

# **When Art, Science and Technology meet: the Strength, the Dilemma or the Curse of Electroacoustic Music?**

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## **ABSTRACT**

**This paper discusses some implications to electroacoustic music composition and reception of the connections of the genre with science and technology. It is argued that the cross-disciplinary nature of the electroacoustic context opens up a path for the appropriation of concepts that reinforce but paradoxically deny the dichotomy objective versus subjective, when the influence of Cartesian dualism in musical thought has already been identified and criticised within traditional western musical thinking. A misplaced emphasis on the separation between subject and object that assumedly characterises scientific methodologies is discussed as the root of a general disregard for the reception end of the compositional process. This separation is also identified with the fragmentation of the holistic musician into performer or composer, and electroacoustic media are suggested as a possible basis for reversing this process and facilitating a different ethos. It is suggested that electroacoustic media provide a unique substratum for the emergence of new ways of making, experiencing and thinking about music. However, it remains to be seen if the genre will evolve towards some sort of ‘classical music of the future’ or merely an idiosyncratic form of the mid-late twentieth and early twenty-first centuries.**

**KEYWORDS:** electroacoustic music, music composition, music reception, cross-disciplinarity, epistemology, music theory.

## 1. Introduction

'Daughter: Daddy, what is an instinct?

Father: An instinct, my dear, is an explanatory principle.

D: But what does it explain?

F: Anything - almost anything at all. Anything you want it to explain.

D: Don't be silly. It doesn't explain gravity.

F: No. But that is because nobody wants an instinct to explain gravity. If they did, it would explain it. We could simply say that the moon has an instinct whose strength varies inversely as the square of the distance

D: But that's nonsense, Daddy.

F: Yes, surely. But it was you who mentioned "instinct", not I.

D: All right - but then what does explain gravity?

F: Nothing, my dear, because gravity is an explanatory principle.

D: Oh.

D: Do you mean that you cannot use one explanatory principle to explain another?

F: Hmm ... hardly ever. That is what Newton meant when he said, "*hypotheses non fingo*".

D: Yes, and I know what *non* means. But what's *fingo*?

F: Well, *fingo* is a late latin word for "make". It forms a verbal noun *factio* from which we get the word "fiction".

D: Daddy, do you mean that Sir Isaac Newton thought that all hypotheses were just *made up* like stories?

F: Yes - precisely that.

D: But didn't he discover gravity? With the apple?

F: No, dear. He invented it.'

Gregory Bateson, *Steps to an Ecology of Mind* pp. 38-39.

In contrast with the traditional manners of composing music using notation, in electroacoustic composition sound is manipulated by means of physico-mathematical and computational models. Electroacoustic musicians deal with representations of different natures, in which the transparency of acoustical phenomena inherent in previous notational schemes is largely lost. In this sense, the expertise embedded in traditional instrument building becomes a necessary part of the electroacoustic composer's trade.

Nevertheless, the gap between poietics and esthetics<sup>1</sup> becomes only slightly more apparent in electroacoustic composition than in some contemporary musical styles. The connections of electroacoustic composition with science and technology merely highlight an already overt distance between the composer's conceptualization of a work and subsequent interpretations, even by its own creator. For instance, exploring compositional method - and often technique - in electroacoustic music, corresponds to delving into the

multitude of mathematical models and technological tools employed by the composers.

Indeed, the exploration of the sonic universe opened up by electronic and computer technology involves a reformulation of what constitutes a *musical problem*. This exploration is no longer a purely musical problem within a frame of thought that places scientific and artistic activities as opposing poles: it is made possible exactly by technological advancements, thereby sharing with technology some of its concerns. Issues in mathematical modelling and data processing, for instance, constitute communal territory. However, as common concern these problems are not exclusively technological either. The representation of data provided by models must suit the purposes that have called for the use of the model in the first place. On the other hand, musical purposes are influenced by the availability of new tools. Musically unconventional tools bring about new preoccupations, different emphases, original *modi operandi*.

A fundamental issue in electroacoustic music is the cross-disciplinary character of electroacoustic composition. Cross-disciplinarity refers neither only to the appropriation of methods developed in one field by another, nor to the interchange of terminologies that accompany these methods. The crux of the matter is that the weakening of boundaries between disciplines triggers a change of perspectives. When musicians, scientists and technicians are dealing with the same instrumentation, this can no longer be treated as purely musical, scientific or technical. The traditionally accepted subjectivity inherent in musical activities is confronted with the assumed objectivity of scientific methods.<sup>2</sup> At the same time that new paths for musical exploration are created, mathematical formalisation becomes part of the very creative processes. Musical, technical and scientific conceptions are extremely intertwined at the moment, and cannot be easily dissociated. One might imagine the integration of previously segregated domains into something *new*, into a new understanding of *that* which is *musical*.

## 2. Objective versus Subjective

The introduction of electronic technology in the compositional scene in the early fifties is generally assumed as part of a process of conscious rejection of established musical models. The parametrical thinking developed by the post-war generation of composers may be viewed as an alternative to a musical tradition that is paradoxically perpetuated through this same thinking, which emphasises self-referential conceptions of music and a disregard for the distinction between poietics and esthetics, accompanied by the mystification of composers and the role of notation. Unfortunately, the electroacoustic musical scene inherits several of these ideas and is strongly influenced by this 'traditional' ethos.

A typical example is analysis. Despite the existence of several schemes for the notation of electroacoustic music, the usual objection to the analysis of the genre is the lack of standard scores. Musical analysis has been traditionally occupied with the exploration of structure understood in terms of compositional ideas and techniques that can be grasped from a score, and despite having been contested by the broader musicological community,<sup>3</sup> this conception is still widely accepted within the electroacoustic musical community. Stroppa (1984) concludes that 'works [that] have been conceived for tape alone are at present impossible to transcribe and analyse'. Unfortunately, this view seems to be changing only slowly. Which circumstances might give rise to such pessimistic prospects?

From the usual analytical perspective, the lack of standardised scores is merely the most apparent hindrance to the analysis of electroacoustic music. The examination of scores relies on an underlying conceptual framework, which is the basis for the existence of a notational procedure, and is tacit common-knowledge within the musical community. This framework comprises contextually determined modes of perceiving and describing musical features, and reveals aesthetic judgements that correspond to a particular conception of musicality. Additionally, it provides the background against which analytical

questions arise, and against which they are justified. The analyst who approaches an electroacoustic piece faces not only the usual lack of scores or other visual aids, but basically the absence of a widely agreed-upon conceptual framework. The occasional scores produced in electroacoustic composition lack such a background, thus not being comparable to conventional musical scores.

Views of analysis based on the examination of a score are tacitly linked with a Cartesian-derived conception of objectivity. The measurability provided by spatial, and therefore timeless, descriptions of sonic and musical features agrees with the separation between subject and object that assumedly characterises scientific methodologies. This state of affairs is clearly paradoxical, inasmuch as the experience of music is psychological. Indeed, analysis of electroacoustic music has been largely approached from a seemingly outmoded perspective that combines 'the worst attributes of nineteenth century ideology and naïve scientific positivism' (Cook & Everist, 1999, pp. x-xi). Interestingly, misinterpretations of scientific notions can be occasionally identified within the literature supported on a view of analysis as a quasi-scientific discipline.<sup>4</sup>

The reliance upon a score as a common-ground upon which music can be discussed is linked with the idea that analyses ought to be legitimised through the verification of their accuracy.<sup>5</sup> However, when a piece of analytical work must be verified, a parallel with scientific experimentation is drawn, and a mechanistic view of music is implied. The scientific method comprises general steps of observation, hypothesis formation and testing, aiming at predicting the behaviour of a system being studied under conditions other than the ones of the observation stage. The central tenet of the method is the complete separation between the experimenter - the subject - and the system - the object: the experimenter must not interact with the system in ways that may alter its behaviour by introducing uncontrollable variables.

The separation between object and subject hypothetically assures the repeatability of any experiment in science. Paradoxically, it was exactly the early age of atomic research that brought to the fore the inevitable active role of the experimenter, who designs the experiment and thus determines the nature of the observations.<sup>6</sup> Indeed, the physicist Fritjof Capra suggests:

In transcending the Cartesian division [between subject and object], modern physics has not only invalidated the classical ideal of an objective description of nature but has also challenged the myth of a value-free science. The patterns scientists observe in nature are intimately connected with the patterns of their minds; with their concepts, thoughts and values. Thus the scientific results they obtain and the technological applications they investigate will be conditioned by their frame of mind. Although much of their detailed research will not depend explicitly on their value system, the larger paradigm within which this research is pursued will never be value-free. (Capra, 1983, p.77)

The idea of paradigm discussed by Kuhn (1970) is applicable not only to science, but to any branch of knowledge: paradigms are conceptual frameworks that 'relate facts, select facts, and make us see facts in a certain light' (Gregory, 1974). Indeed, Kuhn's concept of paradigm (and scientific revolution) provides the basis for Jauss' theory of reception, which suggests 'literary investigation as an analogous undertaking to procedures in the natural sciences' (Holub, 1984, p.1). In particular, where music is concerned, Jauss' project of a 'historiography that will play a mediating role between past and present' (*ibid.* p.58) invites an examination of 'the points of intersection of synchronic and a particular sort of diachronic history, and to treat each juncture as of equal epistemological importance' (Everist, 1999). Unfortunately, given that paradigms 'serve not only to relate facts' but can 'make facts and questions respectable' (Gregory, 1974), this equality of epistemological importance seems most desirable if not utopian, once the minds and intellects involved are mostly part of 'multi-million pound institutional investments such as our national universities [which] are integral to the reproduction of on-going social formations and are

thus at the forefront of cultural guardianship ... and ideological control' (Jenkins, 1991, pp.20-1).

The separation between subject and object within musical analysis is clearly a paradox: the nature of the musical experience is perceptual, and, therefore, subjective. From an epistemological perspective, musical descriptions can be objective only in the sense that the conceptual framework that underlies the description is intersubjective, i.e. can be shared by different individualities. Indeed, the repeatability of scientific experiments is guaranteed by the intersubjective nature of the scientific paradigms. 'It is the recognition of this - the growing awareness that an analysis is integral to its subject and object - that has called into question the implicitly scientific basis of music analysis as a discipline' (Samson, 1999). However, it is only in the absence of the score, the hypothetical frontier between the analyst (the subject) and the piece of music (the object), that musical analysis reasserts itself clearly as an essentially experiential activity.

The absence of scores of electroacoustic music implies that analysis and theory of the genre can hardly avoid tackling issues in perception, and, consequently, the dichotomy objective/subjective. Although the emergence of a preoccupation with these issues is not due to electroacoustic music, 'which has largely been ignored by the musicological and analytical community' (Smalley & Camilleri, 1998), it would seem that the connections of the genre with science and technology tend to encourage the reification of analytic conceptions of 'the musical work', <sup>7</sup> which are paradoxically negated by the very oral nature of the genre. In particular, the media upon which electroacoustic music is registered and kept may be paralleled to the conventional score as that which confers the identity to the composition and corresponds to its mode of being and source of its ontological existence.

Nevertheless, the musical *score* (and clearly the tape or CD) is *not* the *music*: it

merely provides an acceptable substitute within a view of music that is based on ill-adapted mechanistic conceptions.<sup>8</sup> 'Obviously a text, as notated, is not actually the musical work: music exists as sounds, it fills time rather than space ... the notated version is no more than a source of advice or instructions for recreating the music' (Boorman, 1999). Nevertheless, from a mechanistic perspective the score purports to translate into image that which eludes the assumed objective reality of vision: what can be seen can be measured. It is apparently a peculiarity that our culture places so much reliance upon vision, to the detriment of hearing, which is the sense that is least affected by social constraints. Acoustic isolation is only achieved with special preparation for special purposes, in contrast with the routine organisation of space and its division into living or working units. Perhaps the predominant emphasis on the visual is linked also with the fact that what is seen can be more easily controlled than what is heard.

Interestingly, science itself does not always work in the realm of the visible.

Indeed, Bateson reminds us that science may be viewed as:

*a way of perceiving and making what we may call 'sense' of our perceptions. But perception operates only upon difference. All receipt of information is necessarily the receipt of news of difference, and all perception of difference is limited by threshold. ... It follows that what we, as scientists, can perceive is always limited by threshold. ... Knowledge at any given moment will be a function of the thresholds of our available means of perception. The invention of the microscope or the telescope or of means of measuring time to the fraction of the nanosecond or weighing quantities of matter to millionths of a gram - all such improved devices of perception will disclose what was utterly unpredictable from the levels of perceptions that we could achieve before that discovery. (Bateson, 1980, pp.31-2)*

This perspective highlights issues of an epistemic nature: descriptions apply only to objects that possess epistemic value. However, epistemic value is mediated through perception, direct or 'extended', following Bateson's suggestion. Musical analyses are epistemic facts, therefore representing specific paradigms - a conflation of epistemological,



ideological and methodological possibilities and constraints - that provide the adequate background for their evaluation. From an epistemological perspective, objectivity really makes sense only if conceptualised in terms of intersubjectivity. The integration of disciplines within the electroacoustic compositional scene suggests the need for a parallel motion within analytical thinking. Indeed, electroacoustic media provide a unique context in which art, science and technology fuse into a substratum for the emergence of new ways of making, experiencing and thinking about music.

### **3. Notation and the Fragmentation of the Musical Experience**

Although little is known about the origins of musical notation in various cultures, it has been strongly suggested that word literacy long preceded music literacy.<sup>9</sup> Based on archaeological and ethnological studies, the existence of more widely involving functions for music in earlier times has been hypothesised: other than the composer-performer-audience triad, progressively established throughout centuries of western music, probably more collective modes of music production, akin to improvisation and to the music-making of the so-called primitive cultures.<sup>10</sup> The need to preserve and transmit a musical culture, the most basic motivation for the development of notation, certainly took longer to emerge within contexts in which music was endowed with more socially participatory or ritualistic character.<sup>11</sup>

It has been found that earlier notational directives, such as those developed in ancient China and in Byzantium, were used basically as teaching aids; the main knowledge was then transmitted orally or by gesture.<sup>12</sup> Paradoxically, these same notations were theoretical rather than practical. In ancient China the fixing of pitches for the degrees of a scale was directed by needs of social order, harmony and progress.<sup>13</sup> In ancient Greece, scales were defined to fulfil an ideal order dictated by mystical numerical relationships.<sup>14</sup> Nevertheless, the primary uses for notation have been related mainly to performance.

Notation has served the purpose of providing a general chart to be filled in by the player.<sup>15</sup>

Although the interpretation of any written register does suggest facets of the thinking that produced it, some contextual knowledge is paradoxically required. Signs and marks possess a conventional character that determines their interpretation according to a whole range of unwritten ideas. These ideas consist of directives transmitted through teaching, and are often common knowledge within the context. 'One does not simply read black marks on paper but meaningful signs' (Goehr, 1992, p.35). The understanding of the ideograms found in certain eastern languages illustrates this problem. Students of these languages must eventually acknowledge the necessity to delve into the intricacies of the culture to which the language belongs. However, interpretations comply with the perspective of the interpreter.

Conventional musical notation, for instance, spans several historical periods and different geographical locations. Despite all the modifications introduced to this scheme throughout centuries,<sup>16</sup> when conventional musical notation is used to produce a score, common knowledge is omitted to favour the specification of that which is different and new, perhaps even idiosyncratic. New signs have been introduced to refer to extended playing techniques and novel musical ideas.<sup>17</sup> The scheme has also been modified in attempts to make it suitable for the transcription of oral musics.<sup>18</sup> Nevertheless, the continuous changes and modifications imposed on conventional musical notation cannot be compared in depth to the explosion of notational schemes in the twentieth century. Cage (1969) is a well-known collection of examples that illustrate this situation. The contextual knowledge necessary for the interpretation of some contemporary scores is occasionally reduced to one composer's own system, or perhaps even confined to what the composer provides as key to accompany a single composition.

The advent of written registers for music certainly allowed increasing degrees of

complexity and organisation in musical structuring. However, at least in the western world, it also contributed to the over-specialisation of musical activities. In the West notation evolved from the original idea of preservation of the musical culture to become an invaluable aid for developing musical thoughts as well as a potential hindrance to this same development. The original function of notation was to serve as an *aide-mémoire* to the musician.<sup>19</sup> However, musicians progressively became composers *or* performers, and notation evolved from *aide-mémoire* to a means for composers to impose on the performer their individual conceptions.

The idea of prescriptive notation<sup>20</sup> is directly connected with the fragmentation of the musician into two separate entities that play distinct roles in the process of music-making. 'From the early nineteenth century onward, composers have tried to impose a greater level of precision on the performer'.<sup>21</sup> It might be suggested that a human need for control expressed itself in the tendency to ascribe a prescriptive intention to a merely descriptive tool.<sup>22</sup> Description was interpreted and used as a means for prescription, being finally equated with imposition. The need to register the musical practices of the West seems to have coexisted with - and eventually been dominated by - the need to organise the very practices. A thin and easily crossed line divides idea and ideology, organisation and control. As Trevor Wishart puts it, 'ever since the Ancient Egyptians developed pictures into a viable form of hieroglyphic notation, our world has been dominated by a class of scribes, capable of mastering and hence capable, or deemed capable, of controlling what was to be written down and stored in the historical record'.<sup>23</sup>

In a humorous analogy, Roseboom (1993) compares the relationship composer-performer to the position of the observational astronomer involved in searching for extra-terrestrial intelligence. In this analogy, the performer supposedly looks for a message without conception of what it might be. However, Roseboom connects this assumedly

desirable state of mind of the performer to questions such as ‘What is musical intelligence?’. At the same time that the distance between poietics and esthetics is acknowledged, the performer's poietic importance is ignored. The polarisation composer-performer, reinforced by means of an intermediary notational scheme, mystifies both the creative powers of composers and their role in music-making. ‘Music is ... considerably more than a repertoire of audible terms, of works that are compositions ... by these the composer was established as a superordinate authority, while the musical objects whose creators were unknown were almost of no value’ (Reinecke, 1993). Performers are relegated to the position of searchers of an ‘intelligence’ that precludes their own, as if creativity were essentially a *property* of the composer. On the other hand, performances may be evaluated on the basis of precision, and performers may be valued according to their capability for faithful reproduction and technical achievements. Paradoxically, the polarisation composer-performer mystifies also the performer. Virtuosity is praised not as a natural consequence of dedication, but as a necessary goal to be achieved within a certain socio-economic arrangement.

The fragmentation of the holistic musician into performer and composer gave birth to a community in which the appreciation and the understanding of music became merely a question of know-how. In the same way that conventional musical notation is ascribed prescriptive intentions, theory is understood not in terms of hindsight, as suggested by Stravinsky, but as an entity on its own capable of justifying or even creating a musical composition.<sup>24</sup> Moreover, something as basic in other cultures as music appreciation requires skills that must be acquired in the same way that any technician learns a craft. The layperson who plays for their own entertainment and the music listener who plays no instrument are largely left outside. Music listening is not normally considered a valuable skill, and respect is gained mostly in connection with a professional label of critic or analyst.

Nevertheless,

today we have to be aware that ... aesthetic categories are categories of a cultural reality of the last two centuries, grown in Europe. But in spite of all hopes of some, this cultural reality is no aspect or offspring of nature but one of a grown and dynamically developing cultural reality. When we visit a concert or talk or reflect upon music we do it in the frame or the patterns of our own traditional cultural discourse, that was developed in the 18<sup>th</sup> and 19<sup>th</sup> centuries. In those times almost the complete interest was focused on a sort of music to which one had given the name or the title '*Tonkunst*'. And that meant the difference from the low music of street ballads, that is to say to the then not yet declared 'Folkmusic' ('*Volksmusik*'). The musical art - '*Tonkunst*' - was looked upon - and that is significant - as being in contrast to non-European music. Forgotten were our one- or two- million years of genetic past that is not yet history. Instead we were fascinated by a discourse not older than some centuries behind which lay two thousand years at the most. (Reinecke, 1993)

Paradoxically, in integrating composition and performance into a more embracing activity, electroacoustic composition opens up a path for reversal of the fragmentation of the musical experience. The duality composer versus performer is negated. Musical knowledge is once again transmitted orally, and the central need for a notational scheme is connected with teaching purposes. The iconoclastic function of the acousmatic curtain may be at work, denying the listener an object of fetish. Additionally, computer-based music technology becomes progressively cheaper and more widespread, which may be proved to be mostly an encouragement to the non-professional musician.

On the other hand, it is certain that music technology is not necessarily or directly equated with creativity. It is also obvious that tape composition as a direct medium between composer and listener does not guarantee either a more accessible art or a more open musical community. Additionally, the contemporary problems related with the use of communication technology must be also considered, once computer-based technology is pivotal in electroacoustic composition. The use of such technology as substitute for real-life interaction may suggest gloomy prospects of a future without face-to-face communal activities, not to mention the issue of possible listener alienation through the perception of

this technology as esoteric and exclusionary. Essentially, it is clear that much more than an object of fetish is denied to the listener by the acousmatic curtain, albeit half pulled.

#### **4. Issues in the diffusion of electroacoustic music**

An epistemological approach to perception reveals the epistemic nature of the very objects integrated by perception: perception seem to operate in a constant dialectic between concept and sense-data.<sup>25</sup> It is interesting to note that concepts such as melody, rhythm and even phrasing have been widely assimilated by non-specialists, despite being conceptualised differently by a trained musician and an average listener. It does not seem too far fetched to imagine that a notion such as motion,<sup>26</sup> for example, could be absorbed by a wider audience. It seems that tentatively categorising the listener-analyst represented in terms of perceptual abilities - following the usual classifications of listeners as competent, non-competent, naïve, etc. - is a dubious approach. Such classifications tend to reify a *status quo* characterised by an exclusivism which apparently denies the possibility of an ethos<sup>27</sup> that surpasses the preservation of tradition tacitly for the sake of some form of snobbery, intellectual or otherwise.

Within a percept-concept dialectic, perceptual abilities and conceptual structuring are mutually interdependent: new concepts can be learned or crafted that defy preconceptions and enable new perceptions. A pivotal issue in music listening is thus the role of the listener's conceptualisation of music. Views of music are, in essence, preconceptions, ultimately connected with the *identity of the listener*. From a sociological perspective, music may be interpreted as a signpost, a marker. There is a correlation between musical tastes and social groups characterised in positional and ideological terms.<sup>28</sup> Contextualised, the behaviours surrounding music listening may be understood in many ways, as music commonly appears as a supplementary aspect

within different communicational situations.<sup>29</sup> Music is identified with external situations, moods, ideologies, and these are aspects that contribute to the listener's 'definition' of self as an entity that is simultaneously an individual and a part of a social group. The correlation between music and identity exists also at the level of the individual, suggesting that the iconoclastic function of the acousmatic curtain is much more embracing than previously noted. Indeed,

the processes that lead to the imagination and construction of a musical ontology assemble it from various metaphysical conditions, but they strive towards an ontology that expresses and resides in some understanding of self-identity. Far from negating other musics and other ontologies, this self-identity depends on them. (Bohlman, 1999)

Although it is not an idiosyncrasy of electroacoustic music to challenge usual conceptions of musicality and 'definitions' of music, the experience of electroacoustic music deeply challenges habits and preconceptions accumulated and built over a lifetime of acculturation. The plurality of styles in electroacoustic composition suggests a motion towards the development of a new musical intelligence. Nevertheless, music is a perceptual experience, and a new musical mind, albeit multifaceted, cannot be conceived independently of an intelligent ear. However, there does not seem to exist any reason why any listener should not be able to perceive electroacoustic musical structures. Nevertheless, this implies the need to cast off habits of formulaic responses exploited by a culture that trades on a largely unconscious submission to, or perhaps a vulgar liking for, manipulation. The bridge between the 'subjective' and the 'intersubjective' is a function of conscious will: underlying matters of knowledge and perceptual awareness lies the more essential issue that *the perceiver must be willing to perceive*.<sup>30</sup> This is in accordance with the epistemological stance that underlies this paper, as neatly encapsulated in the excerpt of a dialogue between father and daughter transcribed initially.

Several issues of pivotal importance to the diffusion of electroacoustic music have already been advanced in the discussion above, which touched upon notions that pertain to a sociological view of music as a facet of a more embracing context. The spread of the genre might be sentenced to remain either an unresolvable problem or an irrelevant issue, if Music were to be viewed simply as an isolated object devoid of contextual significance. It is certainly true that, given the existence of a community involved in electroacoustic music, the genre is not devoid of ethos, ideology and aesthetic values. Within contemporary western society electroacoustic music might be viewed merely as the product of one more subculture, identified with very specialised individuals belonging mostly to Academia. From a sociological perspective there is a complementarity between exclusivism and massification - and vulgarisation - and electroacoustic music might be condemned to fit neatly into the former category of social processes.

As suggested above, there is certainly a great distance between the concepts underlying the hypothesised intelligent listening and the usual conceptions of music as an isolated object. However, this is not an idiosyncrasy pertaining to electroacoustic music, but an issue that permeates debates on the wider diffusion of music such as Schoenberg's and Webern's, for example. Adorno's remarks transcribed below could easily refer to the reception of electroacoustic music:

... the opinion that Beethoven is comprehensible and Schoenberg incomprehensible is an objective deception. The general public, totally cut off from the production of new music, is alienated by the outward characteristics of such music. The deepest currents present in this music proceed, however, from exactly those sociological and anthropological foundations peculiar to that public. The dissonances which horrify them testify to their own conditions; for that reason alone do they find them unbearable. Exactly the opposite is the case of the all-too-familiar, which is so far removed from the dominant forces of life today that the public's own experience scarcely still communicates with that for which traditional music bore witness. Whenever



they believe to understand, they perceive really only a dead mould which they guard tenaciously as their unquestionable possession and which is lost precisely in that moment that it becomes a possession: an indifferent show piece, neutralized and robbed of its own critical substance. ... the true basis of meaning in the composition is no less hidden from the radio-trained listener in an early Beethoven sonata than in a Schoenberg quartet, which at least reminds him that his sky does not consist entirely of clouds with silver linings upon whose radiance he can forever feast his eyes. (Adorno, 1973, p.9)

Adorno criticises the notion of an *objet d'art* that is indeed merely an object of fetish within a socio-economical order dictated by commercial profit, emphasising the ontological basis of music composition and an ontological level of musical meaning. From this perspective, there are several aspects of the electroacoustic context that suggest new avenues for Music. As discussed earlier, the context is strongly cross-disciplinary, and the electroacoustic community is marked by a distinct international character, despite the historical connections of the genre with western (European, mostly) musical traditions. Additionally, a plurality of compositional styles is paralleled by widespread research into new instrumentation that allows progressively more direct gestural input, providing, perhaps, the basis for the development of new modes of improvisation. The electroacoustic context possesses the seeds for the realisation of a more holistic idea of Music. From a critical perspective, it is preferable to imagine a musical future with progressively less use of music technology for the vulgar exploitation of the *kitsch*:

... from Muzak which can be generated in real-time from synthetic and sampled sounds complete with algorithmic control of 'expressive timing', to perfect recreations of historical performances through computer analysis of earlier recordings, to a virtual reality Karaoke in which I can be the soloist. (Emmerson, 1997)

From an ontological perspective, it is appropriate to view the context, particularly the compositional scene, as transitional in connection with the contemporary dichotomy specialisation versus integration. Contemporary western life seems to be

characterised by an apparently paradoxical coexistence between trends towards opposite directions. Knowledge is fragmented into a multitude of specialised areas and 'specialisms', at the same time that cross-disciplinarity becomes more and more widespread. At a more global level, the disintegration of national states into sub-areas that hypothetically reflect ethnic and cultural divisions is paralleled by a globalisation enabled by powerful and continually improved communications means. 'The post-modern world is a connected world in which everyone lives in isolation' (Richard, 1994). Fischman (1994) identifies a

... trend towards fragmentation of the standard values in Western Society (this latter analogous to standardization in industrial mass production), bringing with it greater individualism and customization in every field of activity. After three hundred years of consistent massification, society is actually reversing this trend.

Concerning music composition and appreciation, it makes sense to argue that 'if demassification is taking place, then it is important to address the problem of audiences from a new perspective; ... this would imply achieving an 'optimal' - rather than a 'maximal' - size of audience' (*ibid.*). However, it seems that pluralism tends to manifest itself as a combination of exclusivism, on the one hand, and surrender to habit, on the other hand. Fragmentation of values and pluralism do not correlate directly with freedom of thought and expression; on the contrary, this sort of fragmentation resembles better some form of pathology: a whole that is broken down into parts that do not relate with each other.

The integration of disciplines that takes place within the electroacoustic context might hold the key for the advent of refreshing attitudes towards music, but it can not prevent the perpetuation of deeply seated ways of a society that pledges openness but simultaneously thrives in exploiting the mystique created around individuals and groups - determined by ethnic, geographical, socio-economic or professional classes.

The debate on the complexity/simplicity of music, for instance, is immaterial when the issue at stake is more essential than fashioned judgements on the accessibility of a musical composition. Such considerations possess patronising undertones, when 'the public intelligence deserves more credit than it is given by those who are worried about the alienation of 'esoteric' composers and argue that music should be administered in acceptable doses of immediacy' (Fischman, 1994). Similarly, arguments on the 'quality' - good versus bad - of a musical piece<sup>31</sup> may reduce a complex matter to sweeping generalisations of the likes of 'dilettantes are in control of the medium; artists without anything significant to say, technologists without any real reason to use the technology'.<sup>32</sup>

The development of an intelligent listening is an integral component of the development of critical attitude, which is indeed a personal matter that concerns both artist and public and is not a function exclusively of familiarisation with cultural values. Critical thinking cannot be developed through training based on the repetition of previously established protocols, but rather through the inspection of the bases upon which models and patterns are founded. Training *per se* does not guarantee an understanding of these bases that is necessary for true creativity - creative activity - to take place. When Education is viewed purely as a passing on of information, aiming at producing individuals with know-how to perform specific functions within the established social structure, the development of critical thinking is relegated a secondary position of mere -perhaps undesirable - by-product of more inquisitive minds: '[we] may win degrees, may have a series of letters after [our] name and land a very good job; but then what?' (Krishnamurti, 1986, p.93). What follows naturally is the question: 'What is the point of it all if in the process [our] mind becomes dull, weary, stupid?' (*ibid.*).

In particular, where musical education is concerned, lack of critical thinking correlates with an acceptance of paradoxical criteria that are inadequate *vis-à-vis* the plurality of concepts and ways of thinking that underlie the music of different times and places. For example, it is surely valid to have our children exposed to the music of non-western cultures, but it is dubious - to say the least - to literally *use* these musics as vehicles to present and illustrate western concepts. When western children are asked to evaluate the mood of an excerpt of *gagaku* music,<sup>33</sup> ethnocentrism in the future adult should not come as a surprise. When music is detached from its legitimate social and cultural context, opening up the way for illegitimate and misguided judgements, a fragmented way of thinking is perpetuated that denies the possibility of a more genuine and tolerant understanding of that which is different. A similar line of questioning may be directed to the evaluation and appreciation of past styles and genres within the western tradition, as well as to electroacoustic music, which certainly fits in the category of the 'different'.

The availability of the powerful tools provided by computer-based technology stresses the depth of these considerations. The diffusion of electroacoustic music, as well as the evolution of the genre, its ramification into styles, all are issues that naturally depend on how this technology is developed and used. However, the development and use of technology is directed by our system of values and beliefs, potentially changeable but, unfortunately, much more easily perpetuated through Education. It is beyond the scope of this paper to examine the complex issues involved in Education, but the matter remains crucial, specially when it is possible to advocate that 'the idea that increasing education will enable the generic listener to enjoy or understand abstract art has little empirical support and runs counter to evolutionary biology' (Pressing, 1994). Despite characterisations of the electroacoustic ethos in

terms of mechanistic objectification of the compositional processes,<sup>34</sup> underlying the genre are novel ways of outlining what music is, and, perhaps more importantly, *what music can be*. We might be now developing the bases of the 'classical music of the future', to use a paraphrase of Orton (1992), but it remains to be seen if we are only dealing with an idiosyncratic form of the mid-late twentieth and early twenty-first centuries .

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<sup>1</sup> The concepts of poietics and esthetics are proposed in Nattiez (1990) as constituents of a tripartition that defines the total musical fact. In general terms, poietics concerns the creative processes and procedures involved in composition, and esthetics concerns the interpretative mechanisms involved in appreciation. The third aspect of Nattiez's tripartition corresponds to the neutral level, the physical level in which the work exists independently of poietics and esthetics. The three levels constitute distinct areas of analytical interest, within Nattiez's semiological program.

<sup>2</sup> From an epistemological perspective, there are some fundamental similarities between scientific and musical endeavours, which may account for the special affinity towards music that scientists often display (Tang, 1984).

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<sup>3</sup> Cook & Everist (1999).

<sup>4</sup> Cogan (1984, p.3), for instance, suggests that 'we live in a sea of vibrations, ourselves vibrant within it', and adds that 'depending upon their frequencies, we perceive wave vibrations as colours or sounds, radio waves, X-rays, or other spectral phenomena'. This is not accurate. Acoustical (mechanic) and electromagnetic waves are phenomena that occur in completely distinct media, and the latter are not perceived by any of our common senses. Despite misconceptions such as this, Cogan's theory provides the basis for a variety of analytical works (on electroacoustic music as well as other genres), as discussed in Ferreira(2000).

<sup>5</sup> Kivy (1980, pp. 3-11) concisely presents the ideas upon which this kind of thinking is based.

<sup>6</sup> Capra (1983), pp. 76-77.

<sup>7</sup> Goehr (1992), pp. 11-68.

<sup>8</sup> An interesting critique of these conceptions is presented in Deschênes (1991).

<sup>9</sup> Cole (1974), pp. 10-11.

<sup>10</sup> Mellers (1992a).

<sup>11</sup> Mellers (1992b).

<sup>12</sup> Cole (1974), p.6.

<sup>13</sup> Cole (1974), p.6.

<sup>14</sup> Cole (1974), pp. 6-7.

<sup>15</sup> Cole (1974), p.9.

<sup>16</sup> Cole (1974); Rastall (1983).

<sup>17</sup> Read (1969), Karkoschka (1972), Stone (1980), VillaRojo (1985).

<sup>18</sup> E.g. Berghmans (1983).

<sup>19</sup> Rastall (1983), p.3.

<sup>20</sup> Seeger (1958) suggests the term 'prescriptive notation' as 'a blue-print of how a specific piece of music shall be made to sound', in contrast with 'descriptive notation', which is a 'report of how a specific performance of it actually did sound'. Seeger's discussion explores the problem of transcriptions of oral musics, but the terms can be found in the literature on electroacoustic music as well.

<sup>21</sup> Boorman(1999). Goehr (1992, pp. 28-29) identifies the roots of this process in the late eighteenth century as 'a simple remedy for dissatisfied composers' who 'wanted performers to regard certain aspects indispensable to the performance of their compositions' and thus specified these aspects progressively more precisely leaving performers to 'learn how to follow the specifications'.

<sup>22</sup> Conventional musical notation is indeed merely descriptive, in the sense that it *describes* sonic characteristics according to a particular conceptual framework.

<sup>23</sup> Wishart (1985), p.125. Wishart suggests that this 'class of scribes' within the musical community is a kind of side-effect of the development of the creative tool embodied in musical notation. He argues against their domination through excessive emphasis on music-writing to the detriment of actual music-making. Wishart's argumentation agrees with Jenkins' view of history as 'a shifting, problematic discourse ... that is produced by a group of present-minded workers ... who go about their work in mutually recognisable ways that are epistemologically, methodologically, ideologically and practically positioned and whose products, once in circulation, are subject to a series of uses and abuses that are logically infinite but which in actuality generally correspond to a range of power bases that exist at any given moment and which structure and distribute the meanings of histories along a dominant-marginal spectrum'. (Jenkins [1991], p. 26).

<sup>24</sup> Craft (1959), p.16.

<sup>25</sup> This view is based on Bateson (1980), which is discussed in more detail in Ferreira (2000).

<sup>26</sup> Smalley (1986)

<sup>27</sup> The term 'ethos' is understood here in G. Bateson's formulation as a 'standardised system of emotional attitudes' (Bateson [1958], p.119).

<sup>28</sup> Hargreaves & North (1997b); Russell (1997).

<sup>29</sup> Typical examples are film soundtracks and the 'tunes' of couples in love.

<sup>30</sup> 'There is a temptation to regard the most educated listeners as the worst: those who promptly react to Schoenberg with 'I do not understand' - an utterance whose modesty masks anger as expertise'. (Adorno [1973], p.11)

<sup>31</sup> S. T. Pope (1994) 'Why is Good Electroacoustic Music so Good? Why is Bad Electroacoustic Music so Bad?', Editor's note *Computer Music Journal* v.18 n.3; note and subsequent responses obtained from the Journal's Internet site:

[http://mitpress.mit.edu/Computer-Music-Journal/EdNotes/So\\_Good\\_So\\_Bad](http://mitpress.mit.edu/Computer-Music-Journal/EdNotes/So_Good_So_Bad).

<sup>32</sup> response to Editor's notes by J. Harrington, Internet site cited above.



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<sup>33</sup> Bennett (1996), p.98.

<sup>34</sup> Chambers (1994).