Historical Analysis
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Aims and Scope: Contemporary Music Review is a contemporary musicians' journal. It provides a forum where new tendencies in composition can be discussed in both breadth and depth. Each issue will focus on a specific topic. The main concern of the journal will be composition today in all its aspects - its techniques, aesthetics and technology and its relationship with other disciplines and currents of thought. The publication may also serve as a vehicle to communicate actual musical materials.

Notes for contributors can be found at the back of the journal.

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Preface

The papers in this volume represent a little over half of the presentations at the Third Science and Music Conference held at City University, London from the 14th–16th of April 1993. The title of the Conference – 'Timbre Composition in Electroacoustic Music' – had been chosen with deliberate ambiguity to encourage a range of interests from technical, aesthetic, cognitive and compositional spheres. There are often legitimate reasons why these areas remain separate, but there is a continuing need to ensure that musicologists, psychologists, composers and listeners enter into a creative dialogue with designers and builders (who are nowadays most often programmers). It was gratifying to see that in the event there were more submissions on aesthetic and perceptual issues than purely technical ones; doubly gratifying, too, that many contributions crossed the disciplines. Details of a cassette of music examples to some of the papers may be found in an Appendix.

The two keynote speakers must be thanked for their leading the way: Denis Smalley's paper 'Defining Timbre – Refining Timbre' continues a series of studies he has made into the deeper levels of signification within our apprehension of timbre. Stephen McAdams' paper 'Timbre on my mind: offerings from cognitive psychology' is not reproduced here at the author's request but focussed on clarifying a descriptive language for timbre perception. At the core of this volume a group of papers spiral out from these keynotes examining perceptual issues (Landy, ten Hoopen, Vaggione and Windsor), compositional approaches (Emerson, Norman and Vaughan) and broader social issues (Waters). The volume opens with three perspectives from the pre-history (Dack) and history (Decroupet and Ungeheuer) of electroacoustic music. The final sequence of papers has been headed 'ways and means' but as I have observed these are not all strictly technical. Synthesis is indeed covered but by authors also known for their composition. The fast developing area of granular sampling and synthesis is represented by two papers (Di Scipio and Lippe), while a paper on a time-domain synthesis technique (Chandra) contrasts with one on recent real-time FFT techniques (Settel & Lippe); a paper examining the direct application of a cluster of techniques to a specific composition (Fischman) is followed by a group of three papers bridging parameter control programs (Taube), the growth of interest in 'knowledgeable' systems (Kirk et al.), and a fully fledged AI approach (Miranda).

In our Preface to CMR 3(1) – selected papers from the Second Science and Music Conference held at City in 1987 – Eric Clarke and I wrote: “Our hope is that this publication will demonstrate the tremendous potential for exchange between the multidisciplinary approaches to music . . . and will stimulate composers, psychologists, analysts and performers to find out more about their colleagues activities.” While it might be said that the argument for interdisciplinary work has in the mean time largely been won, it remains unclear the extent to which the new collaborative spirit is influencing compositional praxis and analytical ideology. But
with, as usual, the technology accelerating ahead of any critical discourse concerning its application and use, the disciplines of music (and electroacoustic music in particular) will retain and extend their central and crucial importance in the cultural debate.

Simon Emmerson
October 1993
Pierre Schaeffer and the Significance of Radiophonie Art

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Pierre Schaeffer's reaction to his perception of "concrete sounds" was of fundamental importance to his later musical investigations. However, it is often dismissed as merely the promotion of explicitly anecdotal sound vocabularies drawn from the "real-world". This is a misconception which obscures the significance of Schaeffer's specifically musical researches; the term "concrete" becomes vague and its cultural and philosophical resonances remain concealed. Schaeffer realised that in the acousmatic environment of radio broadcasting "real", "documentary" sounds could be powerfully evocative, thereby transcending their causal origins. Subsequently, these experiences were refined as he examined how musical aspects might be extracted from any object in the sound universe. Thus investigations of musical language were actively promoted by techniques of radio production. Furthermore, anecdotal sounds encouraged a humanist dimension in Schaeffer's thinking: Man's reaction to the acoustic world when modulated by the transforming power of technology.

KEY WORDS Pierre Schaeffer, radiophonie art, concrete, anecdotal, musique concrète, acousmatic

Schaeffer and Radiophonie Art

The subject of this article is the contribution of radiophonie art to the development of Pierre Schaeffer's musical thought. By establishing the link between radiophonie art and Schaeffer's later musical developments I hope to clarify the status (and perhaps even the legitimacy) of anecdotal sounds in much electroacoustic music.

Historically, Schaeffer's position as the founder of musique concrète is unquestionable. Nevertheless, his position is often relegated to little more than a passing reference in books on contemporary music. Such a superficial account belies a more accurate description of the man as a prolific writer (both of fiction and on the mass media), music-theorist and composer. Schaeffer did not simply instigate a series of idiosyncratic incidents in early electroacoustic music as a colourful prelude to developments in other European centres. His ideas were entirely typical of a main current within French intellectual thought in the pre- and post-war years. Furthermore, these ideas were maintained consistently throughout his development and, I would suggest, are of continued relevance to much present-day electroacoustic music.

Schaeffer's later, purely musical, theories date from 1948 and address fundamental issues of musical communication. Timbre, the instrument, sound classification and description all figure in the many areas investigated and elaborated in works such as the Traité des Object Musicaux (Schaeffer 1966). However, I believe that many of Schaeffer's early experiences in the radio medium—specifically in the practice of so-called radiophonie art—prefigure these later writings devoted to
music theory. The conclusion must be that radiophonic art played a role of central importance in inspiring and consolidating Schaeffer’s ideas. Consequently, his theories started to emerge earlier than the commonly accepted date of 1948. Such a revision emphasises from the very outset the distinct nature of Schaefferian notions from developments in other European centres. It is precisely because many criticisms of Schaeffer concentrate on his earliest experiments that a reassessment of their origins is needed. Misunderstanding and underestimating their unique characteristics hinders an appreciation of much French electroacoustic music and, more seriously, an entire methodology of subsequent musical thought and practice.

La Coquille à Planètes

That Schaeffer was influenced by the radio is in many ways hardly surprising – it was chosen profession. However, there is no necessary connection between the radio medium and music; many others have worked in radio without pursuing the same interests as Schaeffer. He described the medium with obvious enthusiasm calling it “(…) this miracle-machine, this chamber of wonders.” (Schaeffer, 1970 p. 89) He also referred to the “creative power of the machine” and stated his belief that machines used in producing radio programmes:

“(…) are not content to retransmit what was given to them, they have begun – as if of their own accord – to make something. I anthropomorphize a little, but let’s say that accidents are creative.” (Schaeffer, 1977 p. 168)

During the mid nineteen-forties one of Schaeffer’s concerns was radiophonic art which included all manner of sounds: words, music as well as noises. Due to the predominance of drama and the spoken word in radio productions, literary considerations were a decisive factor. Broadly speaking, therefore, radiophonic art could involve the creation of simple sound effects but also more complex accompaniments used to accentuate or comment on aspects of the dramatic action – a role that has continued to the present day. Although these areas seem to be principally an adjunct to drama productions Schaeffer’s upbringing did in a sense prepare him for a unique conjunction of ideas. His parents were both musicians, he was born in the shadow of Nancy Conservatoire, and, despite a cello diploma, did not choose music as a profession, thus, he later said: “purging his Oedipus complex” (Schaeffer, 1977 p. 77). It is surely not too fanciful to speculate that these early musical experiences lay dormant, temporarily submerged beneath his literary and technical aspirations but ready to surface at an opportune moment.

One production in particular must be mentioned: La Coquille à Planètes. This so-called “radiophonic opera” in eight one hour episodes was made at the Club d’Essai of the French Radio in Paris and broadcast in 1948. Apart from the music, which was composed by Claude Arrieu, Schaeffer did most of the work himself – the writing, the studio production and apparently even some of the acting. It is perhaps the first clear evidence of the manner in which Schaeffer’s ideas were shaped by the radio medium. In his book 10 ans d’Essais Radiophoniques Schaeffer wrote that La Coquille à Planètes was an attempt to “promote the acknowledgement of specifically radiophonic expression into every possible and imaginable domain.” (Schaeffer, 1989 p. 30). He continued by claiming that the section called
Aigles (eagles) contained passages where noise is combined with music in a way that was to "reveal preoccupations which led to 'musique concrète'". This production, therefore, was no mere concatenation of naive sound effects but a real attempt to elevate the combination of all sound elements regardless of origin to a level of a truly radiophonic work, albeit within a literary, dramatic, somewhat surrealistic context. And this, it should be noted, predates the commonly accepted beginnings of musique concrète by five years.

Two aspects can be identified from the period of La Coquille à Planètes. Naturally, both are connected in a complex network of relationships. Nevertheless, for the purposes of clarification they can be disentangled. Firstly, there is what can be described as Schaeffer's humanist reaction to technology. Secondly, and leading on from this, is the recognition of the potentially profoundly poetic nature of sounds heard whilst listening to the radio, thus without any visual confirmation of source. Both aspects remained central to Schaeffer's later thinking and, by extension, to much subsequent French thought on electroacoustic music.

Technology and Schaeffer's Humanism

Schaeffer's reaction to the new listening environment created by radio technology was not simply to accept the situation but to investigate the relationship between the listening subject and the object of his/her perception. This human dimension, "man as the measure of all things", the human capacities for knowledge and perception seemed a dominating factor in his thinking. Man was now placed in a new relationship with sounds. The first and perhaps most obvious effect of the radio were the new ramifications of the listening environment itself. Sounds can acquire evocative, almost magical qualities if they are decontextualized by being removed from their causal origins. This has been recognised by other media commentators. Marshall McLuhan, for example, wrote:

"If we sit and talk in a dark room, words suddenly acquire new meanings and different textures. (...) All those gestural qualities that the printed page strips from language come back in the dark and on radio." (McLuhan, 1964 p. 303)

This condition of radio listening was described as acousmatic by Schaeffer and others; the term has since gained general acceptance in the electroacoustic medium. This acousmatic situation must be extended to all those listening environments in which sounds are heard without any visual confirmation of their sources. Consequently it is the natural manner of listening both to the radio and recorded sounds. This notion alone was sufficiently important for Schaeffer to claim that sounds listened to directly and acoustically "triggered off a whole process of discovery" (Schaeffer, 1966 p. 32). Indeed, Traité d'Acousmatique was even considered as a title for the Traité des Objets Musicaux.

I should emphasise that however important the acousmatic situation was in itself it must not overshadow the significance of Schaeffer's inspired use of real sounds for radiophonic art. Acousmatic situations were, and are, commonplace. Listening to instrumental or vocal music via gramophone records or the radio need not be particularly revelatory. Any moderately experienced listener would easily associate such sounds with their instrumental sources. Occasionally confusion
might arise as a result of unorthodox orchestration or playing techniques but the full effects of the acousmatic situation would be minimal. The same was not generally true of anecdotal sounds in radiophonic art. Though often recognisable they were mixed, amplified, juxtaposed, resonance was added to create spatial illusions in ways that could not occur naturally. Thus the listener’s relationship with these sounds is fundamentally different from the rarefied sounds of musical instruments.

Technology per se was not, therefore, the point of Schaeffer’s researches. Machines allowed him to discover a new, almost transcendental relationship between himself and the world. They encouraged and directed the listener’s perception and actively promoted a new sensitivity to sound. Schaeffer wrote:

"The age of mechanism, denounced wrongly by pharisees of spiritualism, is the age of the most inordinate human sensibility. It is not solely a question of machines for making, but of machines for feeling which give to modern man tireless touch, ears and eyes, machines that he can expect to give him to see, to hear, to touch what his eyes could never have shown him, his ears could never have made him hear, to touch what his hands could never have let him touch. As this enormous puzzle, which knowledge of the exterior world is, composes itself, strengthens itself, verifies itself and finally 'sets' into shape, man recognizes himself in it: he finds in it the reflection of his own chemistry, his own mechanisms." (Schaeffer, 1970 p. 92)

Note the epistemological reference towards the end of the quotation and its connection to Man’s subjective experience of objective reality. The radio suggested to Schaeffer that it went “from the thing to the idea, from the concrete to the abstract” (Schaeffer, 1977 p. 2). Indeed, an entire methodology of studio practice resulted from these earliest stages of Schaeffer’s humanist attitude to technology. He wrote:

"An experimental method in music should mean to listen: above all, before, during, afterwards. Because the object is unusual, the challenge is to discover humanity and beauty in it (…)" (Schaeffer, 1952 pp. 179–180)

This method of analysis, of attempting to discover language from sounds – all sounds – contrasted with the ambitions of musicians who wanted to create sounds ab initio. While synthesis was entirely praiseworthy it had an entirely different agenda. In addition, Schaeffer’s attempt to build a machine – a concrete “instrument” – before analysis was by his own account less than entirely successful. He realised the phonogène¹ imposed structures on the sounds before their inherent characteristics had been examined. The listener heard the machine’s registers, there was no automatic perceptual correlation.

Schaeffer’s relationship with technology is a symptom, albeit an important one, of a profoundly influential underlying attitude. This introduces my second point:

¹ There were in fact two phonogènes. Both were tape recorders which allowed replay at variable tape speeds, one being calibrated in discrete steps, the other having a finer, almost continuous range of speed variation. Some years earlier Schaeffer had considered an equivalent device with turntables and recorded discs – a “piano of turntables”.
how sounds can acquire the revelatory characteristics hinted at by the acousmatic situation.

**Schaeffer's "Language of Things"**

I believe that Schaeffer, probably through his literary interests, assimilated many of the aesthetic beliefs of the Symbolists into his practices of radiophonie art. In his article from 1946 'Notes on radiophonie expression' (Notes sur l'expression radiophonique) Schaeffer refers to *La Coquille à Planètes*:

"I was suddenly aware that the only mystery worthy of interest is concealed in the familiar trappings of triviality. And I noticed without surprise by recording the noise of things one could perceive beyond sounds, the daily metaphors that they suggest to us." (Schaeffer, 1970 pp. 108-109)

For "beyond sounds" Schaeffer had written "au-delà des sons". Certain sentiments are clearly recognisable as characteristic of Symbolist terminology and thought. Schaeffer's conviction that sounds, by being displaced through recording and radio, can reveal a reality beyond the normal, material world is entirely consistent with Symbolist thought. A sound need not simply call attention to its origins. In fact, due to the acousmatic situation the listener may have few clues as to the sound source in any case. Thus sounds, even quite ordinary prosaic sounds, could be in a sense "renewed". The acousmatic situation in conjunction with the juxtapositions made possible by radiophonie art can reveal new, multiple meanings.

Clearly one quotation is in itself insufficient evidence. However, in Schaeffer's writings of this period concepts and keywords appear constantly. Furthermore, in the aforementioned article he refers to and quotes extensively from the poet Paul Valéry. Valéry was an important figure in the French literary world. Though he abandoned poetry at the age of 21 to pursue scientific studies he resumed writing some twenty years later. Furthermore, he is an explicit link with the Symbolists (as a young man he attended Mallarmé's renowned Tuesday evening salons or Mardis). Valéry attempted a form of interdisciplinary thinking. He drew analogies from his extensive scientific and mathematical studies and used these to elucidate his investigations into the psychology of human creativity. Schaeffer, by the very nature of his profession, was no stranger to interdisciplinary thinking – indeed we should recall the sub-title of the *Traité des Objets Musicaux* – an interdisciplinary essay. It is not difficult to understand the empathy between Schaeffer and Valéry.

As confirmation of these tendencies two other Symbolist traits can be identified: the deliberate search for significance in a meaningless universe and the notion of analogy. In the same article Schaeffer described the early inspiration of *La Coquille à Planètes*: a chance encounter with a machine in the metro and of the sign "SEVRES", but also the much more mysterious inscription "Babylone". The clicks of the machine cried out for a dramatic context and Schaeffer compared his own attempts to create a means of expressing this chance experience with Valéry's account of the genesis of his poem (perhaps his best known) *La Cimetière Marin*. Valéry described how a rhythm, a metrical line of ten syllables divided into six and four came into his mind (the French term is *dizain*). No words accompanied this chance occurrence but, Valéry continued "gradually floating words fixed
themselves” (Schaeffer, 1970p. 108). After a long time this bare framework gave rise to the poem. Both men actively sought to create meaning in a world of chance events. Indeed, according to Mallarmé everything in the universe happens by chance unless a meaning is grasped and fixed by Man and then it is at best only temporary.2

In addition to this comparison Schaeffer relates his own experience with a shell (this is yet another reference to Valéry who wrote an article L’Homme et la Coquille). In this account Schaeffer recalls his experience as a child as he held a shell up to his ear and heard the sea. Scientists, he continued, will explain this by saying the sound is simply blood circulating in the ear, but as a child he had no problem in creating an analogy which “associated unhesitatingly the ear, the shell, the ocean or if you want, man, instrument, universe.” (Schaeffer, 1970 p. 90). The sound was neither simply the objective sound nor the subjective reaction, but a subtle relationship between the two. The perceiver has to act, intentionally and consciously. By doing so a dynamic analogy is created, not necessarily intellectually conceived but emotionally felt. Once again the result is meaning. Schaeffer wrote:

“They are situated in our interior, in continuity with the physical universe, they are instruments. We find that these instruments of flesh, irrigated by our blood, maintained by the sweat of our brow, are capable of a symbolism of sensations more strange than the symbolism of language. They establish in correspondence between our consciousness and the universe, perceptually and reciprocally translate the non-human into the human.” (Schaeffer, 1970 p. 91)

Note the word “correspondence” – a notion of central importance to the Symbolists. A poem of this name – Correspondance – appears in Les Fleurs du Mal by Baudelaire and is fundamental to Symbolist aesthetics. Everything in the universe is connected in some mysterious way if these connections can be made to reveal themselves.3 This must not be confused with a vague, pantheistic religiosity; it is rather a profound expression of how we as humans see our place in the universe. (Symbolists were, almost without exception, Catholics who had lost their faith.)

Thus the acousmatic situation and Schaeffer’s humanist reaction to technology combined to reveal the poetic, evocative nature of decontextualized sounds. It would have been possible for him to continue to explore radiophonie art, to create a “hybrid art between poetry and music” (Schaeffer, 1966 p. 24). For several years

2 Another example of a chance occurrence for which a meaning is subsequently found by the artist (though only after some effort) is in Mallarmé’s prose poem Le Démon d l’Analogie (Mallarmé, 1945 pp. 272–273). In many ways these three accounts are strikingly similar. Valéry must have been familiar with the work by Mallarmé and it is entirely possible that it was also known to Schaeffer.

3 I am not suggesting that this kind of analogical thinking was invented by the Symbolists. For example, it was common in Mediaeval thought and seems, perhaps unfortunately, to have been largely superseded by other philosophical developments of the Renaissance. However, vestiges continued to exist (see Tillyard, 1943, chapters 5, 6 and 7 for a good account of sixteenth century English “correspondences”). I am indebted to Christine North for this observation.
Schaeffer was still firmly committed to sounds for radio productions rather than music. We have Schaeffer's own words to confirm that his later musical developments followed a period of experimenting for a "technical introduction to a work specially conceived for the radio" (Schaeffer, 1970 p. 92). He continued by stating that at the outset he did not have:

"(…) any other thought than of composing a series of studies, without preconceived subject, without literary concern, with the sole aim of giving me, in different allures,\(^4\) from slowing down to speeding up, from the simple to the complex, opportunities for demonstrating radiophonie mechanisms, I was obliged to gradually enter into a subject whose inspiration was imposed as it were at each instant, of which the episodes were suggested to me by instrumental requirements." (Schaeffer, 1970 p. 93)

It is clear, therefore, that in order to create sounds for radiophonie productions Schaeffer was obliged to experiment beyond simple recording, amplification and juxtaposition. Other procedures of manipulation had to be employed such as mixing and filtering. Listening to such recorded and transformed sounds in the studio he realised that they could function beyond sound effects. According to Michel Chion and Guy Reibel these became "expressive procedures which the radio used for dramatic aims before electroacoustic music made them into procedures of language" (Chion & Reibel, 1976 p. 16). Chance again played a large part in Schaeffer's discovery. The unforeseen event was that produced by the sillon fermé the closed groove on the disc that Schaeffer had to use to record sounds. A closed groove functioned in the same way as a tape loop and a recorded sound could be repeated constantly. Chion and Reibel described the effect as "a fragment of life caught in a trap, torn from its context, placed outside time and normal limits, repeated tirelessly" (Chion & Reibel, 1976p.26). At this point the distinction between radiophonie art and musique concrète becomes increasingly blurred.

This gradual but perceptible shift towards music proper can be detected in Schaeffer's book *A la Recherche d'une Musique Concrète* (Schaeffer, 1952). He recorded in the form of diaries his original intention of collecting physical objects from the sound effects department such as spinning tops, an alarm clock and rattles. He also noted with amusement the confusion of the officials who failed to understand why he should want sound sources without apparent concern for their ultimate context. On April 19th, 1948 Schaeffer recorded a bell after the attack: he reported that "deprived of its percussion the bell becomes an oboe. I prick up my ears. Might a crack be appearing in the enemies ranks? Has the advantage changed sides?" (Schaeffer, 1952 p. 15). Some two weeks later he wrote "Where does invention reside? When did it happen? I reply without hesitation: when I 'touched' on the sound of bells. Separating the sound from the attack constituted the inventive act. All musique concrète was contained embryonically in this inherently creative action on sound material." (Schaeffer, 1952 p. 16). Over the Easter period he conceived of a concert of locomotives and the rest of Schaeffer's development passes beyond radiophonie art and this article.

\(^4\) The French word *allure* was used by Schaeffer to refer to a generalised vibrato of either pitch or dynamic level.
The Origins of Musique Concrète

In the transformation from radiophonie art to musique concrète Schaeffer was able to accomplish something that necessarily eluded the Symbolist poets. They wanted to renew words, to reveal their multiple meanings by placing them within themetrical structures of a poetic line, perhaps surrounding a word with others according to both semantic meaning and phonetic, concrete quality. Nevertheless, words still have a relationship, however multi-faceted with what is being signified. By contrast, once a sound is recorded its links with its source are diminished; after transformation they are probably completely broken. The sound can now attain the status of a sound object, it acquires an autonomous identity and each of its concrete aspects has the potential to participate in the musical discourse.

Schaeffer ultimately decided that sound objects, generally speaking, should not be too anecdotal. Perhaps he realised the problematic nature of anecdotal sounds and without repudiating the notion of musique concrète itself decided that the sounds should not become too illustrative. In the electroacoustic medium sound objects can occupy any number of positions from the explicitly anecdotal through various degrees of ambiguity to completely unpredictable sound behaviours. Perhaps today we have more opportunities to reassert the status of anecdotal sounds and explore areas of radiophonie art that Schaeffer did not pursue. Luc Ferrari, for example, referring to his work *Hétérozygote* stated unequivocally.

“(. . .) I wanted to make a language situated both on the musical level and the dramatic level. The use of realistic elements allowed me to tell a story, or allows the listener to invent images for himself because montage allows ambiguities. . .” (Chion & Reibel, 1976 p. 66)

Anecdotal sounds in Trevor Wishart’s *Red Bird* also supply many successful examples of such sound art.

If musicologists are to form an accurate evaluation of post-war European music (however frequently histories might need to be revised) the origins and vocabulary of this area of French musical thought cannot be ignored. Clearly this precursor of electroacoustic music did not originate from an application of technology by which to extend already existing musical ideas. This is an important distinction from the musical foundations that were extended by *elektronische Musik* in Cologne. However, it did motivate Schaeffer’s initial theories which led in turn to the invaluable achievement of the *Traité des Objets Musicaux*. In addition it confirms the viewpoint, commonly expressed in Great Britain, that a too hasty conflation of French and German electroacoustic developments from the post-war period is a grotesque simplification. A grave disservice is done to both cultures.

The last words surely belong to Schaeffer:

“The miracle of musique concrète (. . .) is that during experiments things begin to talk by themselves, as if they were bringing us messages from a world unknown to us. If I gather together fragments of noises, cries of animals, the modulated sound of machines, I myself also strive to articulate them like words of a language that I would practise without even understanding and without ever having learned it: I am deciphering hieroglyphics. Does the difficulty of this conversation arise from the fact that
the person with whom I am speaking does not have the same faith as me in the secret correspondence between man and the world of which music is one of the keys?

So this is what art is: a translation whose exactness is periodically monitored by experiment; establishing by groping around, rigorous correspondences between man and the world, the two universes similar in every respect, separated only by the surface of our skin.” (Chion & Reibel, 1976 p. 47)

Acknowledgements

Due to the complete absence of English editions it was necessary to use my own translations of French works. As such, I owe an enormous debt to Christine North, a senior lecturer in French at Middlesex University. Her advice always improved these translations and her comments on the philosophical and literary background were invaluable. Responsibility for any inaccuracy or infelicity is, of course, entirely mine.

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In Terminus a complex sound-metamorphosis results from the superimposing of semi-automatical modulation processes, which are not object to further manipulations ones the machine has started. The composer does not controle the sound elements themselves, but the steps of sound-forming. The musical form – describing a path through the steps of sound modulation – guarantees that structures can be recognised and distinguished: the continuum can be musically heard.

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Concluding remarks

I have been concerned not with the acoustic nature of timbre, nor even, truthfully speaking, with its psychoacoustic properties, but with its apprehension, identity and functions in musical contexts from the listener’s point of view. Above all, the use of the label “timbre” is a signifier that we have identified spectromorphological, physiognomic attributes to which we can ascribe meaning. We not only recognise and identify qualities but we identify with them. The concept of timbre, then, evokes both real and symbolic links between our identity and sonic identity, and in electroacoustic music between our identity and that of the wide-open sounding and non-sounding world outside the music.

When source-cause slips into hiding, identity becomes problematic, even impossible. Timbral qualities become phantoms and phantasms. Personalised visions during the imminently level suggest circuitous, labyrinthine trails to wider generic identities and to the extrinsic matrix. The spectromorphological traces which inspire such trail-finding can no longer be parcelled up in generalised physiognomic packages. Timbre becomes the timbre complex, and the timbre complex splits open to reveal disparate lives: the timbral nucleus dissolves, seeping through musical discourse. In struggling to maintain a timbral essence we are indeed obliged to penetrate the very nature of musical discourse.

Composing with timbre, composing within timbre, means confronting and enjoying its dissolution. This can only really be fully pursued in an acousmatic electroacoustic music. In contrast, adventurous contemporary instrumental music, and works which mix instruments with an acousmatic element, are rooted in the umbilical security of instrumental source-cause coherence and directly apprehended sound-making gesture. This equates not with a burning desire to explore timbre, but with a hesitant reserve about cutting loose in order to pursue a freer exploration. There is no reason why the traditional notion of timbre should fade away. A notion of musical timbre will always exist alongside its dissolved attributes. In keeping with this ambivalence I can summarise this discourse in six words:

Timbre is dead. Long live timbre.

References


this article he created a three by three matrix which was intended to aid in helping categorise compositional approaches in electroacoustic music from both the discourse as well as syntax points of view. Through his clear examples he succeeded in offering the reader a means of discussing the treatment of material and structure without resorting to terminology derived from the music of notes. His text has served as an example for the above discussion.

**CDiscography**

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identified by consensus, to be labelled as re-presentational. If there is doubt in the act of identification then we should not qualify the sound as re-presentational.\(^8\) Furthermore, in my discussion of electroacoustic music the word \textit{nimesis} will only be used to refer to sounds which \textit{resemble imitatively} by recognisable vocal and instrumental sources in order to make the distinction with ambiguous electroacoustic sound material that \textit{resembles by being suggestive} of a possible source.

We are now in a position to construct a second axis in our previous diagram which displayed the specific-surrogate continuum (Figure 1), namely an \textit{axis of analogy}. This additional axis reflects the listener’s comprehension of electroacoustic sound material which may shift from a series of sounding analogies to non-sounding analogies, as expressed in Figure 3.

If we are able to identify an apparent source ("... this is the sound of ...") then we are inclined to apprehend the resulting music in terms of sounding analogies which include qualities of actual sounds, objects or sounding phenomena existing in the real world (lower part of the vertical axis). Moving away from the origin we enter an area in which we may infer sound sources ("... this sounds like ...") with possible ambiguity. We apprehend sound material on the basis of \textit{some degree of resemblance} of attributes of existing sounding phenomena. So, too, the sounding analogies become more ambiguous while still suggesting real world or human presence. Beyond this area of ambiguous recognition, we are inclined to comprehend sound material with reference to non-sounding analogies ("... it feels like ...") because no links to sources can be experienced.

While the possibility of source recognition tends to invoke more likely sounding analogies, and vice versa, it is important to note that each does not totally exclude the other; I should suggest that they are interdependently related within the area designated by the curved line.

The following conclusion may be drawn. I have argued that source identity and human presence are ambiguous aspects and may not \textit{a priori} be experienced in electroacoustic music. The more difficult it is for listeners to relate sounds to a specific source, the more listeners are put in the position of relating sound material to features which we may experience and recognise in \textit{sound}: for example, we might only be able to detect some attributes of a human agent, or a particular motion path which a sounding flow traverses within a certain time-span. These features are shown in the diagram (Figure 3) and the dotted arrows express that these features may waver along the field. Electroacoustic technology has provided us with a potentially ‘unlimited’ sonic space in which we can produce sounds that transcend the traditional physical sound sources of Western music. These developments illustrate the need to establish new ways to characterise and differentiate sound material and its possible relationship to ‘causality’.

\textbf{References}


\(^8\) No sound is, strictly speaking, 100\% unambiguously identifiable by \textit{all} listeners. However, we must assume for any discussion the existence of an idealized group who share broadly common acoustic comprehension.
Issues in Timbre and Perception


calling it by the normal procedure of the Music-N family's instrument declaration and playing it with a note-list, or merging it with other granular textures – that is, using external algorithmic procedures (not belonging to the granular synthesis paradigm) in order to articulate these textures in a higher time-level. But pushing things forward, we can also try to expand granular synthesis itself into a broader field. The wavelet transform represents one of these possible expansions; as such, it constitutes a powerful approach to spectral modeling, as its grains can handle data encapsulating time and frequency domain descriptions. Nevertheless, I feel indeed that much additional work has to be done in order to integrate into a system of correlations the three aspects of spectral modeling and spectral composition: analysis, transformation, and resynthesis. This is why I look forward in the direction of hierarchical syntactic analysis.

These questions, as they are addressed here, do not concern only the field of signal processing but reveal an epistemology of music composition. The possible answers are related to the concepts retained as pertinent, acting as substrata of a given musical thought. At each level of a compositional process, we have to deal with the nature of the tools to be employed, and to decide the kind of interactions that we want to compose.

In this light, I would like to finish with another quotation from Norbert Wiener, which gives us a proper warning against the temptation of imposing utopian uniformities:

"At that time (1925) I had clearly in mind the possibility that the laws of physics are like musical notation, things that are real and important provided that we do not take them too seriously and push the time scale down beyond a certain level. In other words, I mean to emphasize that, just as in quantum theory, there is in music a difference of behavior between those things belonging to very small intervals of time (or space) and what we accept on the normal scale of every day, and that the infinite divisibility of the universe is a concept which modern physics cannot any longer accept without serious qualification" (Wiener, 1964, p. 545)

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begins to combine the roles of composer, performer and instrument-builder. Despite the inadequacies of present technology, it would be unwise to under-es-timate the potentialities of such approaches considering the speed at which such interface research is developing. The implications of such a virtual musical world may be truly revolutionary, giving musicians direct access to musical tools without the obscure mediation of symbolic computer interfaces.

Placing the world in brackets, as Husserl (1931) points out, does not mean that it can be ignored; the research presented here finds an alternative “primordial experience” to that identified by Schaeffer (1966), one which is rooted in our direct relationship to a sounding world. It is not suggested that we should return to some pre-rational, ‘primitive’ relationship with sounds, rather that we should not forget where sounds originate from, or are perceived to originate from, as these origins are instrumental in defining our relationship to the world. One should not regard the admission or exploitation of such origins as a constraint but as freedom from a compositional ideology that demands that we treat sounds as abstract material.

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oriented variables which *prima facie* concern themselves with the *expressive detail* of timbral nuance and development.

I have referred to all the Aristotelian causes of sound: material, formal and efficient. But what of the final cause? To what end? It is to place the human once more centre stage – but not the stage of the proscenium arch. If 'All the world's a stage' then our human can just as well be at the centre of a network for all to hear!

**Postscript**

I have devoted this paper to what I see as the misunderstandings inherent in much real-time music of the last 12 years. I have not discussed what, in fact, lies nearest to my heart as a composer: the use of acoustic sources, manipulated live. This might appear to overcome some of the dislocations referred to, but when there is a visual component to perception, exactly the opposite can be the case. We might provoke just those dislocations that we seek to overcome, especially in space. But that is the subject of a future paper. For now I wish to attempt to reclaim the riches of the acousmatic universe to be placed under the expressive control of the truly 'live' performer.

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When it comes to considering tape music performance it might be best to shake loose from comparisons with 'traditional' notions of concert performance, and to stop worrying over their absence. My storytelling analogy is just a suggestion for a performance model that might make more sense, or at least offer more avenues for exploration when it comes to dealing with recorded sounds as material 'from life'. In the case of 'realworld' music it offers the possibility that not only is such music capable of being performed it is, to an extent, about performance. If recordings provide us with experiential evidence then the composer's interpretation of them forms – or per-forms – that experience into an affective whole. It makes musical stories from everyday sounds, it makes musical sense from 'ordinary' listening and it evokes an emotional response to the timbres of experience.

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It must support deterministic as well as experimental approaches to composition, with access to both high and low levels of construction.

Where forms of notation are used, then the morphology of the symbols used to describe a sound must have a correspondence with the sound itself as perceived by the composer – the composer should be able to design the symbols. In this way, a system of notation using the graphic forms often adopted to describe a piece may also prescribe the order of events within it.

The implications of this criteria are that there is a requirement for an approach to the design of hardware and software for musical applications to which the key is flexibility of interaction. The composer should be empowered to realise the fruits of his or her artistic imagination without the ‘interposition of the equipment’ being ‘stamped on every tone’ (Adorno, 1954, p. 110). Similarly, due to the danger of the learning curve associated with any application extending beyond the shelf-life of the compositional problem to which it is intended to be addressed, simplicity of operation is also important, with data entry being related to higher-level concepts in which parameters can be organised hierarchically by the individual user. Composers do not represent their ideas in a uniform manner and therefore any flexible representational system demands a strong user-defined link between the material and its symbols of signification. Appropriate methods of representing higher-level musical structures should be considered a design priority and the extremes of deterministic or algorithmic approaches to composition must be as well supported as those strategies relying on the aural feedback loop.

Obviously this leads to a larger project of general definition and specification, with the overall aim of allowing the concepts behind a work of electroacoustic music, however loosely or specifically these are defined, to remain uncompromised by the very means of production. Only in this way will the potential of electroacoustic music be fully realised in a music which is enabled by available technology, rather than merely exemplify conflict between the patterns of behaviour imposed by high technology and those of artistic intention.

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It is not the doubt about the label which worries me, but the implied lack of social and cultural significance of what we, as composers of electro-acoustic music, are engaged in.

I said earlier that it was also politically difficult to sustain a view of the autonomous timbral object. It is a political question because the education system is now so politicised, and because part of the reason that timbre has been so regarded is because of the protected status of electro-acoustic composition, within its academically protective institutions. (The modernist tendency to regard all art works as the unquestionably autonomous products of their gifted makers has exacerbated this sense of separateness from the social world.) Paradoxically, despite their dependence upon academic institutions, there seems to be a pervasive sense among practising composers that work in education is somehow not ‘real work’. It is this which leads me to the third of my summary observations, below, about timbre and music.

**Summary observations**

- Timbre is as much an intentional process, an ideology, an attitude, as a physical characteristic. The reasons it has not been privileged to the same extent as pitch and rhythm even in formalist ‘parametric’ considerations of music relate as much to its social/situational ‘intolerance’ as to its notational unrepresentability. Madonna can be timbral music, though of what quality is open to question. The point is that timbral listening is a type of interpretation.

- The phenomenological language we use to describe timbral (especially electro-acoustic) music is problematic because it fails to acknowledge this interpretive function of the subject (the listener). It assumes the transparency of the subject (something no anthropologist would get away with), and does not allow that timbre is partly an intentional process. It also fails to acknowledge the weight of extramusical association carried by its metaphoric terminology.

- There is an urgent need to find a language which is inclusive of metaphors of experience which are current and common (in the sense of widely comprehensible), to allow access to timbral music to non-experts. It needs to be a language which acknowledges the complicity of the listener in listening (as an interpreter, not merely a receiver). This should be an educational imperative in a country which has a national curriculum which statutorily defines the limits of music; which reinforces the unfortunate separation of autonomous musical objects from the social processes which are responsible for them, rendering them incomprehensible except within the ideology of enforced ‘enlightenment’. Composers can do better than this.

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provide an instrumentalist with a high degree of intimate expressive control over an electronic score.

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The functions for plotting the FFTs were written by Theodore Gray of Wolfram Research.

I prototyped the synthesis algorithms for wigout using Mathematica V2.1, then rewrote them in C for speed. The graphics in this article were made with Mathematica V2.1. Currently, wigout runs on a NeXT 68040 workstation.

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create unusual spectral transformations of input signals, resembling extreme chorusing effects.

**Future Directions**

The authors are currently working on alternative methods of sampling that operate in the spectral domain. Many interesting techniques for sound manipulation in this domain are proposed by the phase vocoder [Dolson 1986; Nieberle & Warstat 1992]. Along with the possibility of modifying a sound’s spectrum and duration independently, we would like to perform transposition independent of the spectral envelope (formant structure), thus allowing one to change the pitch of a sound without seriously altering its timbral quality.

**Conclusion**

With the arrival of the real-time FFT/IFFT in flexible, relatively general, and easily programmable DSP/control environments such as Max, non-engineers may begin to explore new possibilities in signal processing. Though our work is still at an initial stage, we have gained some valuable practical experience in manipulating sounds in the spectral domain. Real-time convolution can be quite straightforward and is a powerful tool for transforming sounds. The flexibility with which spectral transformations can be done is appealing. Our DSP configuration is fairly simple, and changes to its topology and parameters can be made quickly. Control signals resulting from detection and tracking of musical parameters offer composers and performers a rich palette of possibilities lending themselves equally well to studio and live performance applications.

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Conclusion

Digital synthesis allows the composer to explore timbral possibilities unavailable in physical instruments. Describing these sounds can be a very complex process. Digital instruments allow a composer to control sound specification at a fairly high level, but still require a composer to manipulate large quantities of parameterized data. Common Music provides additional support for this process by allowing the composer to define and manipulate sound descriptions as reusable compositional objects. Common Music allows the composer specify sound events directly, or indirectly through an algorithmic process. Once specified, sound events may be edited using a composition editor which supports a sophisticated a referencing scheme, query facility and conditional command application.

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amplitudes and the density parameter. Although not shown in the figure, the dynamic behaviour of the system could be further influenced by controlling the rate at which the partial accumulator feeds the iterative cycle. This could be achieved by providing a timer input for the accumulator. Varying the rate of the timer would then change the time taken for the instrument to come into balance.

Our intention in making this design was to produce an electroacoustic instrument which could be substituted for the MIDI generator in the Ceci n'est pas un Orchestre Tabula Vigilans example.

Conclusion

We have shown that MIDAS UGPs can be used to represent the behaviour of electroacoustic scores and instruments in a uniform fashion. Indeed, there need not necessarily be any clear distinction between the two. By adding sufficient processors into the MIDAS system, real-time performance with such designs will be achievable. The degree to which algorithmic (Tabula Vigilans) processes may be integrated within the MIDAS environment means that we have the real possibility of composing and performing live music with electroacoustic instruments, where algorithmic elements form an integral part of the instrument definition.

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