entry point" for analysis, nevertheless provides valuable indications about how listening adapts itself to the object.

Search for a Law of Organisation

A single testimony informs us about this listening strategy which seeks to go beyond the appearance of configurations, such as they are set out, in order to search for an underlying model through "musical intelligence". Listener B: *Awareness, musical intelligence, operate in a very original manner in relation to the habit of perceiving superimposed things (..). When one perceives these chains, one senses that each has its tempo, coincidences, temporal relationships, but no synchronicity. At surface level, [apart from the end], there is a trio of elements which are always viewed in a constantly varied manner.*

This trio of such different elements forms a figure, and this figure, as it becomes impregnated in the memory, is a figure which does not exist, which is never heard. In fact, it is a kind of archetype which is presented beneath the constantly variable modalities, and each of these manifestations secretes a trace in consciousness — which is ultimately deeper than a sound trace (...). And this figure cannot be stated, because at the extreme it would render all the others useless, which are like approaches, a moving, constantly, around (...). This is much like African musics which in effect centre around something which is never stated.

The analogy with certain African musics clarifies well this proposition (and it could be that knowledge of these references has influenced this listener). The work of Simha Arom in particular (Arom 1985) has shown that the polyphonies of the Banda Linda horns were each based on a simple "model" that is to say, a basic purified cell which is never heard as such, but provides the underlying form for repetitive ornamented variations.

This analysis concerns the first part of the piece, and it is not surprising that a listener oriented in this way is disconcerted by the formai development: *"I am not very attracted by (..) the formai layout which seems to me a Little arbitrary, fabricated (..); it yields things which I feel less (...), progressions not justified"*.

Analysing *Sommeil* from this point-of-view would consist of searching for the hidden figure. Considering the scarcity of indices, we shall content ourselves with noticing in the first 23 seconds how on the surface *"this is a trio of elements which are always being viewed in a constantly varied manner"*: One can divide these 23 seconds into six surface figures associated with three types of objects. There is only one way to segment if one takes as rules:

- (1) that each fragment consists of one (and only one) high impulse, one (and only one) low impulse and a fragment of the breath chain;
- (2) that one segments at an instant of silence (or pseudo silence).

Each of the six figures obtained presents a remarkable dynamic configuration (see Fig. 11).

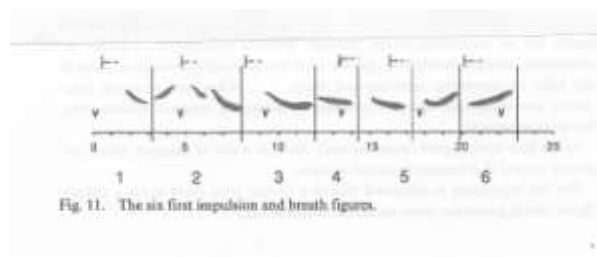


Fig. 11. The six first impulsion and breath figures.

0

5

10

15

20

25

Figure 1: This is the percussion-resonance type. More precisely, the first phase (close string of high and low impulses) ascends, the second (breath) descends, and the figure is of the *arsis-thesis* type. There is a certain elegance in making the fall come only after a fairly marked moment of suspension (silence).

Figure 2: *Arsis-thesis* again, but the upbeat (breath) is doubled, by a low-high movement of the impulses as if trying to outmatch the breath. In response to this double upbeat there is a double fall in the breath.

Figure 3: For the first time the impulses make a rapid descending fall which is prolonged as though amplified by a long, smeared breath.

Figure 4: Here again, the fall precedes, but it is a breath descent which leads to a "run-up" movement (*élan*) by the impulses. The two impulses are synchronous, but the "run up" effect is produced by the low *appui* and the melodic variation of the high impulse.

Figure 5: "Composite" figure (in the Schaefferian sense) which consists of two distinct successive motifs: a descent which is going to "bump into" an impact, then a deep V-shaped pattern underlined by a low impulse at the most hollow point, which acts as an *appui* to the "run up" phase.¹⁹

Figure 6: "Fall" in two phases (according to the theory of the U.S.T), in which the second is an accelerated descending movement (ending up here in a low impact which acts as an *appui* to a new run-up), perceived as "an unstable equilibrium which breaks up".

We notice (without studying it) how these figures are linked by dynamic continuity.

Immersed Listening

Faced with *Sommeil*, no listener succeeded in practising this listening which we call "immersed", but curiously we have a negative description of it. Two of our subjects said that they tried to give themselves over to this type of listening, which is familiar to them, but they failed because the piece did not lend itself to it. Listener H: *For a certain time during the piece, I really felt, physiologically, as though in the depths of the sea (...). At the beginning I let myself go, (carried) by the kind of continuous flow, until the moment when there was a silence, then another; the background breath sound was interrupted. This made me a little uncomfortable; it made me draw back a bit from the piece, to view it*

¹⁹ The word "run-up" or *élan* here, as for the preceding figure, is utilised in the precise sense which it has been given in the theory of temporal semiotic units — *Unités Sémiotiques Temporelles (U.S.T)*

with a certain distance, shah we say more coldly. Listener F: (...) I would like to enter, let us say, the depths. What pleases me with electroacoustic music is that I can easily let myself be captivated by the sounds. I enter, how can I tell you... as though one is in water, almost submerged by sound. I let myself be led by it.

Although the basis of the testimonies is inadequate, their agreement and the common experience of this listening behaviour permit us to single out some characteristics: a certain abandon ("I let myself go", "I let myself be led"), the music perceived as a surrounding milieu, as a sensorial bath (metaphor for immersion in water). Here again one notes a symbolic relation to the body, but the opposition between interior and exterior sounds is excluded: the music in its totality is perceived as exterior, in contact with the body via the skin, via the senses.

One understands that *Sommeil*, heard on a single loudspeaker for nearly half its duration and particularly fragmented into brief and disjointed sound objects, would hardly favour this "immersion". This judgement of inadequacy, clearly formulated by these listeners, gives us an idea of the way in which the subject/object relationship works. The listener has at his disposal a repertoire of preferred listening behaviours. Of course he "accommodates" his listening to the object, according to an expression borrowed from Piaget, but he is thereby constrained to adopt a mode which is less suitable. It results in a feeling of displeasure which can be translated as a negative judgement about the piece ("I didn't like it") but it is probably explained through a conflict experienced between a familiar behaviour and a behaviour imposed by the morphology of the piece. One thus understands the limits of "assimilation" (if one expresses this double adaptation movement in Piaget's terms). In adopting a particular point-of-view, the listener tries to make the object conform to his expectations, that is to say, he releases a form which is a function of his adopted strategy. But this is not without limits: an object cannot be assimilated according to any strategy.

Maybe one discovers here a factor which explains musical preferences: a work or a genre will be preferred to the extent that it lends itself to a listening-type which is best suited to the subject for reasons which are psychological as much as cultural. (For example, one can think of contrapuntal writing which requires a certain mental disposition more suitable for a "contrapuntal listening" as opposed to a lyric repertoire which would call for another strategy responding to another motivation). Thus the potential exists for a branch of psychological study of listening behaviours related to personality, balancing the branch of semiology tackled here, which analyses the relation between object and listening behaviour.

Non-listening

Listener G (first listening): *It isn't that I don't like it, but I got tired of it, in the middle (..). I must say: if I didn't have to listen to it I would have gazed at the chimneys...*

The authenticity of this testimony reminds us that simple distraction, turning one's attention to things other than the music, is also a typical listening behaviour. We do not seek here to create an analytical approach (interesting though it may be to know what perceptual image of the piece is constructed by the listener who is listening in a peripheral rather than attentive way). However, if one reminds oneself that the model of behaviour-types is intended to describe actual listening behaviour (of a particular listener in particular circumstances) as a combination of types of behaviour, then it is necessary to introduce this factor which, undoubtedly possesses a psychological reality.

The above testimony gives an idea of the laws of combining listening-types during the listening act. Firstly, there is an incompatibility (here between non-listening and all other listening) which requires a choice; thus eventually a change in approach during listening (in this testimony between "beginning" and "middle"); and sometimes a conflict due to contradictory motivations (here between little interest in the piece — or great interest in chimneys — and a demand imposed by the circumstances). This incompatibility is verified for the listening types studied here (in particular between empathic and taxonomic listening). However, it would be jumping to conclusions to say that the incompatibility between listening types is an acquired fact. The dynamic of the listening act remains a field little explored, and verbalisation is an unsatisfactory methodological tool. However, one already notices in the light of certain experiences²⁰ that the resolution of a conflict between two behaviours, a sudden shift due to a realisation, an "auto-command" which the subject gives himself in the course of listening, and the behaviour of changing strategies, are events of the behavioural act which can be translated into observable emotional responses. Afterwards certain of these are described by the listener as moments of aesthetic emotion. Without pretending to have discovered here the "key" to aesthetic emotion, one should nevertheless perhaps consider the dynamic combination of listening types during listening as a small part of an empirical response to this vast problem.

²⁰ Fairly developed exploratory work, conducted with Jean-Luc Jézéquel from 1985 to 1988, has shown us that the recording of electrophysiological signs gave valuable information on this dynamic aspect of the listening act. See F. Delalande and J.L. Jézéquel, "Indices Electro-polygraphiques des Conduites de Réception Musicale, étude expérimentale", the INA-GRM internal library, unpublished research, nos. 53 and 54 (263 pp.) (available for consultation at the premises).

CONCLUSION: PERSPECTIVES ON RECEPTION RESEARCH

This study is a point of departure: it suffices to show how listening behaviours are differentiated from each other. In responding to different motivations, in determining strategies and selecting different characteristics, each behaviour gives its particular form to the sound object, accompanied by sensations and images which translate into specific metaphorical configurations. One also sees how each point-of-view, as defined by a listening-type, determines pertinences leading to an analysis. But the questions which remain unresolved are so stimulating that it would be regrettable not to evoke them in this conclusion.

We have insisted that these observations are based on a very restricted corpus of testimonies, gathered from eight listeners who, in general, are close to electroacoustic music and to the piece on which the analysis has focused. Consequently, the sole conclusion one can draw is the possibility of differentiating listening-types and of taking them as analytical points-of-view. But how general are these particular listening behaviours? Would one observe the same behaviours (1) with a group of people from a different background, (2) with another type of music, (3) with another type of artwork? If one cannot provide answers to these questions, one can provide some comments and additional information.

(1) It is quite clear that reception behaviour depends very much on the circumstances of the act of reception. Attentive listening is a very particular practice, limited historically, geographically and sociologically. It is unlikely that one encounters forms, even debased forms, of taxonomic listening or figurativisation in a techno-music "rave" or a Central African village celebration. On the other hand, the few polls carried out at gatherings of listeners tend to confirm that sufficiently varied publics, when they practise an attentive listening, produce testimonies which conform quite well to those analysed here. It could be that in our culture the listening of every attentive listener, whatever the background, comes down to a combination of some of the types of listening described here, or at least a finite or even restricted number of such listenings.

(2) An altogether different question is to know if such a repertoire of listening behaviours, supposing that the present repertoire is verifiable for this piece, can be transposed to another work. One can already predict that this transposability would be limited: "immersed listening", appears to be difficult to apply to *Sommeil*; only certain listening-types are compatible with certain works. However, as we have indicated, a similar observation campaign for a Debussy piano prelude brought to light worrying similarities relating to the three behaviour-types uncovered (taxonomic listening, empathic listening and figurativisation). One is therefore entitled to ask if there is not at least a core of listening-types general enough to be applied to fairly different repertoires.

(3) In attempting to be more daring one cannot escape the question of a possible transfer to other forms of reception in the arts. A comparison between the results of this article and the studies of Jean-Claude Passeron on reception in painting has shown remarkable similarities.²¹ Taxonomic strategy, the search for quasi-physiological sensations on which all perception of an order depends, the search for an underlying law of organisation, and figurativisation, would all find their equivalent in painting. Might there be, at least in our Western culture, types of reception behaviour which are sufficiently general to include music and painting? Might there, for anthropological reasons, be a finite number of ways of apprehending an art object?

DISCOGRAPHY

"Sommeil" is the first movement of Pierre Henry's *Variations pour une Porte et un Soupir* (1963), CD Harmonia Mundi, France, HMC 905200.

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²¹ This comparison has resulted in a publication: *l'oeil et l'oreille à l'oeuvre: enquêtes sur la réception de la peinture et de la musique*, by J.C. Passeron and E. Pedler, including a chapter taking up the results of the present article, of which a first chapter ("*le temps donné aux tableaux*") has been published in *Documents Cercom/Imerec*, Marseille, 1991).

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