
The technological era of ‘sound’: a challenge for musicology and a new range of social practices

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The ‘technological revolution’ that took place in music during the twentieth century is equivalent to the revolution that took place between the twelfth and fourteenth century, which transformed musical notation into applications of technology related to creation. This second revolution, as well as the first one, concerns not only musical form, but also the social organisation related to music. The aesthetic of sound is the key factor (in all the genres of contemporary music), which is a major challenge for musical analysis. Society is reorganising itself, favouring the appropriation and amateur practices within musical creation. Musical research institutions – and particularly the GRM – develop new forms of collaboration with their audience and contribute to the constitution of a ‘horizontal’ society, based on exchange, in frank opposition with the ‘vertical’ society, based on a reduced number of producers and a large amount of consumers.

1. INTRODUCTION

As everyone knows (especially readers of this journal), the middle of the twentieth century has been characterised by a genuine ‘technological revolution’ of Western music. Not only has it been possible, since 1877, to record sound, but it has also become feasible to compose directly onto a medium. Until then, recording was used to *preserve* and *transmit* music that had been composed and played using the old technology – the score and the instrument. Then, one day in 1948, the record was used to assemble sounds and to *compose*.

What is perhaps less obvious (even for readers of *Organised Sound*) is that a similar ‘technological revolution’ had already occurred between the twelfth and the fourteenth century, and that the second revolution is comparable to the first. Around the thirteenth century, the use of a support system was mastered aimed at not just *preservation* and the *transmission* of music but also to its *creation*. Annotation had, till then, been used to transcribe orally imagined music. Within a few decades the practise of this new writing spread widely. Instead of first singing and then writing down to conserve the memory of what had been sung, it became possible to create, with the help of writing, music which could subsequently be sung or played. Writing became a technology of creation. It

became possible to imagine a second voice while reading the first one, and to verify intervals at a glance. The use of retrograde and polyphony as used in *Ars Nova* in general are strictly unimaginable without the help of a written representation on a two-dimensional support system.

The revolution of writing has had well-known consequences in both the aesthetic and the social field. Music is no longer the same when composed with the help of a score. Writing is the ideal tool for polyphonic inventiveness and, as has often been remarked, the combinatorial games of serialism echo the one of *Ars Nova*. Over seven centuries of Western art music has explored both the horizontal and the vertical.

The organisation of social practices has itself been strongly dependent on the technology of writing. Through written composition appears the figure of the composer (nothing is easier than to write down one’s name as well); with the printed score (1501) a clientele of readers develops that, within the family home, can decipher polyphonic songs, while musical education includes reading and writing. Gradually musical practice focuses on the score.

In a comparable manner, the electroacoustic technology of the twentieth century has not only created a music that does not look like written music, but has created new social practices founded on these new techniques.

2. ORGANISED SOUND

Certainly, someone such as Varèse did not wait till the facilities of a studio became available in order to define music as ‘organised sound’. He dreamt of a studio before he obtained one. ‘We possess today the scientific means which would allow us to create not simply faithful reproductions but totally new sound combinations, making it possible to create new emotions to reawaken dulled sensibilities. All sounds imaginable can be perfectly reproduced and controlled in quality, intensity and tone, which opens up infinite aural horizons.’¹ In 1940 this dream was still a dream. In fact

¹‘Organised sound for film’ Varèse 1940, cited from Varèse 1983: 108–112.

it would take at least another eight years for the sensibilities to awaken, not until machines and inventors with complementary skills were brought together in a 'Club d'Essai' by an 'administrative virtuoso, a creator of impossible but indispensable institutions'² as well as an 'organiser of sound', Pierre Schaeffer.

In fact neither Varèse nor Schaeffer was the first in according prime importance to sound in musical aesthetics. The history of Western art music is permeated with an increasing preoccupation of how to set the rendering of sound in writing. From the baroque to the middle of the twentieth century the details concerning instrumentation, then orchestration, the mixing of timbres to create new tone colours and so on increase – from the moment of conception, when details of performance such as 'nuances', articulations, phrasing and playing modes are all written down to a point where pencil and paper, in other words the technology of writing, can no longer cope. It is then, as if by a miracle, that electroacoustic technology makes an appearance and is not only able to fix sounds onto a medium, but is also capable of manipulating them and to allow for composition to take place. It is capable, to repeat the very accurate opposition of Varèse, to copy pre-existent music as well as to produce entirely new music.

We must therefore place this profound mutation in the middle of the twentieth century. This does not only concern what is properly called electroacoustic music but also all music that uses, to various degrees, electroacoustic means, that is to say, with a few exceptions, all music.

The field covered by the term 'electroacoustic' is difficult to delineate. Let us devote a few words to this.³ Usage has reserved the expression 'electroacoustic music' to art music, created by composers who have in general been trained in classical music or who belong to the social sphere of art music by way of institutions. Why 'electroacoustic' rather than 'acousmatic' or 'concrète'? Because it is in effect the technology that distinguishes it from writing. Based on the balance between an electric signal and an acoustic wave, it calls on the microphone and the loudspeaker – the first to transform into an electric impulse, the second into an acoustic wave. This involves the activation of an electric signal or its digital equivalent⁴ to obtain an acoustic result. We know already that this type of music can be subdivided: on the one hand, music entirely produced in a studio, recorded on a medium or in the memory of a computer and projected in space by loudspeakers; on the other hand, 'live' music which has kept its

connection with the instrument or the voice and is performed on stage, based in instruments and sometimes using electroacoustic additions in order to enhance and transform it.

It is worth noting that the same dividing line exists in 'popular music', which does not lay claim to the title 'electroacoustic music', although pop music almost always uses electroacoustic technologies. On the one hand, there are the songs and productions created in the studio, recorded and mixed, fragment by fragment, track by track, and made audible only by the use of speakers (even if there also exists a live version of the same title). On the other hand, there is live music, often derived from rock, with its predilection for stage performance. It is not the intention here to attempt an outline of classification, superficial and changeable, but to point out that all pop music today, with the exception (if that) of the acoustic guitar and the accordion, starts with microphones and synthetic sound systems and ends with speakers. It belongs to the *electroacoustic paradigm*.

Since when has pop music taken hold of these technological means? An article by Peterson (1991) devoted to the birth of rock gives an answer: 'Why 1955? How to explain the birth of rock?' The author's answer to his own question is technological: the commercialisation of the 45 rpm record, the magnetic tape and tape editing, the development in broadcasting (increase in the number of radio stations, appearance of the transistor radio) – the date again places us in mid-century. For pop music as well as for its big art sister it became possible, from that point on, to produce a final 'sound' thanks to studio techniques.

During this period classical music was equally hit by the technological shockwave. The changeover from 78 rpm records to LPs gave full scope to the research into the musical quality of 'sound'. The enormous improvement in the signal to noise ratio (+15 dB), the widening of the frequency range (two and a half octaves) and the lowering of distortion (divided by 3.5) allowed details of timbre to be properly fixed. Just one year after the commercialisation of the micro groove, the first ensemble playing on ancient instruments, *Concentus Musicus*, was founded by Nicolaus Harnoncourt (1953) and performers of baroque music embarked on a 'search for lost sound'.⁵ It had become possible to record and capitalise on the research of 'sound'.

Within the world of Western music these techniques of fixed and manipulated sound have provoked a profound mutation in the middle of the twentieth century. The word 'sound' itself has changed meaning. It is no longer an acoustic phenomenon, which can be measured in physical variables of decibels and hertz, nor is it the elementary particle of classical music theory

²Page 4 of introduction to *Traite des Objets Musicaux*, Schaeffer 1966 back over.

³The GRM has devoted a year-long conference to this: 'Territories and maps of electroacoustic music 1995–96'.

⁴In this sense, the computer used to synthesise or transform sound signals belongs to the domain of the electroacoustic.

⁵To recycle the title of the first chapter of a work by Philippe Beussant (1988) *Vous avez dit baroque?* Actes Sud.

called 'the art of combining sounds' present in expressions such as 'a three-note chord'. Sound has from now on an aesthetic quality.⁶ When one compares the 'sound' of Miles Davis with that of Chet Baker, or judges the 'sound' of a recording label (the Decca sound of the 1960s), this is no longer about measuring or combining but about qualifying. For listeners, sound has become a prominent criterion of appreciation. A radio programmer of pop music will judge the originality of 'sound' before listening to a melody or a rhythm. With the exception of a few nuances, the same criterion pertains equally to jazz as to classical and contemporary music: in the second half of the twentieth century, people have developed a 'modern ear' especially sensitive to this new variable in music production.

Again Varèse got it right when he answered John Cage: 'Music of the future? Surely based on sound, beyond notes.'⁷

3. A CHALLENGE TO MUSICAL ANALYSIS

The 'music of the future' is today the music of the present, and musicology must integrate this novelty into its field of study. Until recently, this has hardly been done. There were good reasons for this delay. For seven centuries Western art music has manifested itself in two forms: written and aural. Social practices converged on the first, so it seems justified that analysis has mostly concentrated on the score. To acquit our musicology even further it must be pointed out that it was much easier to analyse the configuration of notes in a score than the quality of 'sound'. Suitable tools were unavailable.

It fell to a team working on the music of sound – rather than on notes – to invent such tools. Right from the beginning of *musique concrète* Schaeffer had, as he could, represented his projects in a notebook. GRM still has two graphic representations of the *étude* 'Timbres-Durées' created, with the help of Pierre Henry, by Olivier Messiaen in 1952.⁸ The notation is still prescriptive, meant to guide the projection and performance in public. Transcriptions associated with an analytical project first appeared in 1958 when the group obtained its new name, 'Groupe de Recherches Musicales' (Musical Research Group), and began to devote itself to the analysis of sound. There are two types of graphic representation: one is achieved with the help of a tool from an acoustics laboratory, the bathygraph,⁹ the other is manual, guided by a specific analysis aim based on hearing. This is the period in

which Mireille Chamass and the composers of the GRM tried to define, aurally, the classification criteria of 'sound objects' and to build the future typomorphology which would be central to '*Traité des Objets Musicaux*' (Schaeffer 1966) and '*Solfège de l'Objet Sonore*' (Schaeffer and Reibel 1967). These criteria are customarily used in creating listening transcriptions of that period.

It seems clear that by 1958 twin models of analytical representation had appeared: one, the physical images of the markings achieved mechanically; the other, a transcription carried out by ear and by hand, representing the features deemed relevant. The first model is accurate in marking recoverable instants, but gives only a rough idea of what one hears; the second model attempts to represent what is heard whilst drawing on the first. This is the philosophy as adapted by the *Acousmographie*.

The analysis of the music of sounds has not only led to the formation of a software program, it has also compelled a reconsideration of the theory of music analysis in general. The analysis of the score simplifies problems considerably. Unfortunately for the analysts, one does not listen to a score. One listens to a sound object. Between the two, musicians have been at great pains to bestow, with a detached lightness and transparency, that a deep sustaining note has the power and roundness to contrast with the grace and delicacy of a melodic line, leaving the chords to melt into a sonorous mass which becomes mysterious, etc. An analysis of a sound object such as this, whether the sound is produced by an orchestra or through loudspeakers, lacks not only material tools but also conceptual ones. This is where the analysis of electro-acoustic music can contribute to the reformulation of the theory of analysis. We will summarise these two basic observations.

3.1. Multiplicity of viewpoints

There is not just *one* analysis of a piece of music. 'Give me an analysis of this piece' is an instruction that has no more sense than 'give me an analysis of Paris'. Such an instruction has no definite meaning because it has infinite meanings. It is possible to show up as many forms and functions as one wishes both in a musical work and in Paris.

The comparison is rather far reaching. In both cases it is classical to base the various analyses on a *representation orientation*: a representation in the form of a map for the city, a time axis (at the least) for music. It is a convention to favour one analysis over others for practical reasons. What is a city map? It is the representation of a 'partition' of urban space (considered at ground level) between built-up spaces (apartments, public buildings) and open spaces (streets, gardens, water surfaces). The musical equivalent is the

⁶For a more detailed analysis see Delalande 2001.

⁷Varèse 1947, quoted after Varèse 1983: 121.

⁸Box of 5 CDs, 'archives GRM'.

⁹The bathygraph, a laboratory instrument, was equipped with a needlepoint scratching over white paper. The time setting of the needle and the speed of the passing paper smoothed out the dynamic envelope. The bathygraph was often used at the GRM between 1958 and 1967.

commonly used basis of transcription, the axis of time (this is not self-evident) on which it is possible to place, before a more detailed analysis, the differentiation between the built-up and empty spaces that are the moments of sound and silence. From there on the town planner can carry out all the analyses he wishes by superposing them, if it suits him and it is possible, onto the city map. Notice that a map is usually represented as linear, in black and white. Over this background the information that is relevant to certain viewpoints can be superimposed in colour (one coloured map for each viewpoint). This is often the method favoured by the Acousmographe, where over a black and white background (the sonogram), various plans of coloured representations can be placed, like so many traced copies, to represent relevant information.

No town planner would deny that the number of viewpoints under which he can 'analyse' the city is infinite. He could mark on the map the sociological indicators of the relationship people/city (average age by clusters of buildings, density of pharmacies and doctors, medium price per square metre, proportion of school-going children, proportion of apartments with bathrooms, etc.). He could, if he were interested, work out transport networks (flow of automobiles, nature of public transport, analysis of parking spaces, various networks of water, sewage, gas, etc.), or else the nature of sub-soils, or again that of structures (roofing, period, material, number of floors, etc.).

It is understood that: (1) the number of analytical viewpoints is infinite. If a certain viewpoint is chosen, it is to satisfy a specific curiosity in revealing certain types of features that function in a certain manner. (2) The visual representation on the map (optional) is a moment of analysis. It follows an enquiry the result of which is transposed on the map and can, in certain cases, re-lance the analysis by revealing topographical repartitions, correlations or laws that could not have been imagined without the help of representation. These two statements can equally be applied to musical analysis. Music presents infinite descriptive features: pitch, mass and other Schaefferian criteria, space, plans of presence, speeds of evolution, features inciting more or less accurate causal identifications such as tactile or kinaesthetic sensations, workings of the inner ear, signs of intervention, etc. It is impossible to launch oneself into an analysis without first selecting, willingly or not, some of the possible viewpoints, but according to which criteria?

3.2. The determination of viewpoints

A priori, in analysis any viewpoint of music can be interesting. In practice it does not work that way: the analysis settles on a target. What would one like to describe? What does one want to understand?

The target, implicit or explicit, to which the 'musical analysis' is traditionally addressed, is to describe music

such as it has been conceived and created by the composer or such as it is heard by the listener (or both, evidently), meaning that anything that cannot be connected to the production or the reception of music lies outside its scope. This is not obvious, but is a choice as specified by the aims of musical analysis and therefore differentiates it from, say an 'analysis' (and it is one) that would consist of locating the 'maximum loudness points' in order to make copies without saturation. Locating the 'maximum loudness points' is a viewpoint (in the sense that a decision has been made to interest oneself in only this aspect of music): 'loudness' is the 'relevant' descriptive feature.

It is worth noting – and this is very important – that establishing a viewpoint, and therefore its relevant features for analysis, is always dependent on external considerations. It is either a choice answering to a practical application of the analysis (such as locating the maximum loudness points with regards to a copy) or it is the result of what we call an 'external' enquiry. This is the case with musical analysis, which is about establishing, by the listener under certain hearing conditions, the features and configurations that either answer to compositional intentions and procedures or are the source of perceptive structures or semiotics (of sense). It is not possible to determine relevance by studying the music itself; at the most one can formulate hypotheses that can be more or less verified with the composer or listener. This is always a question of 'external enquiry' in a broad sense (as against an internal analysis concerning the music itself) and which proceeds by interviews or by experimentation, the study of sketches, technologies used, etc.

What has just been said concerns the establishment of viewpoints and the descriptive features relevant to these viewpoints: this arises from external considerations. But this does not apply to the analysis of complex configurations (repeats, alternations, symmetries, progressions, etc.) that is brought into effect on the transcription. Because that is where the transcription comes into play.

Accordingly, it is advisable clearly to distinguish two phases, because they correspond to two completely different methodologies. The first is an external enquiry, which results in the establishment of viewpoints and the relevant features (of each of these viewpoints). It allows for the development of a transcription, or rather transcriptions that correspond to the different viewpoints considered. After this (the second phase) work is carried out on the various transcriptions to show up complex configurations for each of the viewpoints.¹⁰

¹⁰Applications of this type of model of analysis can be found in 'Entendre' on the CD *Musique électroacoustique* by Delalande 1998 and applied to written music in Delalande 1989. Also, in French but with music and transcription, 'Aquatisme' by Parmegiani in *Portraits Polychromes*.

These general considerations are indispensable for the analysis of electroacoustic music. They are equally indispensable when approaching the complexity of written music, if only because, once written, the music is transformed into sound, then heard. To forget this detail is a limitation that is now unsatisfactory. Sound is central to musical practice.

4. THE SOCIAL STAKES

When music research made its first appearance around 1950 with *musique concrète* in Paris and electronic music in Cologne, it could not be suspected that the musical practices of a substantial part of the public would be upset. Music research has much at stake socially, which struck me as soon as I became associated with these circles. I have spent part of my professional life trying to release the potential of social change brought on by the new music technology. I can therefore give evidence in the capacity of a witness as well as a participant. In fact rather less as a participant and more as a witness since music technology is running away with itself in the sense that it is accelerating and becoming autonomous. The question addressed these days to the institutes of music research is: how is it possible to control and guide a process which, having been initiated within institutes of music research, now seems to submit itself to other forces?

4.1. Access to music through creation

During the 1970s I had been struck by the exponential development of a creative amateurism (Delalande 1981). Before 1970 composers formed a very small musical elite, several dozen or so in France, all having passed through the long and selective courses of the Conservatoire National Supérieur. But then in 1967 and 1968 courses in electroacoustic composition opened in Marseille and Paris, training over a two-year course about a dozen composers a year who, after their studies, founded co-operative studios to allow them to continue to compose and where, to make ends meet, they taught, initiating young composers who in turn continued this cycle. Concurrently, equipment became popularised and miniaturised by degrees truly unimaginable. Recently Christian Zanési showed me his laptop (which he stows in his backpack when he takes his motor bike to go to rehearsals) and told me: 'I have my studio in here! If only Schaeffer could have seen this.' In 1952 Schaeffer certainly imagined something like a data processing studio, but not exactly a laptop: 'The consistency of this perspective brings us ... to cybernetic machines. Only these types of machines (likely to weigh several tonnes and to cost hundreds of millions of francs), endowed with a certain memory by oscillatory circuits, will allow for the infinite play of complex numerical combinations which are the key to all musical

phenomena' (Schaeffer 1952: 119) For fifteen years this was a good forecast. Yet another fifteen years later PCs entered homes and music technological products formed a substantial market. This is how the few dozen composers of the 1970s, grown to a few hundred in the 1980s, now have reached a million in France. (Pouts-Lajus 2002)

One must place the history of the last thirty years of the century in context with the preceding decades. The gulf never stopped widening between contemporary music and amateur musicians. While many aristocrats and educated middle-class people of the baroque period not only played but also occasionally composed small pieces for harpsichord, and while nineteenth-century amateurs could still play the music of their time, those in 1950 would not dare to play Boulez, let alone compose in his style. The new music technology has radically reversed the direction of this evolution. Approaching music by creating it is today one of the most natural of actions.

This is not simply a question of tools. Music research is a return to the roots: an exploration of sound that has left the complexities of the 1950s behind in favour of concrete manipulation. Is this art music? (The French expression for art music is 'scholarly music'.) If there is science involved here, it is a science of observation that develops by experience. This means a return to the roots of music that consists of sound, but also a return to the behaviour of exploration which, in a baby, appears as early as the sensory-motor period, well before twelve months and produces, by six months, long sequences of improvisation on a resounding object. The famous *Variations pour une porte et un soupir* (Variations for a Door and a Sigh) by Pierre Henry testifies to the same sort of enchantment over the sumptuous creaking of a door that would fascinate a young child and stimulate it to draw its own variations (eight months).¹¹ On this fact, and parallel to amateur composing, a stimulating pedagogy of music has been founded which addresses, in the first instance, very small children (nursery, then crèche). Babies do not need computers. However, they do need the guidance of an adult who knows how to recognise these sonorous explorations as being musical, and it is this re-definition of music that has contributed to the technological paradigm of sound.

4.2. Listening through analytical instruments

The music revolution of the twentieth century, born out of the possibility to fix sound for repeated listening, is above all marked by the appearance of listening devices. Written music is conceived by a composer sitting in

¹¹The concept of the 'musical idea' conceived as a sonorous singularity that is discovered, attracts attention and inspires the prolongation of the variation, draws the circular reactions of the small child close to the strategies of adult composition (see Delalande 1984 and 2007).

front of a piece of paper and using his eyes in order to control the progression of voices or the succession of chords. How will it sound? He can only imagine this in his mind. On the other hand, electroacoustic music is continuously being composed in front of speakers. The hand is guided by the ear, not the eye. This circuit running between actual hearing and composing is constituent to invention in this new paradigm. The ear engenders the idea.

Throughout the twentieth century, listening devices have increasingly improved. At a concert the listener has no means whatsoever to take action on what he hears. With a record, the listener already had a formidable listening tool at his disposal: he could repeat, listen piecemeal, slow down. Bartók compared the phonograph to a magnifying glass and made great use of it in his analysis of oral music.¹² With time, aided by data processing, the listening instruments now available have become infinitely more powerful and allow different visual images to be associated with sound. The passing of time is displayed by a cursor that moves over these representations synchronic to listening, and it is possible to turn back time by pulling the pointer to the left. How miraculous! In certain software programs (such as the *Acousmographie*) it is possible to annotate the visual representations, highlight in colour a listening intention, intervene on the sound and filter certain zones to uncover layers that were hidden. In other words, the listener, not satisfied with contemplation, can explore. It is not surprising that the French *Éducation Nationale* (national education ministry) has shown an interest in this sort of software. Both teacher and student can show what they hear by highlighting certain details of the image. Institutions such as the GRM actually invest a great deal in the domain of analytic listening tools.

Analytical instrument-based listening fragments, selects, enlarges details – one could say it *de-composes*. Listening has always involved enlargement, selection and reconstruction. But this mental process has now been substantiated in the listening device, and that slight tilting, that gap one passes through almost imperceptibly, is in reality causing a crisis in the social order of music – for after *de-composing* it is also possible to re-compose differently.

In 2000 the *Éducation Nationale* included in the programme for the baccalaureate a composition by Jean-Claude Risset entitled *Sud*. Teachers and students received interactive multimedia tools to visit the work in order to scrutinise and dissect it.¹³ However, Jean-Claude Risset being a co-operative man, they were also given data of the composition and the processing software used by Risset, which enabled the students to re-compose *Sud*, or to turn it into a pastiche, and thus to appropriate the work. The objective of the *Éducation*

Nationale had obviously been to maximise the understanding of the submitted work. However, having received the software, the students felt free to do as they pleased, not in the manner of Risset, but in their own way. The work and the composer were no longer central to their motivation: this was their production that, in any case, they did not regard as composition any more than they regarded themselves as composers.

One can see a whole new field of social practices opening up that actually merges more or less with what one calls 'electro' and that no longer relies on the fundamental categories of the old social order, namely the composer and his work. There are musicians who no longer call themselves composers but DJs, or producers or simply techno or electronic musicians and who produce not work but sessions, mixes or experiments.

This is not simply a question of vocabulary or translation. These are new practices defining new roles. DJs were mediators who linked the music of others by mixing it just a little. Then they started mixing ever more ever shorter fragments so that the music of others gradually disappeared, turning DJ-ing into an art of cutting and mixing. This is an art of appropriation, helped now by specific instruments, notably the sample cutters: fragments are cut (from disk or the Internet) then transformed, mixed, looped and arranged in a personal way.

5. WHICH TYPE OF MUSIC RESEARCH, FOR WHICH SOCIETY?

During the last ten years something very striking occurred: the relationship between institutions of music research and their social environment changed. In that respect the example of the GRM is typical.¹⁴ For fifty years relations between the GRM and the public consisted almost exclusively of broadcasting music on the radio, recordings or concerts (the contact with professionals was mainly done through research publications, seminars, periodicals and by selling software). Over the years the relationship with professional circles hardly changed, but relations with the general public have advanced rapidly: music is still being distributed, but new forms have been added to this.

- (1) First, we are selling new software programs, increasingly adapted for the general public, which deal with sound processing used in compositions (GRM Tools)
- (2) Next, in 1999–2000, we implemented a CD-Rom on electroacoustic music, which has been designed in several stages in a specific order. We started with a sort of encyclopaedia ('connaître', to know).

¹⁴A seminar was organised in 2004 by the GRM on the theme 'Which cooperation between Recherche Musicale and Society?' A summary is available on www.infa.fr/grm/outils_dev/theorique/seminaire/semi-2004/

¹²Bartók 1937.

¹³See the *Portrait Polychrome* devoted to Risset.

Then we added means to explore some compositions by making use of various viewpoints ('entendre', to hear), and finally tools to create music oneself ('faire', to make). The project has evolved in the sense of a constantly increasing appropriation by users.

- (3) The sectors that are currently being developed are: the lining up of interactive multimedia analysis, inciting a personal 'visit' (especially Portraits Polychromes); the distribution of a software program intended to annotate, highlight and transcribe, in short, actively to appropriate music (the Acousmographie) – the free distribution of creative tools, derived from software initially intended for professional circles (GRM Player).

To summarise, apart from the distribution of compositions, the general public has also been presented with the means of appropriation of music and the possibility of composing it. However, as the public has become less undifferentiated and their demands more specific, it has become an interlocutor with whom one can establish a relationship of cooperation rather than a one way distribution.

Here are three examples of cooperation:

- (1) First, the collaboration with educational institutions, notably the Éducation Nationale – forty years ago musical research already established contacts with the educational system. However, this was initially a one-way affair: the schools asked for nothing. Later secondary school teachers in particular began seeing the benefit of computer informatics in music classes and today the Éducation Nationale, headed by the Inspector General, has invested in means of a true collaboration, through agreements with research centres to study 'the tools of music'.¹⁵
- (2) A second form of collaboration has been established with the related musical world of 'electronica'. For a long time certain composers of electroacoustic music, Pierre Henry and many others, have cast an eye in the direction of popular music. As long as this concerned electric guitars and rock, the relationship was rather remote. But certain pop genres have distanced themselves from the stage and the stardom, making music with machines without instruments, or performers. This time the connection could assert itself, and has indeed asserted itself. For instance, Christian Zanési has organised concerts of mixed genres.¹⁶ This collaboration, founded on shared aspirations, will obviously knock down fences that have

enclosed musical research in a micro environment. The collaboration is likely to expand its sphere of influence.

- (3) The third strand of collaboration concerns amateurs. The GRM has long since conducted training courses for all sorts of people: interested musicians, but also teachers, theatre people, directors, etc. Of course the millions of amateur composers mentioned earlier do not arise out of these courses and the focus on mutual observation is recent. Surprisingly, these people have a great musical culture. They listen enormously. Consequently, they not only pirate software from the GRM, which is anticipated and normal, but also music, which is frankly undesired. This is a form of profound cultural influence: appropriation engendering creation. This very special public, which is not known to us, in return knows us very well, or so it seems. These people obviously need tools, but also a variety of aesthetic *references*: not only techno but also world music, electroacoustic art music and contemporary music. And these are not models, but also references through which the public can map out its own route.

About twenty years ago musical society was broadly organised in what I shall call a 'descending vertical model'. The composer wrote works that were performed in public. The role of the public was to applaud.¹⁷ Pop music, especially rock, has adopted that descending vertical arrangement. However, in this case it is not about applause but adulation, and involves the obliteration of a person's personality in order to identify with the pop idol (copying clothes, aping gestures, parroting speech). Obviously this descending chain also belongs to the world of marketing, and in order to get one's money worth out of a pop star, that star has to be flogged worldwide, through well-known networks not of broadcasting but of saturation of the mass media: private FM radio stations, television, star academies, mega concerts, etc.

Tangential to this descendent vertical arrangement, another social system of music is taking shape that one could call a 'horizontal system', founded on an exchange from equal to equal. These are the millions of amateurs who have no wish whatsoever to become a celebrity, who impart their creations to equals, through the Internet or through quite intimate concerts without costumes, smoke machines or extravagant stage effects and also through a blossoming of small CD labels, much to the irritation of the major ones. Evidently this horizontal communication is purely gratis, in the sense that neither profit nor celebrity status is sought. It is shaping a social system based on exchange, poles apart from the commercial system.

¹⁵Tools for music, *Dossiers de l'ingénierie éducative* no. 43, June 2003, Paris: Seren, CHDP. www.cndp.fr/DOSSIERSIE/43/som43.asp

¹⁶Especially the yearly festival 'Presences électronique' in collaboration with Radio France.

¹⁷A director of *Jeunesses musicales de France*, a big organisation of school concerts, told me 'We teach children to applaud!'

As much as vertical commercial distribution demands a levelling of tastes and personalities in order to corner large markets, the horizontal system favours individualisation and difference, by looking for that peculiarity which characterises creativity.

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