What the GRM brought to music: from musique concrète to acousmatic music

MARC BATTIER

MINT, Maison de la recherche, Université Paris-Sorbonne, 28, rue Serpente, F-75006 Paris
E-mail: marc.battier@paris-sorbonne.fr

Sixty years ago, musique concrète was born of the single-handed efforts of one man, Pierre Schaeffer. How did the first experiments become a School and produce so many rich works? As this issue of Organised Sound addresses various aspects of the GRM activities throughout sixty years of musical adventure, this article discusses the musical thoughts behind the advent and the development of the music created and theoretised at the Paris School formed by the Schaefferian endeavours. Particular attention is given to the early twentieth-century conceptions of musical sounds and how poets, artists and musicians were expressing their quest for, as Apollinaire put it, 'new sounds new sounds new sounds'. The questions of naming, gesture, sound capture, processing and diffusion are part of the concepts thoroughly revisited by the GRMC, then the GRM in 1958, up to what is known as acousmatic music. Other contributions, such as Teruggi's, give readers insight into the technical environments and innovations that took place at the GRM. This present article focuses on the remarkable unity of the GRM. This unity has existed alongside sixty years of activity and dialogue with researchers of other fields and constant attention to the latter-day scientific, technological and philosophical ideas which have had a strong influence in shaping the development of GRM over the course of its history.

> To oppose noises, my own noise. This noise will then repel all the others, those that are now, those that were then, those of the day, collecting them through an unprecedented wonder of nature.
>
> Henri Michaux, 1950, 'Composing', *Passages*

1. INTRODUCTION

Electroacoustic music has marked a decisive stage in the relationship between musician and composition. It found its place in its first era at the heart of public radiophonic studios, university-based or at any rate lodged in private organisations. We know how it blossomed out and succeeded in mastering some industries' technologies that were at first reluctant to take it on; and at last, after many misadventures, established a dialogue with the instrumental tradition. Today, it knows how to harness the unimaginably powerful techniques of musical computing. Moreover, the tradition established by Pierre Schaeffer at the end of the 1940s, which was called the Paris School, is still alive and the musical creations that it brings about have the imprint that is their very own.

An approach to composition would evolve that would be impregnated by a specific thought. Differing from what was taking place in other great studios, the Paris School advanced above all through concepts. It was this wish to adhere to constantly reinforced theory that gave the movement its unique character. That said, electroacoustic composition, which was the basis of the Paris School, followed the contours of historical contingencies: technological evolution, relations to the public, co-operation with the leading institutions; and we must not forget the individual paths which tended to branch off in unexpected ways influencing the flow of artistic thinking.

If Pierre Schaeffer, in inventing musique concrète, did his best to give a conceptual status to the sound object, other musicians, through their practice as much as through their thinking, set out on new tracks or invented new concepts, and from this also made theory-based work: we can name as typical (in a list of composers that must be incomplete) Pierre Henry, Luc Ferrari, Guy Reibel, Bernard Parmegiani, Ivo Malec, Michel Chion, Alain Savouret, François Bayle, above all, then Christian Zanési and Daniel Teruggi. All have taken on the thinking and some of them have forged new concepts as well. I will try here to describe the vision of the Paris School whilst presenting the break-up in terms of its rapport with the music of the first half of the twentieth century.

2. A SYMPHONY OF NOISES

As the Canadian composer Murray Shafer has shown,[1] noises belong to the outside world, that of spaces, of towns, of external acoustic spaces, just as the place of music is indoors. It seeks for its best protection from noises. The solution to this dilemma has been put forward since the beginning of the twentieth century. The Italian Futurists (first Ballila Pratella, then Luigi Russolo) advanced the suggestion that new music could be based on turning the noises of the world into music.

[1]Raymond Murray Schafer. 1976.*The Tuning of the World*. New York: Alfred A. Knopf.

Organised Sound **12**(3): 189–202 © 2007 Cambridge University Press. Printed in the United Kingdom. doi: 10.1017/S1355771807001902

The idea of a symphony of everyday noises was also expressed again and again in the first half of the last century. Perhaps Schaeffer, a well-read man, was familiar with the lines that Apollinaire had devoted in his fiction *Le Roi-Lune* to a novel transduction technique which King Ludwig II of Bavaria had invented using multiple microphones?

> [The Moon-King] was seated in front of a keyboard, one key of which he was applying with a weary air; and it remained stuck, so that there came from one of the pavilions a murmur both strange and continual. At first I was unable to discern its meaning. The well-developed microphones which the king had at his disposal were regulated in such a manner as to bring into the cellar noises of life on earth from the most far away places. … Now it is murmurs from the Japanese countryside[2] … Then, from another depressed key, we are transported in mid-morning, the king hails the socialist hard work in New Zealand, I can hear the whistling of geysers … Doum, doum, boum, doum, doum, boum, doum, doum, boum, it is Peking, the gongs and drums of the patrols … The king's fingers run over the keys, haphazardly, raising them up, in some fashion simultaneously, all the murmurs of the world have just been made for us, as we remain stationary, a tour by ear.[3]

Apollinaire called this group of living and natural sounds from diverse sources a 'symphony made by the world'.[4]

The meteoric development of cities and industrialisation struck artists' and musicians' imaginations very forcibly at the turn of the twentieth century, precipitating a waterfall of movements (the 'isms') which took hold of them. With this, sounds from the world became present in and part of composition: the sounds of machinery which led Luigi Russolo to his famous classification,[5] the birds which inspired Messiaen, the zoomusicology of Francois-Bernard Mâche, the sirens and sound masses of Varèse – the examples are numerous and very varied. And for Jean-Etienne Marie, Schaeffer was defined as a 'naturalist with nature's sounds'.[6] All these approaches share in their very different ways a holistic vision of the creative imagination.

This interest in the sounds of the world is the pivot on which concrète invention turns, and beyond that, also a great part of electroacoustic music, even if a significant proportion of it is based on composition from synthetic sounds. We need not concern ourselves here with sound landscapes, which would be simplistic and more than that, false, but chiefly with what Schaeffer himself described thus: 'The sound object, which may be any possible audible sound, is that which ranges from natural sounds to the noises of civilisation, from animal cries to human words'.[7] That is to say, one takes external sounds, and harnesses them to ensure their transduction. The instruments adapted to this effect are: the microphone, or, more widely, the membrane that is sensitive to acoustic vibrations and reconstitutes them, through conversion, into another shape – mechanical for the first gramophones, electric thereafter; and the recording and playback machine. Each of these steps has contributed to modify our perception of sounds, and where the need arises, to transform the sounds themselves. For that, one must first become a 'phonographist artist'.

3. THE PHONOGRAPHIST MUSICIAN

Apollinaire was the first to declare that the gramophone could become the instrument through which he would create a 'vertical' poetry, not declamatory but with simultaneous action. He then proclaimed himself to be a 'phonographist poet'.[8] The gramophone, an apparatus conceived for recording and reproduction, is intriguing, and one finds a considerable amount of people who came upon the idea that it should be used as an instrument for creation. In 1931, Boris de Schloezer expressed the opinion that one could write for the gramophone or for the wireless just as one can for the piano or the violin.[9] The music critic André Coeuroy, in his 1928 *Panorama of Contemporary Music*, wrote 'perhaps the time is not far off when a composer will be able to represent through recording, music specifically composed for the gramophone'.[10] For Henry Cowell, referring to the projects of Nikolai Loptatnikoff, there was no doubt that 'there was a wide field open for the composition of music for phonographic discs'.[11] Even Igor Stravinsky, who never created an electroacoustic work, declared in 1930 in the revue *Kultur und Schalplatte* 'There will be a greater interest in creating

[2]In an earlier version Apollinaire had written 'tous les chants' ('all the songs') before changing it to 'toutes les rumeurs' ('all the rumours/murmurs').

[3]Guillaume Apollinaire. 1977. 'Le Roi-Lune' (1908–1916). In Michel Décaudin (ed.) *Oeuvres en prose completes*, volume 1. Paris: Gallimard, pp. 313–16.

[4]*Ibid.*, p. 316.

[5]Luigi Russolo. 1913. *L'Art des bruits*. The edition edited by Maurice Lemaître and published by Richard-Massé (1954) is of interest for its famous (and unjustified) attack on Schaeffer by the essayist; the classification appears on p. 37. One may profitably consult the critical edition edited by Giovanni Lista, 2001, Paris: L'âge d'homme.

[6]Jean-Etienne Marie. 1976. *L'homme musical*. Paris: Arthaud, p. 19.

[7]Pierre Schaeffer. 1976. 'La musique par exemple'. *Cahiers recherche/musique* no, 2, *Le Traité des objets musicaux 10 ans après*, p. 58.

[8]Guillaume Apollinaire. 1991. 'A propos de la poésie nouvelle', *Paris-Journal*, 29 juin 1914. In Pierre Caizergues and Michel Décaudin (eds) *Oeuvres en prose complètes* volume 2. Paris: Gallimard, p. 982.

[9]"Can we compose special music for the phonograph and the radio and thus create a new art? As long as we consider the record only as a "photograph", we compare it to the original and condemn it when it varies there from. But even these differences can acquire an aesthetic value." Boris de Schloezer. 1931. 'Man, music and the machine', *Modern music*, **8** (3): 9.

[10]André Coeuroy. 1928. *Panorama de la musique Contemporaine,* édition revue et augmentée. Paris: Kra, p. 162.

[11]Henry Cowell. 1931. 'Music of and for the records', *Modern music* **8** (3): 34.

music in a way that will be peculiar to the gramophone record'. Lastly, Hans Heinz Stuckenschmidt discerned a fundamental aspect of phonography, that it could exist as music without having been created by an instrument; 'Music impressed directly on to a disc is produced with an ideal precision and without individual interpretation'.[12] This was the method by which the status of 'authentic discs' was made to appear. Stuckenschmidt, however, was one of the first to underline an essential difficulty, even though it is not completely an aporia. According to him, there did not exist any specific system adapted to such instruments as the gramophone. Perhaps it would be necessary to create a graphic alphabet which would allow sound to be impressed in the form of signs engraved on the surface of the disc, an idea that had already been expressed by Laszlo Moholy-Nagy in 1923 in an article for *Der Sturm*.[13]

Finally, the symphony of the world has been connected with phonography through the vision expressed by the composer Carol-Bérard in a passage which evokes in a striking fashion the reflections that Pierre Schaeffer would publish twenty years afterwards:

> Why, and I have been asking this for fifteen years, are phonograph records not taken of noises such as those of a city at work, at play, even asleep? Of forests, whose utterance varies according to their trees – a grove of pines in the Mediterranean mistral has a murmur unlike the rustlle of poplars in a breeze from the Loire? Of the tumult of the crowd, a factory in action, a moving train, a railway terminal, engines, showers, cries, rumblings?'[14]

Carol-Bérard was one of the first to dream of how this question of sound which is both varied and shapeless, this assemblage of differentiated noises, would come to exert its influence on them in their musical creations.

Experience with the microphone, or more generally with sound recording, has sent those who discovered it down a new route. In December 1913 Apollinaire, along with other poets, visited the Archives of the Voice at the Sorbonne and recorded three poems there.[15] The poet said of this experience 'After the recording, they played my poems back to me on the apparatus, and I did not recognise my voice in the slightest'.[16] But it was his friend André Salmon who gave the better description of this blind listening:

> He listens to himself, not without stupefaction. His friends find his presence there, but he does not recognise himself! Really, our profound organs of aural perception experience enjoyment thanks to the gramophone … when it sends back to us this voice of its own which stifles, when we speak, the said profound and very delicate perceptions. The interior voices, Victor Hugo called them, he who loved Professor Brunot's invention.[17] Thus at the second hearing we heard ourselves, to summarise, for the first time, and this gave us a lively surprise. After Guillaume Apollinaire, we too knew this emotion, this troubling, in listening to the singing of our double.[18]

Apropos this session, here follows another evocative remark by Apollinaire much before the one inspired by listening to this recorded sound. It was on the occasion of poems recited by René Ghil 'the real great success of this session'.[19] He remarked: 'One would say that the sound of Aeolian harps vibrating in an Italian garden … and more than anything the hymn of telegraphy is represented by the wires and poles that cease to mark the trunk roads.' In this way, the voice of the poet René Ghil takes on, by its phonographic recording, the tone of an 'aerial music'.[20]

The technique of recording and of montage, which is associated with cinematographic practice, came to serve as the substrate of musique concrète.[21] For the *cinéaste* Jean Epstein, sound recording revealed what was hidden in the act of simple acoustic listening:

> the microphone and the loudspeaker transmit accents with an unsupportable shamelessness, where all is revealed: the naïvety of false pride, the sharp bitterness that comes from success denied, the disquiet that underlies self-assurance and laughter, all the feeblenesses and all the slyness of a character who was thought of as upright, sturdy, in control of himself. They are not many, the priestly confessors who have been able to see and hear as far into the soul as this glassy gaze and this all-listening photo-electric cell![22]

This phenomenon of an epiphanic being that appears through the transduction of sound became the pedestal of Schaeffer's thinking named *reduced listening*. According to Epstein, this was because of the way that recorded sound distanced itself from the individual: 'But the ghost also speaks, and with a voice that the living, in all sincerity, does not recognise, which one cannot

[12]H.H. Stuckenschmidt. 1927. 'Machines – a vision of the future', *Modern music*, **4** (3): 10.

[13]Laszlo Moholy-Nagy. 1923. 'Neue Gestaltung in der Musik. Möglichkeiten des Grammophons', *Der Sturm* **7**. Reprinted in Ursula Block and Michael Glasmeier (eds) *Broken Music*. Berlin: Daadgalerie, Berliner Künstlerprogramm des DAAD et gelbe Musik, 1989, pp. 55–6.

[14]Carol-Bérard. 1929. 'Recorded noises — Tomorrow's instrumentation', *Modern Music* **6** (2): 28.

[15]Apollinaire recording 'Le Voyageur', 'Le Pont Mirabeau', 'Marie'.

[16]Guillaume Apollinaire. 1977. 'Les Archives de la parole', *La vie anecdotique*, 1st July 1914. In P. Caizergues and M. Décaudin (eds) *OEuvres en prose completes*. Paris: Gallimard, p. 213.

[17]Ferdinand Brunot, founder in 1911 of the Archives de la parole. The laboratory was installed at the Sorbonne. Émile Pathé provided a phonographic recorder with a technician to work the machine. On his first visit in 1911, Apollinaire made an evocative commentary in a chronicle called 'La Sorbonne est ébranlée'.

[18]André Salmon, 'Plus de livres … des disques !', *Gil Blas*, 25 December 1913.

[19]Apollinaire, op. cit., p. 214.

[20]Ibid.

[21]For the role of radiophonics in Schaeffer's thinking, see John Dack, 1994, 'Pierre Schaeffer and the Significance of Radiophonic Art', *Conetmporary Music Review* **10** (2): 3–11.

[22]Jean Epstein, 1946. *L'Intelligence d'une machine*. Ed. Jacques Melot. Paris.

recognise, because it has never been heard from the outside, carried by a breath that is not one's own.'[23] Schaeffer explicitly cited Jean Epstein at the time of the foundation of the Groupe de Recherches Musicales,[24] with reference to his use of extra-musical sounds. The filmmaker, one can say, had already imagined that 'through the transposition of natural sounds, it becomes possible to create chords and dissonances, melodies and symphonies of noise, which are a new and specifically cinematographic music'.[25]

4. THE ORCHESTRATION OF NOISES

Twenty years before musique concrète, the composer Carol-Bérard wrote:

> If noises were registered [sic], they could be grouped, associated and carefully combined as are the timbres of the instruments in an orchestra, although with a different technique. We would then create symphonies of noise that would be grateful to the ear. There are plenty of symphonies today which are anything but agreeable, while there are at large and unregistered, a myriad of delightful sounds – the voices of the waves and trees, the moving cry of a sailing vessel's rigging, an airplane gliding down, the natural choruses of frogs around a pool.[26]

If the holistic vision leads one to consider the noises of the world, the vision of musicians will converge very shortly with the question of how noises are orchestrated. Recording, one knows, provides the sonic material from which the musician creates his work. To those on gramophone records, Schaeffer gave the name, 'fragments'. For Marina Scriabine, it was a question of 'documents';[27] these, says Scriabine, are then *manipulated* before one has the power to *structure* them. But the determining factor for Schaeffer was to make evident the creative role related to the perception of sounds, once these had passed through the tube of the microphone. Musique concrète was to be founded on the hypothesis that there exists a domain 'beyond the sounds':[28] it is by recording 'the noises of things', and then by the operation of capturing sounds through a microphone, that we can attain it. The sound signal collected by the microphone and reconstructed by the loudspeaker crosses space without preserving the image of the original sounding object. Listening is then favoured by the absence of visual stimuli; it is concentrated, and perception converges – better than that, it is reduced to that pure listening. Concerning the microphone, Schaeffer asserted that 'without changing the sound, it transforms the experience of listening'.[29] The microphone 'tells strange things,' said Luc Ferrari, 'it gathers a straw from the eye of its neighbour and makes a beam from it.'[30]

Schaeffer was supremely fascinated by the mystery of recording, for it operates within a remarkable differentiation between what is conceived (the sounding body) and what is perceived – what he called the separator power, but one that is also sensitive to manipulation. In his text of 1946 he discusses the question of the transformation of time perceived through recording. In this way he invokes the simple ways that alteration in chronological time is used in cinema. However, his inquisitive mind led him to denounce the limits of slowing and reversing the film. This observation demonstrates a clear knowledge of the techniques of manipulation, which he would himself exploit two years later.[31] But Schaeffer had had also benefited from an experience that was rare, at least at that time. The development of his thinking had primarily been formed by encountering the voice of actors and the microphone. Before him, Rudolf Arnheim had fully noted the effects of microphonic recording in his 1936 essay *Radio*, in which the idea of a creative role for this medium was introduced. 'The rediscovery of the musicality of sound in noise and in language, and the reunification of music, noise and language in order to obtain a unity of material: that is one of the chief artistic tasks of radio.'[32]

The mastery of noises turned out to be more delicate than had been foreseen when it was first thought of.[33] The noises of the world are at the outset presented to our perception as signals, manifestations of something strange to which we should lend our attention. They are decoded within the instant with the intention of ascertaining their cause: isolated, selected and identified, their origin important to us because they can be significant agents of our environment. Schaeffer, in his first statements, gave priority to the masking of the cause by the effect of the transduction. However, noises can be resistant to this operation. As Schaeffer observed in the preface of his five first studies in June 1948,[34] there is no doubt that certain of them could eventually

[23]Ibid.

[24]The Groupe de recherches musicales (GRM) was founded in 1958.

[25]Quoted by Pierre Schaeffer, 1959, 'Images et mouvement', *La revue musicale* no. 244, *Expériences musicales*, p. 66.

[26]Carol-Bérard. 1929. 'Recorded noises – Tomorrow's instrumentation', *Modern Music* **6** (2): 28.

[27]Marina Scriabine. 1963. *Le langage musical*. Paris: Les éditions de Minuit, p. 204.

[28]Pierre Schaeffer. 1970. 'Notes sur l'expression radiophonique' (1946). In *Machines àcommuniquer*, volume 1, *Genèse des simulacres*. Paris: Seuil, p. 109.

[29]See Pierre Schaeffer, 1994, Notes sur l'expression radiophonique (1946), reprinted in Dix ans d'essais radiophoniques, du Studio au Club d'Essai, 1942/1952, Arles: Phonurgia nova, p. 88.

[30]Luc Ferrari. 1959. 'Les étapes de la production', *La revue musicale* no. 244, *Expériences musicales*, p. 54.

[31]See Pierre Schaeffer, op. cit, p. 95.

[32]Rudolf Arnheim, *Radio* (1936), translated into French from the German by Martin Kaltenecker, Paris: Van Fieren, 2005, p. 57.

[33]For a presentation of noise in musical composition during the twentieth century see Pierre-Albert Castanet, *Tout est bruit pour qui a peur*, Michel de Maule, 1999, *passim*.

[34]Pierre Schaeffer, *Présentation du 'Concert de bruits'*, Sunday 20 June 1948, Clubd'Essai, p. 3.

become a sound object because their anecdotal character can be masked; others, in contrast, keep their 'dramatic character' and it is not possible, at least through the technology available to the Club d'Essai, to erase recognition of their cause completely. Later, Schaeffer would assert that there was no difference, only nuances, between musical sound and noise.[35]

The concrète approach is not without recall of the theoretical protocol of the Russian Constructivists, and in particular their insistence on the idea of *faktura*.[36] Alexei Gan, following the example of other artists of this movement, distinguished three disciplines in the artistic practice of Constructivism: the *tectonic*, suggesting a theoretical framework which determines the direction for artistic activity; the *faktura*, which defines how one approaches the material which allows one to proceed to the *construction*, that is to say the putting into shape. The aspect that leads to the concrète approach is *faktura*, which Gan further defined as work on the material in its entirety, and not just on its surface. To make this real, one must apply a particular technique, which allows one to increase the possibilities of transformation of the material with which one begins. The *faktura* is therefore defined as 'a material knowingly chosen and rationally deployed'. Schaeffer's thinking led him to define the process of concrète composition which consists of extracting from the material regarded as a sound object the possibility of updating those properties which would serve to mould the musical object. This was through a process comparable to the *faktura* of Constructivism, which Schaeffer implemented to turn the sound *event*, still impressed with its dramatic stamp, into the musical *object*, material that was pure sound. Furthermore, with Pierre Henry, a composer of this new music, there came a detachment from the power of predetermined sounds in order to be able to shape a new material:

> musique concrète was not a study of timbre, it is focused on envelopes, forms. It must be presented by means of non-traditional characteristics, you see … one might say that the origin of this music is also found in the interest in 'plastifying' music, of rendering it plastic like sculpture … musique concrète, in my opinion, has led to a manner of composing, indeed, a new mental framework of composing.[37]

5. PROVIDING A FRAMEWORK TO MUSICAL RESEARCH

The life of Pierre Schaeffer (1910–95) has been fully documented.[38] His studies at the École Polytechnique, his passion as much for the violin as for literature, his ever increasing responsibilities at the heart of the institution of radio – all that is as well- known as are the aspects of his complex and at times disturbing character. It came about that musique concrète would be invented by a man of many gifts but who neither had nor claimed to have the status of composer. In the course of the 1950s, when his professional role of responsibility for radio led him to make prolonged stays abroad, Schaeffer would pursue his ideas, developing since 1948. As one often finds in his writings, his suggestions are worked out in the form of lists, laying down what he found appropriate as a stance, and rejecting what appeared to him to fall outside its domain.

Having made its first appearance without a predefined status, musique concrète received an institutional embodiment from the beginning of October 1951, with the creation of the Groupe de recherches de musique concrète within the Radio-Télévison française. It was thus that the two first historic studios were created simultaneously, for it was also in October 1951 that the studio of the NWDR was founded in Cologne!

The international influence of musique concrète was as swift as it was incontestable. The first example of the spread of the approach can be found without doubt in Japan. The composer Mayuzumi Toshirô,[39] who had undertaken his studies in Paris, happened to hear a concert of works of musique concrète in May 1952, following which he visited the studio of the Groupe de musique concrète. On his return to Japan, with the collaboration of the radio JOKR of Tõkyõ Broadcasting System, he created a work in three movements directly inspired by this experience, *Musique concrète for X Y Z*.[40] Even if this was not the first Japanese electroacoustic work, for it was preceded by the *Études* by Akiyama Kuniharu, it bore, through its title, the sign of a strong relationship with the Paris School. It is interesting to note that its method of composition, in contrast, is highly personal and does not follow the Schaefferian dicta of that period.

Promoting the confrontation of ideas about music and the technological environment, the first International Decade of Experimental Music was

[35]Pierre Schaeffer: intervention at the session of 27 February 1971, *Bulletin de la Société française de philosophie*, no. 3, July–September 1971, p. 108.

[36]Alexei Gan, *Konstruktivismus* (Tver, 1922).

[37]Interview of Pierre Henry with Richard S. James, cited in 'Expansion of sound resources in France, 1913–1940, and its relationship to electronic music', doctoral thesis, University of Michigan, 1981, note 91, p. 79.

[38]See especially the well-documented works by Martial Robert published by Harmattan: *Pierre Schaeffer: des transmissions à Orphée* (1999); *Pierre Schaeffer de Mac Luhan au fantôme de Gutenberg* (2000); *Pierre Schaeffer: d' Orphée à Mac Luhan: communication et musique en France entre 1936 et 1986* (2002).

[39]Born in 1929, Mayuzumi Toshirô had been a pupil of Tony Aubin during his studies at the Conservatoire in 1951–52.

[40]Mayuzumi's work, *myujikku konkureto no tame no sakuhin XYZ* was first performed in 1953 at the Tõkyõ Summer Festival.

organised by the Groupe de recherches de musique concrète.[41] Here we find the pioneers who were essential for the history of electroacoustic music. Vladimir Ussachevsky, the delegate of the BMI,[42] presented there, having already undertaken some preliminary trials in New York (since 1952) with Otto Luening, before founding the electronic music studio at Columbia University in 1955, the same year as the studio of musical phonology by RAI in Milan. There too we encounter Hermann Scherchen, who would establish a studio at Gravesano in Switzerland in 1954; Pierre Boulez; and Herbert Eimert, one of the co-founders of the studio of the radio station NWDR in Cologne, who had just organised its inaugural, concert.

As for the Paris studio, it attracted composers from a variety of backgrounds who would experiment with the technical capabilities of the studio. In 1951, Schaeffer organised the first musique concrète workshop, in which Pierre Boulez, Jean Barraqué, Yvette Grimaud, André Hodeir and Monique Rollin came to study. Olivier Messiaen, as a guest, was assisted by Pierre Henry to create 'a rhythmical work', *Timbres-durées*, of a respectable fifteen minutes length. Put together from a repertory limited to repercussive and brief sounds, the work was withdrawn from the catalogue. Be that as it may, Messiaen gained a great respect for what electroacoustic music could achieve, and one must not regard his experience as having no effect at all. He was followed by other composers of the same generation, such as Darius Milhaud, whose *La rivière endormie* (1954) evokes more the manner of the Hörspiel than that of musique concrète through its sung passages, spoken words and slightly altered instrumental music. Edgard Varèse made the first of the three version of *Déserts* (1954) and Roman Haubenstock-Ramati produced *Amen de verre* (1957), a study, in which the objects are slowly transformed according to the profiles of the glissandi created by means of the sliding phonogène. Such glissandi also appear in Henri Sauguet's work, *Aspect Sentimental* (1957), but these were recorded with a sliding flute; the author, who had already produced two concrète works (including his *Six pièces en un acte* of 1955), loved to work with a restricted palette made up of resonant sounds with 'in delta'[43] profiles, and endowed with an *allure* of dry or wet percussive textures as well as with human breath.

With so many composers whose reputations were already established, one could foresee that the Schaefferian doctrine would not be followed to the letter. For example, *Jazz et jazz* by André Hodeir, a result of the early years of musique concrète, is a mixed-media work written for piano and three-track magnetic tape.[44] Certain others had already made their compositional choices, such as Pierre Boulez, who realised two études where he adapted concrète processes to the serial method. In the first étude, undertaken in 1951,[45] Boulez chose to use the sound from only one source, an African sanza, a 'thumb piano' with metal slats fixed on a small resonating case. Using the keyboard of a C chromatic phonogène, the composer brought about changes of playback speed, which produced transpositions in pitch and alterations in duration simultaneously. He worked on the idea of creating a 'scale' of durations so that serial operations could be applied. The second étude, undertaken a few months later, followed his thinking about rhythm starting with six types of highly varied sounds.[46] Another concrète work was destined for the experimental film by Jean Mitry, *Symphonie mécanique* (1955).

6. THE RESEARCH PHASE

The development of electroacoustic music that was founded on the Schaefferian legacy needs to be considered in quite distinct stages. These can be arranged by the production modes of the works, which are there to underline the composer's discourse. Schaeffer's diary well illustrates how the imagination is ceaselessly up against the restrictions of experimentation. Attempts multiply and happy accidents are regularly produced. It is through the ear that techniques are selected, later to become methods with the capacity to astonish. In this way a repertory of techniques evolved, many of which had not been established in the radiophonic studio. The techniques that are the most appropriate for the creation of musique concrète are remarkably few. They consist of using the radiophonic studio technologies in special ways. One may distinguish three classes of such techniques. First, the alteration and transformation of time; here the techniques are derived from the use of a turntable, including segmentation (removal), acceleration, slowing down, reproduction of sound back-to-front, application of a dynamic envelope using a level potentiometer, and repetition of a fragment (the closed groove or loop).

[41]The 'Première décade internationale de musique expérimentale' was held in Paris from 8 to 18 June 1953.

[42]The American society for the rights of authors, Broadcast Music, Inc., was founded in 1939.

[43]See *infra*.

[44]See Marc Battier, 2006, 'André Hodeir et la réalisation de *Jazz et jazz*', *Les Cahiers du jazz*, no. 3, p. 54–9.

[45]See the description given by the author in the letter to John Cage (n.d., c. December 1951, in *Pierre Boulez, John Cage. Correspondance et documents*, J.-J. Nattiez (ed.), Mainz: Schott; letter 35 in the original edition of 1990, letter 36 in the revised edition, 2000); see also Pierre Boulez, 1966, 'Eventuellement', in *Relevé d'apprenti*, Paris: Seuil, p. 177 *seq*.

[46]See Pascal Decroupet, 1994, 'Timbre diversification in serial tape music and its consequence on form', *Contemporary Music Review*, **10** (2): 12–23.

After that comes transformation of texture and timbre. Few techniques were applied during the early years, and it was necessary to invent a number of devices to support the process. In reality, perception of timbre is modified by temporal operations, and thus to cut the attack of a sound so that only the resonance or the sustain fragment can be heard leads to the masking of the original timbre. With the arrival of phonogènes, treatments that work upon the timbre were to be the result of speed variations, and the consequent transpositions in time and pitch. These effects combined to work upon the perception of the spectrum of sound. The use of filtering as a form of treatment developed slowly as was the case with other electronic devices for sound manipulation, such as ring modulators or amplitude modulators. These devices were only progressively installed during the early years of the GRM. For one thing, industry produced only a few of these devices, and in addition they were seen as electronic objects which worked against the philosophy of musique concrète. As other studios abroad began to employ them fully (Cologne, Milan), the GRM was to become sensitive to these means of transforming sounds.

Finally, musique concrète came up with a third category, or at least found a means to experiment through practice: spatialisation, that is, multi-channel diffusion. In 1951 Jacques Poullin invented a 'music stand for spatial application', which was used in a concert shortly afterwards. Here one heard spatialised works by Schaeffer and Henry (*Symphonie pour un homme seul, Orphée 51)*,[47] and, by using a three-track and six-spools tape recorder, a work by Messiaen, diffused by Pierre Henry with three fixed channels and a 'cinematic' one, and by Hodeir with piano. After his visit to Darmstadt during the summer of 1951, Schaeffer published a statement on musique concrète, and it is amusing to note that he inserted this under the title 'Die Klangwelt der elektronischen Musik'. It was in relation to this episode that he stated his position vis-a-vis the approach of the German studio: 'I found we had many common ideas with my German colleagues (we shared the same curiosity), but I did not believe in their *elektronische Musik*, all entirely turned, in my sense, towards a means of execution which would have small chance of renewing musical ideas.'[48] It is convenient to mention here that the electronic music which made so scant an impression on Schaeffer was not that with which the Cologne studio is the most frequently identified. In fact, during the studio's early years, the sources were not yet those of frequency generators, but instead keyboard instruments: Harald Bode's melachord and the Elektronische Monochord conceived by Freidrich Trautwein. It was chiefly with the aid of these keyboard instruments that the greater part of the first études by Herbert Eimert and Robert Beyer were made. But then, Schaeffer shared with Henry little enthusiasm for electronic instruments. One can find in this little known historical event the origin of Schaeffer's lack of interest for the German electronic music.

[47]At the Théâtre de l'Empire, 6 July 1951.

[48]Pierre Schaeffer. 1952. *A la recherche d'une musique concrète*, Paris: Seuil, p. 113. See also p. 15 in the same work.

7. THE RELAYED GESTURE I

The first act of 'relaying' by the concrète musician is related to the machine. It suggests, by virtue of its arrangement and its functions, possibilities of actions related to a given real-world sound, such as is its recording. But – and here one goes back to the intuitions of precursors such as Carol-Bérard, the artist converts these machines of reproduction into instruments of reproduction. It is here that we interpose the idea of reinvention: throughout the twentieth century the artist has shown how he can transform the machine into a basis for creation. When the gramophone changed its status from being an apparatus for reproduction to an instrument of production, an artist has, by thought or deed, reinvented the apparatus.

This machine, in the Club d'Essai's studio, was above all represented by the turntable, but it was also the potentiometer of the mixing desk. In Schaefer's hands, the turntable in effect became the generator for unheard behaviours of sound. They were thoroughly explored and classified, and became the vehicle for the research which led Schaeffer towards the conception of musique concrète: closed groove (made into a loop), speed variation (transposition of pitch and tempo), reversal, removal. Using the mixing desk's potentiometers, one's action leads to a new dynamic outline, which, in some cases were able to mask the identification of the source: the sound sheds its envelope and becomes disembodied.

The use of the turntable and its technical capabilities is the mark of the first works of musique concrète, as much with Schaeffer as with Pierre Henry. This technology would be the one used up to Schaeffer's and Henry's *Symphonie pour un homme seul*. In fact, it was during the work on this ambitious piece that the first tape recorder arrived in the studio.

8. A QUESTION OF NAMING

At least Schaeffer hesitated over the choice of an expression to describe what he had just invented: what to call this 'new music', this 'anti-music'. If he definitively adopted the term concrète, which he justified elsewhere, it was because it evoked other meanings, with reference to the association of ideas he establishes between painting and music. His deliberations drove him to establish a parallel between the evolution of painting since the beginning of the twentieth century, which led from the figurative to the abstract. It

was the idea of the ductile quality of sounds which led Schaeffer to this rapprochement between his discovery and the visual arts. Seeing that it was 'comfortable to establish links between musique concrète and abstract painting, that these were tangible and real, for all that descriptive music is as illusory as musical painting'.[49] It would ever after be possible 'to compose a concrète music that expresses the equivalents of matter and form from the standpoint of abstract painting'.[50] This is why he wondered whether he should not have chosen the expressions 'musique plastique' or even 'plastique sonore' (plastic sound).[51]

It was the poet Jérôme Peignot who suggested to Pierre Schaeffer an alternative name: 'acousmatic music'. This is what Peignot said:

> To try and finish in good time with the expression 'musique concrète', why not use the word 'acousmatic', taken from the Greek word akousma, which means 'the object of hearing'. In French, the word 'acousmatique' already describes those disciples of Pythagoras who, during five years, only heard his lessons hidden behind a curtain, without seeing him, and keeping a rigid silence. Pythagoras was of the view that a simple look at his face could distract his pupils from the teachings that he was giving them. If one gives the word an adjectival form, acousmatic, it would indicate a sound that one hears without being able to identify its origin.[52]

This idea was relaunched by François Bayle fifteen years later, when he applied it to the music of Paris School.

This term, henceforth used in reference to the musical work of the GRM, has to be extended through the notion of 'acousmate', which gave a mystical dimension to the phenomenon of hidden sound. Sound technologies have increasingly reinforced the idea of acousmate as a number of great mystics have given witness, supporting our listening to voices without bodies. Voices without bodies: this addresses itself to the idea that with sound technology one can transport or reproduce sound without its being associated with the material that produced it. Historically, the idea of 'acousmate' is linked to mysticism. Here is what the Dictionary of the Académie française says in its fifth edition of 1798: 'ACOUSMATE. Noun singular. Noise of human voices or instruments that one imagines one hears in the air.'[53] In his comments on the Académie's Dictionary, Antoine-Augustin Renouard wrote

> Biographers have written that St Cecilia, ready for her martyrdom, heard within herself the songs of angels, from which derives her title as the patron saint of music. If this historical point is correct, St Cecilia was in a state of acousmate, or of enchantment, for these two words in the language of learned metaphysicians, are essentially synonymous. Both designate a mental condition, which few physiologists know how to distinguish. The condition is rarely morbid, sometimes endemic; but those who suffer from it, when they are not saints, have often imputed it to witchcraft.[54]

This definition by the Académie can be found copied exactly in the notebooks of the young Apollinaire. The poet gave this title of acousmate to two of his poems. The first is a poem included in the Stavelot anthology, and probably dates from 1899:

> I sometimes hear the quiet voice of the absent[55]

In the second poem, also titled 'Acousmate', and dating certainly to same period, Apollinaire wrote these lines:

> Shepherds used to listen to the speech of angels /
>
> Shepherds used to understand all they thought they heard[56]

This is the role now played by phonography, to make voices without bodies or sounds without their causal source heard: writers, researchers and poets all make this attribution. The gramophone holds onto the physical inscription. In giving it back, it leaves to the listener the care of reconstituting the sound image which traces the sound of origin. It is in these two tendencies, restitution and recreation, that one finds the sources of the creation of phonographic sound.

The occasion of the great turning-point that was the creation of the Groupe de Recherches Musicales in 1958 produced a change in the adjective of qualification: henceforward one would speak of *experimental music*.

> It was called musique concrète, electronic music, electroacoustic music, *music for tape*, these synonyms which initially designated, in principle, the same thing, indicated at the same time certain tendencies – not aesthetic, for I take the word tendencies in the sense of the signifiers which were consecrated to it. In taking as signifier 'music for tape', one takes on the medium, one emphasises the origin, on the instrument: the generator, the synthesiser, and so on. In calling that music, musique concrète, I would emphasise, according to my way of thinking, on the *approach*. In terming it electroacoustic music one may find a synthetic term where the concrete sources (that is, the microphones) and the synthetic sources are mingled, as manipulations so often mix them.[57]

[49]Ibid., p. 114.
[50]Ibid., p. 115.
[51]For a development of this question, see Jean-Yves Bosseur, 2001, 'Musique concrète/peinture abstraite', in Sylvie Dallet et Anne Veitl (eds) *Du sonore au musical*, Paris: L'Harmattan, p. 261–77.
[52]Jérôme Peignot. 1960. 'Musique concrète', *Esprit*, no. 280, January, p. 116.
[53]*Dictionnaire de l'Académie française*, cinquième édition, Paris, 1789.
[54]Antoine-Augustin Renouard. 1807. 'Remarques morales, philosophiques et grammaticales', in *Dictionnaire de l'Académie française*, Paris.
[55]Guillaume Apollinaire, 'Acousmate' (j'entends parfois une voix quiète d'absente), *Le guetteur mélancolique*, 'Stavelot', ca. 1899.
[56]Guillaume Apollinaire, 'Acousmate' (Paix sur terre aux hommes de bonne volonté), *Lacerba* no. 9, 8 May 1915.
[57]Pierre Schaeffer, interview with Michel Chion, reproduced in *Cahiers recherche/musique* no. 4, 1977, p. 122.

9. CABIN OR STUDIO? THE GESTURE OR THE MACHINE?

In their development, the activities of the studio had the effect of opening up new questions that the composer had to confront. Schaeffer had well foreseen this when in the first pages of his diary[58] he wondered whether it was necessary to choose between the analogue sound where one could find the electroacoustic equipment, and the recording studio, a temple where the microphone captured the resonances of the sound-producing objects. Placing gesture as the primary consideration in compositional practice was the decisive factor for the Paris School: in order for the music in process of gestation to find its sound shape, the composer draws from a repertory of actions, controls, manipulations, synchronisations and so on. He disentangles two distinct routes: that of the recording studio, and that of the analogue sound.

And it was the latter that was Schaeffer's choice. There he found himself 'among the turntables, the mixer, the potentiometers' and he could work 'through interposed items'. By contrast, it was the recording studio that above all tempted the young Pierre Henry, who thus created a new route for concrète practice. For him, electroacoustic music was an affair of gesture and invention, and he would remain faithful to these feelings. In 1970 he wrote 'Anyone who practices Electroacoustic music invents his music, makes it, makes it real, with his fingers.'[59]

Schaefer's preference was hence for the analogue studio. He imagined a control device made from a battery of turntables which he could steer at will. The result of this technique was that the method of composition made itself apparent by a process of collage, where the items were superimposed upon each other or followed one another without much effort of articulation or transition. With the maturation of thought, the question of finding means to combine and articulate objects became a focus of the techniques of montage. For that, it was possible to evoke comfortably a procedure of electroacoustic writing, where the musician proceeds without graphic inscription but instead with a vocabulary of styles of gestures and actions. It was thus that the idea was formed, advanced and developed by Guy Reibel, *concentrating on sound producing objects* and *mechanisms*. The route explored by Reibel consisted of making an inventory of the actions comprising the ways of playing, acting upon a sound body, whether this was acoustic, according to the concrète tradition, or electronic, ignoring, in this case, the means of recording or adapted interfaces. Thus the idea of the instrument, not in a conventional sense, was apt for the purpose of playing and exploring gestures. Reibel asserted that the approach, undertaken soon after his arrival at the GRM, conformed with Schaefferian thought.[60] In fact, one can see a sort of struggle between the composer's musical idea and the sound-producing object that puts flesh on it – even if this is an electroacoustic device. An electronic machine, in effect, is not a tool given to the musician without encumbrances. Beginning with its own particular ways of functioning, it has its range of possibilities as well as its limitations, and can easily be resistant to the composer's wishes. The imprint of this compositional strategy can be found in the work in six movements *Variations en étoile* (1966).

The basic question posed to the concrète musician is: ought one to act and understand later-on? To state it in another way, can the gesture – on the sound body, on the potentiometer, on the machine – work by itself to make a musical character appear? Or rather, must it in contrast apply a strategy aimed at unveiling the initial intention through the gesture?

10. THE RELAYED GESTURE II

In order to explore the transformations of recorded objects more elaborately, Schaeffer thought about adapting the tape recorder, with which the studio had only just equipped itself. Several machines were thought of and produced by Jacques Poullin. There was the keyboard phonogène, made by the Tolana company, which would allow a magnetic tape in the form of a loop to be played according to a selection from twelve playback speeds. There was the sliding phonogène, whose effect one can hear in *Orphée ou toute la lyre* by Schaeffer and Henry (1951). This was furnished with a lever which assured a gradual change in the speed, resulting in a sort of spectral and temporal glissando. This was constructed by the Sareg company. The morphophone would read a loop of magnetic tape with the aid of ten heads which one could place along the loop and be regulated at will: one might thereby produce repetition according to a chosen rhythm. Finally, the universal phonogène, created in 1961, was an adaptation of the principle of the machine developed in Germany by Axel Springer, the Springer Tempophon.[61] Its principle allowed one to work independently on speed variation, resulting in an acceleration or a slowing down, as well as the transposition of pitch. Its manipulation was, however, very delicate.

Several works mark the phase that opened with the founding of the Groupe de Recherches Musicales. With these works a new way of electroacoustic composition

[58]See Pierre Schaeffer, 1952, *A la recherche d'une musique concrète*, Paris: Seuil.

[59]Pierre Henry, 'Le voyage intérieur', *Les lettres françaises*, 8 May 1970, reprinted in Martine Cadieu, 1992, *A l'écoute des compositeurs*, Paris: Minerve, p. 220.

[60]See Guy Reibel, 2000, *L'homme musicien. Musique fondamentale et création musicale*, La Calade: Édisud.

[61]One can hear this in the work for tape by Herbert Eimert made in Cologne, *Epitaph für Aikichi Kuboyama* (1960–62).

began characterised by an effort to create a unity of the material by inserting it into a formal, coherent discourse. Schaeffer created two études which had as their point of departure the desire to make a work exploring a limited collection of objects, assuring a form integration in the most musical way possible: the *Étude aux allures* (1958), first, put into play a number of sorts of processing. One can clearly distinguish the action of the keyboard phonogène, whose playing produced a kind of melody of resonances, of bandpass filters, which cuts off the spectra of resonant rich sounds, apparently coming from metallic plates crashing into one another, just as from constructions of hybrid objects tied two by two though editing, according to an outline of expansion/contraction: these are the sounds in *delta*, a name given based on the shape of the Greek letter, which became an electroacoustic pattern commonly used at the Paris School. With the *Étude aux allures* (1958) Schaeffer inclined towards a property of sound that he characterised as its allure, which one might concisely describe as a periodic or quasi-periodic movement animating a sound, and which often depicts itself as a sort of tremolo applied to different parameters of sound. For the *Etude aux objets*, Schaeffer chose about a hundred sound objects for which the puzzle – the challenge – was to use them only in the crudest possible way, relinquishing electronic treatment.

11. THE THEORETICAL EFFORT

In Paris the man of science who very soon attached himself to the studio was Abraham Moles. His contribution was essential. It can be noted in 1952 in an appendix to a work of Schaeffer's, *A la recherche d'une musique concrète*, with the chapter called 'Esquisse d'un solfège concret' ('Sketch for a solfège concret'). Gradually, Schaeffer forged what Hugues Dufourt calls a philosophy of the sounding.[62] To be a philosopher is to create concepts, and this was exactly the purpose of his theoretical work.

In 1966 he published his treatise, the *Traité des objets musicaux*, which Schaeffer said had taken him fifteen years to write. He emphasised that it 'is not above all a treatise on musique concrète, it addresses itself to music as such, but it is also an interdisciplinary essay'.[63] Running to 672 pages, the *Traité* develops his thought in seven great books, themselves subdivided into chapters. Oddly lacking an index, its imposing size making it difficult to consult, it was left to Michel Chion to draw up a *Guide des objets sonores*,[64] a work which allowed many composers in France and abroad to grasp Schaefferian concepts and integrate them into their own approach.

The way one perceives the captured and recorded object is the engine that drives concrète invention. Schaeffer gives this its name, *reduced listening*. This expression evokes the attitude consistent with how one regroups Schaeffer's indices, under the condition that the composer's perception is concentrated on this activity. Reduced listening allows one to disengage the musical properties of the fixed object. In the *Traité*, Schaeffer introduced the term *acoulogy* to designate the act of isolating and of defining the musical characteristics of recorded sounds. Thus defined, acoulogy was intended to become the science of reduced sound.

Several years later, Michel Chion proposed to enlarge the field of acoulogy and to present it as 'the science of hearing in all its aspects (when with Schaeffer, it only concerned itself with the dimension of sound related to reduced listening)'.[65] Chion proposed that the acoulogy that he was advancing 'ought not to aim directly towards a musical result, or a cinematic one, but instead towards a more general, artistic goal. Its objective is knowledge.' The science thus defined would be, in the geometric image that Chion gave as an example, nourished by musical experience, rather than directly serving it. Thus detached from the contingency of artistic production, acoulogy would come to enlighten 'all our listening'. It would appear from this that the vision of a science of listening, extended as Chion suggested, is derived from Schaeffer's suggestions about how the concrète musician, since before 1952, could benefit from the particular technique of capture and recording of sound. If all Schaefferian theory is directed purposely towards musical practice – that of radiophonic art as well as that of composition – what Chion teaches us is that what Schaeffer opened up can become the most general one, paraphrasing a well-known reflection in Schaeffer's diary of 1952.

Acoulogy is the way to distinguish between two levels of work. The first, *typology*, allows the classification of sounds by types of objects. It leans on a specialised vocabulary applied to the objects: continua, sustained and discontinuous characteristics, provision of fixed or variable mass, etc.[66] The phase of typological examination produces a classification of the objects. The second level, *morphology*, is the conceptual tool that categorises the ways of describing the classification of the objects. Schaeffer distinguishes between an *internal morphology*, applicable to those objects which have a certain unity of character, and an *external morphology*, when the sound is composed of simultaneous elements differing in

[62]Hugues Dufourt. 1999. 'Pierre Schaeffer. Le son comme phénomène de civilisation', *Ouïr, entendre, écouter, comprendre après Schaeffer*. Paris: Buchet/Chastel, pp. 69–82.

[63]Pierre Schaeffer, 'Un nouvel humanisme est l'affaire d'aventuriers', *Les lettresfrançaises*, 20 October 1966, reprinted in Martine Cadieu, *A l'écoute des compositeurs*, Paris: Minerve, 1992, p. 120.

[64]Michel Chion. 1983. *Guide des objets sonores*. Paris: Buchet-Chastel et Bry-sur-Marne, Institut national de l'audivisuel.

[65]Michel Chion. 1998. *Le son*. Paris: Nathan, p. 274.

[66]See Pierre Schaeffer, 1966, *Traité des objets musicaux*, Paris: Seuil, p. 442.

nature, even composite, made up from a number of detached elements, yet stemming from the same source.

These ideas, together with all the multitude of others which were disclosed but which are not discussed here, were experimental. Intended to serve as the foundation on which creation would be erected, they are of necessity impregnated by the aesthetic choices of their inventor. Schaeffer united them in his great project of a *solfège of sounds*, the proof that his ambition was to put together a complete and coherent musical system, rivalling that of the *solfège of notes*. To better make them operative and to spread them around, he undertook an enormous catalogue of examples of sound, with a commentary by himself.[67] He was helped by Guy Reibel in this task, with the assistance of Beatriz Ferreyra, François Bayle and Henri Chiarucci. Many of the ideas were accepted by the community of composers attached even indirectly to the Paris School, and one finds them adopted in Anglo-Saxon countries as well, where they spoke rather strangely of 'concrete music' to designate the natural provenience of the sounds and their remoulding into musical sounds, without necessarily following the Schaefferian solfège.

The *Traité* has been used as a pedagogical work, in which one may try to use words to describe sounds and to frame them into categories; this is illustrated by a great number of sound examples with comments. Undoubtedly it with this intention that the book is most often read. Ironically, even though the taxonomy is segmented into elementary categories, it is difficult to find an approach based on these in many produced works. By contrast, it presents a considerable effort to give a universal approach to very different compositional activities. It inspires admiration for what is a unique large-scale treatise focused on its thinking that the *sound* may come to substitute for the *note* as the material from which music is made. Finally, and this is often emphasised, certain properties of sounds found in the *Traité* represent classifications currently in use; and terms such as 'allure' or grain, for example, have become part of the vocabulary of electroacoustic music.

In the period during which he was preparing the *Traité* as in the years that followed it, Schaeffer requested the practice of Études as one of the foci at the GRM, which he had inaugurated in 1948. This insistence occupied the fourth position in the series of methodological rules he articulated in 1957: 'Before conceiving works, undertake studies'.[68] This was the spirit Schaeffer proposed to the composers of the young GRM, an experience which would find its first form of expression in the Collective Concert.[69] A kind of revolution, this project requested a contribution from all of the GRM's composers with regard to a single question: what connection should there be between the musical object and composition? Should one not place the idea of *structure* before that of *object*? All collaborators attacked this problem while Schaeffer proposed the project of a concert which would be fed by all of them. A veritable experimentation followed, carried out on the question of structures, the operative idea which acted like yeast in germinating musical objects. Experimental protocols were brought to readiness and each was applied to fill grids that evaluated them in order to validate the effect of structures. But when the results were analysed and discussed, it appeared that the subject of musical structure had not been of great importance and thus experience led to a collective concert in which the composers – at least those who had accepted to participate in the experience all the way through (it appears that there were ten),[70] each composed about ten minutes of music sharing the same materials. The collective concert was a unique chance to think together beyond the musical object. Up until then, the act of composing used to be dependent on analysis of how the material was listened to; Schaefferian philosophy was contingent upon this. With the collective concert, the idea was to seek supplementary models which inclined towards composition as an independent activity. Iannis Xenakis, for a time responsible for the programme, suggested a model based on combinatorial theory for this occasion. This would lead to working on the musical fragments made by certain composers with those provided by others. The project then was conducted through a sort of axiom that rested on a formalisation of sound. Schaeffer stressed musical structures which could work with the mathematical models put forward by Xenakis; even though in so doing, he was advancing indisputably towards a structuralist approach. It therefore led to a series of profound upheavals at the GRM.

12. THE RELAYED GESTURE III

The production of musical works, starting from the early 1960s, developed afterwards, while Schaffer undertook to put in place new teams of research: the Group for Technical Research supported the development of new electronic instruments and the Group for Image Research focused on audiovisual questions that would take on a growing importance for Schaeffer.

[67]This remarkable pedagogic exercise was first brought about by François Bayle, Agnès Tanguy and Jean-Louis Ducarme. Today it is available on compact discs accompanied by the complete transcription in three languages. Paris, Institut national de l'audiovisuel/Groupe de recherches musicales, 1998.

[68]Pierre Schaeffer. 1957. 'Lettre à Albert Richard', *La revue musicale*, no. 236, *Vers une musique expérimentale*, p. XIV.

[69]On this subject, see François-Bernard Mâche, 'Le 'Concert collectif'. Chronique d'une expérience' 1963, *La revue musicale*, no. 394–7, *Recherche musicale au GRM*, 1986, p. 193–9.

[70]The participants in the Concert collective given on the 18 March 1963 were Fr. Bayle, Ph. Carson, E. Canton, L. Ferrari, I. Malec, Fr.-B.Mâche, J.-E. Marie, B. Parmegiani and N.V. Tuong.

The development of a device for electronic production was the responsibility of François Coupigny,[71] who directed the Group for Technical Research. Coupigny produced an ensemble of electronic modules designed to generate signals and to process external sources. These devices emerged in about 1969. Thereafter called the synthesiser (a term which at the beginning they had tried to avoid because it had a meaning that linked it to electronic music), it became the heart of the new Studio 54 at the GRM; installed by Henri Chiarucci in 1970, conveniently set up above the nerve centre of the studio, the mixing console furnished the tape recorders with remote controls. It served also as a model for a more modest but portable unit, used for concerts up to the present day. It was in this way that the compositional environment of the GRM took the same path as other studios in the world, namely that of automation. This tendency began with the cybernetic inventions of Louis and Bebe Barron in New York, and includes others such as Raymond Scott's electronium (United States), Josef-Anton Riedl's Siemens studio in Germany, the Belgian IPEM studio in Ghent, and the Dutch studio in Utrecht.

The GRM way of composing in part depended on the technological environment in which it was deployed. We have seen how the experience of microphone recording can lead to a particular listening experience, and how this act was relayed by the devices and machines invented for composition.

Under these conditions, the question of musical notation was posed in a way that had not been made up till then, as the realisation of music had depended on the employed production techniques. There are only a very few examples of prescriptive notation in the Paris School tradition. Schaeffer, in his first experiences, had tried to note his figures of concrète objects for his first étude, but this tentative experiment was quickly abandoned. It flows from his theory of the primacy of the ear that the work should be composed as close as possible to the material, and given that no instrumentalist is required, notation is of little utility. In the course of training young composers, Schaeffer would ask students to make études, stemming from schemes in which the types of objects to be used were specified. The most developed notation is that which offers visual marks for the diffusion of works. François Bayle's concept of the acousmonium in 1974 hastened the usage of notation: graphics, imposed upon a temporal axis, allowed the diffusion of sounds at the heart of this orchestra of sound projectors. For the Paris School, notation was not something to be inscribed in the conception but in the gesture. Even with the arrival of computer technology, which forces one to specify exact data, the gesture remained a focus with the creation of the Syter digital machine.

But how did the GRM welcome the arrival of computers? The development of digital music in Europe was late and very gradual. The GRM was amongst the first to invest in this novel and still somewhat inaccessible technology. It fell to Francis Régnier to explore the possibilities, despite the extreme caution attached to it by Schaeffer ever since 1970.

During that period, the most developed software for digital synthesis and processing was Music V, an application in widespread use, developed at the Bell Telephone Laboratories by Max Mathews and his team.[72] Jean-Claude Risset played his part in this. He was the first to introduce it later in France, at the Université d'Orsay. The program was placed at the disposal of the GRM on a mini-computer. This computer system was installed in the little Studio 123 at the Maison de la radio, which was near Studio 116, dedicated to conventional analogue techniques.

The first attempt to distribute Music V among the composers of the GRM failed. Seeing that it was necessary to predetermine the data and code things exactly, the musicians could not find the equivalent of the gesture. The answer to this setback was found in the development of digital programs conceived to emulate conventional processing of sounds. The goal was thus to attempt to reproduce in software the manipulations of the analogue studio so that composers would find themselves in familiar territory. Bénédict Mailliard, in Studio 123, then defended the idea of a conversational type of programme. With this class of software the user could choose the values of transposition and display them as variables similar to conventional machines. One calls this *conversational* because the software establishes a dialogue with the musician and the latter responds according to those choices that seem good to him. He therefore works on an interface which, in the background, steers a number of processing programmes. The 'set of resonant filters' deserves a special mention, because it became one of the most attractive tools and because it represents an original contribution to digital manipulation. The filters allow sounds to pass through adjustable frequency bands up to a level where the filter itself resonates and accompanies the treated sound with a sort of spectral reverberation. Besides that, the musician can freely choose the number of filters making up the treatment set, as it is software-based and the only limits are those of the machine: the gesture now takes place in the virtual domain. One can hear this applied in the first work that came out of Studio 123, *Erosphère* by François Bayle. The *sound editor* restores the operations of editing in the digital domain – segmentation, collage

[71]Francis Coupigny. 2001. 'Sous la direction de Pierre Schaeffer: repères pour un parcours inventif'. In Sylvie Dallet and Anne Veitl (eds) *Du sonore au musical*, Paris: L'Harmattan, pp. 55–60.

[72]Max V. Mathews, with the collaboration of Joan E. Miller, F. Richard Moore, John R. Pierce and Jean-Claude Risset. 1969. *The Technology of Computer music*, Cambridge, Mass.: The MIT Press.

of sequences. The *software for temporal and spectral processing*, are manifold and varied: they derive from the representation of sound in the digital domain, and thus are not transposed computer versions of conventional treatments.

The practice of using computer programs has only partially modified this stance. Software manipulation demands a form of coding of values. That very often necessitates notation specifying at least a pre-existing state. The GRM, after having tried to spread the use of Music V, chose to create an environment based on gestures.

From the middle of the 1970s, research at the GRM led to the development of a program using a real-time audio-numeric system. This was the Syter project (*système temps réel*).

With Syter, composers had access to real-time and interactive control of processing programs for digital sound. The software developed for Syter was then transferred to platforms of personal computers with the GRM Tools program. This new package allowed the treatment techniques in use at the GRM to become accessible to a wide public of users.

13. ENERGY

A new phase of musical research was marked by the arrival of François Bayle as director of the GRM in 1966, when Schaeffer devoted himself to other functions. During nearly thirty years, Bayle was to mark the compositional direction of the Paris School with his imprint. In 1997 he was succeeded by Daniel Teruggi. This composer, who joined the GRM in 1980, has put in place a clearly defined course of action, which, as this article is being written, gives a new direction to the GRM.

From François Bayle's catalogue, one notes that works of chamber music without an electroacoustic dimension were the most prominent up to 1970. In that period instrumental works, of which only some involved magnetic tape playback, included traditional instruments as well as less traditional ones such as the glass harmonica, Baschet crystal, the Ondes Martenot and the Hammond organ as instrumental sources thus widened the spectrum of possibilities in orchestration and of expression.

Two works were to launch the next phase of Baylian writing. One was the suite for tape *Jeîta ou Murmure des eaux*, conceived in seventeen movements; the other, more importantly, *l'Expérience acoustique*, between 1969 and 1971. Several major works followed, of which *Vibrations composées* (1973), *Grande polyphonie* (1974) and *Camera oscura* (1976) are the most important from that period.

Bayle rarely resorted to live sources; writing for tape became systematic for him. A new form of writing appeared, and one finds its source in the terminology employed at the time. New terms blossomed in the course of the 1960s. The majority referred to a sound's cause: bounces, rustlings, evolving gestures. Certain of them invoke the idea of flowing, or of surface: tissue, fluid, hesitation. Others again allude to discontinuities: fragmentation. Certainly, the idea of motion that was present in Schaefferian theory in that period was evolved further. New terms are borrowed from subtitles of works, or from the writings of the GRM's composers at the time. These choices reflected a new attitude towards conducting sounds. Rather than inclining towards the object with a view of examining its properties, the sounds became forces influenced by the movements that cause them. Among the representative works are Bernard Parmegiani's *De natura sonorum* which is frequently quoted as exemplary of this period. It breathed life into a new form of sonic analysis, and its techniques of realisation as well as its stylistic assumptions are exposed in the work.[73] The principle of the work is to ally concrète objects to electronic sources. Putting these materials into an intimate relationship sometimes creates a vertiginous fusion of texture and tone, sometimes of radical contrasts. The magisterial essay by musicologist Jean-Jacques Nattiez has shown the poetic categories of it: starting from Nattiez' observations, one understands better how, in a work like *De natura sonorum*, the nature of the musical object has been transformed: the relations of energy are the driving force of the constitution of objects. The sound object became sonic material through a recorded fragment. Musique concrète, following the example of the cinema, would proceed by putting together individual sound sequences, usually short, especially the first studies of noise in 1948. It was François Bayle who gave form to a completely different conception. The vocabulary employed by this composer celebrates his influences but also introduces his own new models. One of the most important concepts in the process of the refounding of the Paris School is the idea of morphogenesis, which Bayle directs towards the question of the flow of energy that animates the sounds. Giving a direction to composition towards certain dynamic materials was for Bayle the means of generating sonic forms in motion. The sound was thus liberated and the style of composition at the GRM was completely changed by this. Bayle made images of sounds emerge from forms. These he named iSounds (iSons). The thought around this concept, amply developed in his work of 1993,[74] is indeed a radical return to questions related to the material, but also led to a deeply novel

[73]Jean-Christophe Thomas, Philippe Mion and Jean-Jacques Nattiez. 1982. *L'envers d'une oeuvre.* De natura sonorum *de Bernard Parmegiani*, Paris: Buchet-Chastel and Institut national de la communication audivisuelle.

[74]François Bayle. 1993. *Musique acousmatique. Propositions … positions*. Paris: Buchet-Chastel and Institut national de la communication audivisuelle.

attitude towards composition. Managing flows, making images emerge from sound – all that evolved from the end of the 1960s, but it is Bayle who translated the compositional option into a conceptual formation.

It was during these decisive years that the compositional tendency, designated by the term 'acousmatic' became stronger; the term approved by Schaeffer at the end of the 1950s (and which afterwards passed into general use) was adapted to describe music recorded onto sound media. This exists without any visual information for the public. According to his own theory, the effort of causal recognition collides with a constant erasure organised by the creator. When Bayle recovered the term in the middle of the 1970s, he commented on the perpetuation of the model. One can see by this action the choice between music recorded on a given medium and other forms of musical presentation; for example, mixed music allying instruments and an electroacoustic constituent without distinction either through a medium or live, direct, which continually expanded elsewhere during this period. Bayle promoted the term acousmatic above all to make visible the new theoretical status of the musical object. Schaeffer quickly realised this, when he declared to Bayle that until then the musical object gave life to time, but after Bayle had further evolved Schaefferian ideas, it was time that gave life to the musical object.

REFERENCES

Bayle, François. 1993. *Musique acousmatique. Propositions … positions*. Paris: Buchet-Chastel and Institut national de la communication audiovisuelle.

Bayle, François. 2003. *L'image de son. Technique de mon écoute/Klangbilder. Technik meines Hörens*. Münster: Lit Verlag, Bilingual edition.

Chion, Michel. 1983. *Guide des objets sonores. Pierre Schaeffer et la recherche musicale*. Paris: INA/Buchet Chastel.

Chion, Michel. 1998. *Le Son*. Paris: Nathan.

Dufourt, Hugues. 1999. 'Pierre Schaeffer: le son comme phénomène de civilisation', in *Ouïr, entendre, écouter, comprendre après Schaeffer*. Paris: Buchet/Chastel, pp. 69–82.

Gayou, Évelyne. 2006. 'Le GRM, Groupe de recherches musicales. Des racines de la musique concrète à l'électroacoustique des années 2000. Histoire, oeuvres, concepts, outils: une synthèse', doctoral thesis supervised by J.-Y. Bosseur, Université Paris-Sorbonne.

Risset, Jean-Claude. 1999. 'Pierre Schaeffer: recherche et création musicales et radiophoniques', in *Ouïr, entendre, écouter, comprendre après Schaeffer*. Paris: Buchet/Chastel, pp. 69–82.

Schaeffer, Pierre. 1952. *A la recherche d'une musique concrete*. Paris: Seuil.

Schaeffer, Pierre. 1966. Traité des objets musicaux. Essai interdisciplines. Paris: Seuil.

Teruggi, Daniel. 1998. 'Le système SYTER. Son histoire, ses développements, sa production musicale, ses implications dans le langage électroacoustique d'aujourd'hui', doctoral thesis, Université Paris 8.

Thomas, Jean-Christophe (ed.). 1999. *Ouïr, entendre, écouter, comprendre après Schaeffer*. Paris: Buchet/Chastel.

Thomas, Jean-Christophe, Philippe, Mion, and Jean-Jacques, Nattiez. 1982. *L'envers d'une oeuvre.* De natura sonorum *de Bernard Parmegiani*. Paris: Buchet/Chastel and Institut national de la communication audivisuelle.