

## Instrument and Pseudoinstrument - Acousmatic Conceptions

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Lear: "What, art mad? A man may see how this world goes with no eyes; look with thine ears"

William Shakespeare, King Lear Act 4, scene 5

### Introduction

The senses dedicated to perceiving sight and sound seem locked in mutual collaboration; the former supporting and supplementing information gained from the latter. For the musician seeking visual confirmation of a sound's source the relationship seems a permanent, indeed self-evident, aspect of the musical experience. However, this apparently inescapable causal connection is one of several traditional assumptions that have been subverted by recording technology and the medium of electroacoustic music. Audiences attending concerts of such music are aware of sounds but physical sources and instruments as traditionally defined are often entirely absent. Nevertheless, at a fundamental level the connection remains and continues to influence our responses to electroacoustic music. It is my belief that the French, or to be more precise the *Schaefferian*, tradition of electroacoustic thought, far from colluding in the demise of the instrument, has ensured its existence albeit in a radically revised and generalised form.

In the present study I will examine the subtle and complex link between sounds and sources - both real and imaginary - in electroacoustic practice and theory. Listening conditions promulgated by the broadcasting media and electroacoustic studios have forced a reevaluation of the conventional

correlation between eye and ear. My methodology will consist of a summary and exegesis of selected writings by Pierre Schaeffer. Since his death in 1995 his reputation as a theorist and commentator on music's relationship with the new technologies has spread beyond the confines of a restricted group of musicians. In addition, I shall identify common aspects between Schaefferian theories and recent developments in electroacoustic composition in Great Britain. In particular, Denis Smalley's elaboration of the Schaefferian heritage exemplifies the British reaction to, and assimilation of, French electroacoustic thought. It is likely that a full appreciation of much contemporary music in Great Britain is impaired if this European connection is neglected.

I will restrict my remarks principally to the genre formerly known as "tape music". Now, due to the anomalous nature of the term "tape", it is more commonly called "acousmatic" music. This unfamiliar adjective describes conditions of presentation and reception: both performer and instrument are absent in physical terms, the audience has no visual cues, and access to the composer's music is mediated solely by the sound projectionist, the equipment used at the concert and the acoustics of the performance venue. Any mental imagery results from the sounds alone. However, even within acousmatic music there is no general consensus regarding sound vocabulary. Different sound repertoires result in a plurality of languages from the explicitly anecdotal to typomorphological. The following discussion will concentrate on the latter though many observations will be applicable to the former.

## Terminology and concepts

### 1 The term: *acousmatic*

Pierre Schaeffer considered the acousmatic mode of listening to be of fundamental importance. He wrote: "C'est en constatant les divergences, apparemment légères, entre le son noté et le son enregistré, entre son *écoute directe* et son *écoute acousmatique*, que tout un processus de révision et de trouvaille nous a paru se déclencher." (It is by observing the apparently

superficial divergencies between the notated sound and the recorded sound, between the sound *listened to directly* and the sound *listened to acousmatically*, that I would suggest a whole process of discovery has been triggered off.) (Schaeffer, 1966: 32) According to the composer Francis Dhomont, Schaeffer even considered naming his book the *Traité Acousmatique* in preference to the *Traité des Objets Musicaux* (Dhomont, 1991: 25). Michel Chion also emphasises the term in his book *Guide des Objets Sonores* by dedicating the first section of the opening chapter to "La révélation acousmatique" (Chion, 1983: 18). With so many overwhelming endorsements, the essential qualities and ramifications of the acousmatic situation must be carefully examined.

The term "acousmatic" was originally coined in reference to the alleged teaching practice of the Greek philosopher Pythagoras and his followers. It described conditions in which primacy was given to the aural apprehension of information, consequently, visual corroboration was ignored. The specifically acousmatic mode of perception necessitated the practice of placing a lecturer or speaker behind screens. This deliberate act of concealment forced the students to concentrate exclusively on the words; the speaker's presence and any physical gestures that might be used as emphasis could cause no distraction. The comprehension of verbal meaning by sound alone was, therefore, considered of the utmost importance. Moreover, it should be noted that the need to minimise all extraneous visual cues simultaneously recognised the potential vulnerability of the listening process. It is this insistence on the direct perception of sound without visual confirmation of source that defines the conditions of the acousmatic experience. The term is now so firmly established that there are even cognate words such as "acousmonium" (the loudspeaker "orchestra" used by the Groupe de Recherches Musicales) and "acousmateque" (the venue used by the Groupe de Recherches Musicales for the performance, conservation and dissemination of acousmatic works). Interestingly, the word also existed in English before becoming obsolete in the eighteenth century. According to the Oxford English Dictionary "acousmatic"

was derived from ancient Greek, the literal meaning being: "one willing to hear".

## 2 The significance of the acousmatic situation

The apprehension of sounds without visual reference to their sources might seem relatively trivial without further investigation. For example, radios, gramophones and compact disc players provide conditions in which sounds can be heard acousmatically. In such cases the full effects are frequently overlooked due to familiarity. Thus, a clear distinction must be made between such commonplace experiences and their more profound consequences: it is the latter which entirely justifies Chion's use of the term "révélation". For example, if sounds are recognisable, such as an environmental sound in a radio play or a recording on compact disc of a performer playing a conventional musical instrument, there is usually little impact regarding the sound's origin or its characteristics. The listener can easily construct, often automatically and unconsciously, a connection between sound and source and the significance of the acousmatic situation is minimised. Even with an unfamiliar musical instrument, the sound's spectral and dynamic evolutions will doubtless indicate its general physical construction and the type of energy input required to initiate sounds. Exceptions will occur only if instruments are played with "extended" techniques or if unorthodox orchestration hinders instrumental recognition. In such situations - increasingly common in much contemporary music - the listener is forced to concentrate solely on the sound's features and how these function within the composer's chosen language. As a result the bond between a specific source (whether recognisable or not) and the resulting sound is weakened. Such is the full effect of acousmatic listening properly speaking: source recognition is deferred and the relationship between the sound as object and the subject's listening processes becomes paramount.

## 3 Value/characteristic

Naturally, in the environment of the electroacoustic studio acousmatic conditions are the norm. The tape recorder functions as "la tenture de

Pythagore" (Schaeffer, 1966: 98) encouraging the exclusive use of aural perception in any process of extracting potential meanings from recorded sounds. However, invisible sources are, for the musician, infinitely more revelatory than the simple concealment of a speaker from Pythagoras' students. The student audience could have been in no doubt that the sound source was a human being and that the message was in a known code - language. The acousmatic situation encourages composers to explore the potential that each individual feature of sound might have for articulating musical structure. Schaefferian terminology defines these form-creating aspects as values (*valeurs*). In traditional musical languages pitch and duration (or rhythm) are the principal values. Other aspects such as dynamic levels, instrumental timbre and articulation are called characteristics (*caractères*) and their structural roles are usually less important. The hierarchy of the value/characteristic dualism can be illustrated by considering a transcription for piano of a Beethoven symphony (common practice in Beethoven's day). The pitches of the transcribed version would be identical to those of the orchestral instruments (though some might be omitted due to the restricted span of two hands on a keyboard). While continuous sounds would not be possible on the piano, the durations would still indicate accurately the attack-points and thus the rhythms of the notes. Thus, the values of pitch and duration would be the least affected when transcribed to a different instrument and, as a result, an accurate understanding of the music - its motivic, harmonic and rhythmic development - would still be possible. It must be emphasised, however, that even though the values of pitch and duration are the principal carriers of musical meaning in this example, the role of the characteristics must not be disregarded. For example, the lack of balance between dynamic levels and the absence of instrumental colours (particularly at structurally significant points) would impoverish the language. In addition, the articulation of sounds, how they are shaped and controlled over time, is distinct for each instrument. While articulation is not essential to a comprehension of Beethoven's language, it is, nevertheless, of crucial importance to the listener's perception of "expressive" playing. In a piano transcription these aspects would be minimised. Schaeffer

was aware that both values and characteristics co-exist: to emphasise one at the expense of the other would result in an unbalanced musical language. An understanding of the value/characteristic dualism is important. It is paired with that of permanence/variation (described in section 6 of this chapter) and the manner in which both dualisms interact is central to the Schaefferian elaboration of the instrument.

Recorded sound objects often contain many constituent elements and the composer must determine which features can be abstracted as either values or characteristics. If a common aspect is shared between several sound objects it has the potential to be considered as a value. The composer can then exploit this abstracted, common attribute to create higher level structural relationships between sounds. Differences in the value will encourage the listener to perceive processes of development and variation. For example, Schaeffer identified a "generalised" vibrato called *allure* (see section 9) which is perceived as changes in either pitch or dynamic level. If several sound objects display this feature, a "play" of allure might result. Different allures could be compared according to speed, the deceleration or acceleration of the rate of change, the depth of the allure and so on. The elaboration and development of the abstracted feature of allure will, if successful at the stage of composition, predominate over other aspects of the sounds. Indeed, in 1958 Schaeffer composed an "Etude aux Allures". His intention in this composition was to direct the listener's perception to changes in allure thereby allowing it to communicate as a principal articulator of structure and thus promote it as a value.

Naturally, human perception has certain physiological predispositions and cultural biases - hence the traditional predominance of pitch and duration. Nevertheless, the discovery of new values was important for Schaeffer. It transcends, one might even say liberates, sounds as mere indicators of their sources. "Le son de la trompette ne fait que nommer l'objet. Par un curieux paradoxe de l'habitude, l'homme, ici, n'est plus en prise directe sur le concret,

le processus d'abstraction joue automatiquement (et notamment la relation causale) et lui masque l'objet dans sa totalité." (The sound of a trumpet does nothing but name the object. By a curious paradox of habit, man is not directly in contact with the concrete, the process of abstraction automatically comes into play (and notably the causal relationship) and it masks the object from him in its totality.) (Schaeffer, 1952:160).

#### 4 The four listening modes

Two consequences of the acousmatic situation merit attention. These are reduced listening (*écoute réduite*) and the four modes of listening (*les quatre écoutes*). Both resulted directly from the acousmatic conditions of studio practice and indicate early practitioners' concern for the perceptual processes involved in music creation and reception. Reduced listening is a specific form of directed perception. The sound is heard as an object of perception in its own right - hence the term "sound object". Attention is given to all intrinsic qualities and any speculation of causal origin is suspended or, to use the phenomenological term, "bracketed". Reduced listening is, in a sense, intentionally unnatural. By deliberately disregarding source identification or any potential message that might be communicated, the listener is free to concentrate on the sound's inherent features. For detailed examination, repetition is essential. This presents few difficulties with sounds recorded by means of modern technology (though Schaeffer's first experiences would have been with the closed groove or "sillon fermé").

The four modes of listening identify the circuit through which perception moves back and forth as sounds are apprehended. There are four French verbs by which Schaeffer differentiated each stage: *écouter*, *ouïr*, *entendre* and *comprendre*. In practice none is exclusive: the functions of one will probably merge into another. The four activities were specified by combining the two dualisms of abstract/concrete and objective/subjective. Schaeffer believed these supported all perceptual activity. The former dualism expresses how abstract qualities of sounds such as pitch, spectral content or vibrato can be

identified and what their potential might be as values. Concrete describes the undifferentiated totality of characteristics from which such values are abstracted. Thus, an individual sound object (whether transformed or not) will be heard as a summation of its concrete aspects and might even indicate a particular source. Reduced listening will omit such speculation in preference to an assessment of those features which have the greatest potential to emerge as musical values. The objective/subjective dualism refers specifically to the nature of perception itself. Objective indicates the process of directing perception towards the sounds as objects in their own right whereas the term subjective implies that the activity of perception is scrutinised. For example, the verb *ouïr* is regarded as concrete-subjective and a basic, almost crude mode of listening. No attempt is made to actively discriminate between any constituent features of the sound and no substantial process of interaction is engaged by the subject beyond an awareness of a sound as a totality. By contrast, *comprendre* is described as abstract-objective and initiates a more sophisticated process. The listener is less introspective and intentionally engages with specific characteristics, searching for the manner by which meaning is created within a system or musical language.

##### 5 The "en-soi" of sounds

Schaeffer's dilemma regarding the necessity and status of the "source" can be detected in his writings. Even at the earliest stages of *musique concrète's* development he aspired to an idealistic notion of "pure" or "absolute" sound. The term "concrète" in *musique concrète* was never meant to indicate a dogmatic adherence to compositions based on recognisable sound objects (a distinction which Schaeffer repeatedly clarified). It simply identified the repository of "raw" material derived from recordings of any sound source in order to discover common, abstract features. For example, in his diaries Schaeffer recounts the effects of manipulating a recording of a train. With the relatively crude resources available to him the sound continued to refer obstinately to its source. On May 10th 1948 Schaeffer refers to the "rhythm"

achieved by a series of juxtaposed sound objects with different spectral characteristics. He wrote: "Il se crée ainsi une sorte d'identité et sa répétition fait oublier qu'il s'agit d'un train." (It creates for itself a kind of identity and its repetition makes one forget that it is actually a train.) (Schaeffer, 1952: 21). The repetition nullified the source and permitted, indeed actively encouraged, Schaeffer to perceive a musical structure, however rudimentary, emerging from the interplay of durations and spectral behaviours. He continued by summarising a problem that still occupies many musicians in electroacoustic music: "Tout phénomène sonore peut donc être pris, (tout comme les mots du langage) pour sa signification relative, ou pour sa substance propre. Tant que prédomine la signification, et qu'on joue sur elle, il y a littérature et non musique. Mais comment est-il possible d'oublier la signification, d'isoler l'en-soi du phénomène sonore?" (Every sound phenomenon could, therefore, be taken (like words of a language) for its relative meaning or for its inherent substance. As long as meaning is predominant and one plays on it, it is literature and not music. But how is it possible to lose meaning, to isolate the 'in itself' from the sound phenomenon?) (Schaeffer, 1952: 21). Thus Schaeffer's intention was not to produce music which capitalised on the recognition of sources - though he acknowledged the poetic nature of such music and even exploited these relationships himself in works such as the "Symphonie pour un homme seul" which was a collaboration with Pierre Henry. He wanted to transcend identification of specific, concrete sources in an attempt to establish the abstract bases, the "en-soi" of sounds. In this way he intended to discover the generalised foundations of music and "(...) de poursuivre la recherche musicale à partir du concret, certes, mais tout entière vouée à la reconquête de l'indispensable abstrait musical." ((...) the pursuit of musical research from the concrete but always wholly dedicated to the reclaiming of the indispensable musical abstract.) (Schaeffer, 1966: 24). Thus, though the acousmatic situation encourages the listener to disregard the source during the exploratory stages of sound objects it simultaneously promotes the reemergence of a virtual common source or *pseudoinstrument* once values are identified and composition begins. This fluctuation in the source's importance has been

expressed succinctly by Chion in a subsection on the instrument where he proposes the heading: "L'instrument trouvé, perdu et retrouvé" (The instrument, found, lost and found again.) (Chion, 1983: 54). Consequently, despite their physical absence in the electroacoustic studio the notions of source and its more specific counterpart the "instrument" remain valid, even essential concepts.

## 6 The instrument as source - the abstract from the concrete

The instrumental "model", Schaeffer came to believe, has a "primordial role" (rôle primordial) in all traditional music (Schaeffer, 1966: 243) . In fact, the disappearance of the notion of the instrument concerned him: "Plus inquiétante encore était la disparition éventuelle de la notion d'instrument." (Still more disturbing was the possible disappearance of the notion of the instrument.) (Schaeffer, 1966: 19). It was this understandable tenacity to retain at least the vestiges of an actual source which led to the development of "generalised" instruments. One such device was the phonogène which replayed a recorded sound at various speeds. The intention was to create the impression of a related group of sound objects by the application of a systematic process of acceleration or deceleration on one sound. However, transposing a sound in the pitch field shifts each component frequency in the same manner. Schaeffer realised from his studies of recorded instrumental sounds that a truly unified family of sounds, each member of which is perceived to originate from the same source, results from a delicate but perceptible interplay between the individual characteristics. This cannot be reproduced by simply shifting the sound object up or down in the pitch field. Timbral homogeneity, developed by instrument makers, results from educated listening and is in part a perceptual artifice. According to Schaeffer, each sound from an instrument has its own "timbre" (if timbre is defined as revealing a causal origin). A single sound object cannot be regarded as representing the totality of an instrument's timbre. This results from a consideration of several sound objects and must take into account "laws of compensation" to encourage the perception of a unified

instrumental timbre. Thus, increasing the playback speed of a recording of notes in the low register of the piano will never produce an accurate impression of notes in the high register. Although the phonogène was successfully employed by several composers as a basic transformation device it invariably drew attention to its own technical procedure rather than promoting common features between sounds. The same criticism is often true of devices such as samplers and filters - the listener frequently hears the process of sampling or filtering rather than a related sound family. Thus, instrumental unity cannot be guaranteed by the consistent application of a technical procedure.

Confirmation of Schaeffer's belief in the importance of instrumental notions is demonstrated by the first two chapters of the *Traité des Objets Musicaux*. In these chapters - *Le Préalable Instrumental* and *Jouer d'un Instrument* - he carefully scrutinised the manner in which instrumental sources function. All sound sources, naturally, embody the abstract/concrete dualism by producing sounds with a greater or lesser number of constituent elements. However, the emergence of values is not immediately apparent as it is only by comparison with other sound objects, either from the same source or others, that common values can be abstracted. But instruments are specific types of sources and consequently display explicit manifestations of the dualism. It is precisely the function of an instrument to produce variations in several features whilst retaining a perceptibly homogeneous "timbre", and such variations are a basic requirement for a value. This fundamental fact is expressed by the Schaefferian concept of "permanence of characteristics/variations of values" (*permanence des caractères/variations des valeurs*) (or PCV2). For example, discrete pitches and durations, the most important values in traditional Western music, result in languages based on pitch and rhythm precisely because the variations of these values can be perceived against the unchanging, permanent characteristics which constitute the instrumental "timbre". As a prerequisite, instruments require registers (registres), which are defined as areas of the perceptual fields of pitch, dynamics and durations in which values can vary. A piano, for example, has a pitch register accessible whenever the keys are

depressed and the hammer strikes the strings. In addition, it has registers of durations and dynamic levels. These registers are connected: a note of low dynamic level will of necessity be short in duration. A single cymbal, however, has a dynamic register but no pitch register - this can only be simulated by assembling a collection of cymbals varying in size. Furthermore, instruments should ideally display a capacity for *jeu* or play. *Jeu* expresses the instrument's potential for shaping the sound's dynamic and spectral evolutions. To illustrate these notions consider the following: a Bach fugue played on the piano exhibits the most obvious abstract relationships between the pitches and durations. These are values and remain the same if the work is played on a different instrument with comparable registers. Only the instrumental "timbre" will change. However, if the fugue is orchestrated such that few pitches in sequence are played by the same instrument (as in Webern's orchestration of Bach's *Ricercata* from the *Musical Offering*) the shifting instrumental colours could cause a rebalance of background and foreground. Arguably, in works where the pitches remain relatively stable the balance could tip entirely in favour of perceiving changing timbre against a background of unchanging pitch. At such points traditional roles are reversed and instrumental colour becomes a value while pitch assumes the role of characteristic - Klangfarbenmelodie is achieved. However, Schaeffer correctly asserted that music does not communicate solely by values, the roles of characteristics should not be overlooked. An accomplished instrumentalist will pay scrupulous attention to aspects of sound which are not values per se. It is the quality and articulation of each note - concrete characteristics and aspects of *jeu* - which are intrinsically "expressive" and contribute to a satisfying aesthetic experience. Thus, abstract and concrete exist in a carefully balanced equilibrium and neither performers nor composers of acousmatic music can ignore this intimate connection

Schaeffer illustrated the problems encountered by placing too much emphasis on either the abstract values or concrete characteristics by citing differences between the initial stages of *musique concrète* and *elektronische Musik*. He

asserted that composers of musique concrète tended to produce sound objects that displayed many characteristics interacting in inherently interesting ways. But the shaping of dynamic form and spectral development are aspects of jeu and were often unsuited to the kind of variation within registers required to produce values. Each sound object, though interesting in itself, could not be related by common values to other sound objects and a musical discourse was unlikely. By contrast, early electronic works resulted from painstaking care in exploiting individual registers. By means of synthesis, composers could vary parameters independently thus liberating sounds from the aforementioned connection between a note of low dynamic level and its duration. However, this extension of serial thought emphasised the abstract relationships of the values at the expense of the qualities of jeu. With considerable humour Schaeffer summarised the situation: "Nous travaillions alors, les uns à construire des robots, les autres à disséquer des cadavres. La musique vivante était ailleurs, et ne devait se donner qu'à ceux qui allaient savoir s'évader de ces modèles simplistes." (We worked then, some of us constructing robots, the others dissecting corpses. Living music was elsewhere and only revealed itself to those who knew how to escape from these simplistic models.) (Schaeffer, 1966: 61)

## 7 Programme de la Recherche Musicale (PROGREMU)

The materials, construction and playing techniques of physical sound sources provide a given framework for classifying and describing the resulting sounds. It is by such criteria that many traditional systems of instrumental classification have been formulated. The same is not true of recorded sounds listened to under acousmatic conditions. These must be organised according to intrinsic characteristics. In order to approach a systematic classification of this potentially vast sound universe Schaeffer developed a five part programme known as the *Programme de la Recherche Musicale* or PROGREMU. The first two stages - typology and morphology - classify and describe sound objects respectively. But composition is the ultimate goal and taxonomy, however

detailed, is insufficient in isolation. Methods by which sound objects can be subsequently related, arranged and created must also be provided. The remaining three stages of PROGEMU - characterology, analysis and synthesis - were proposed for these purposes. Space unfortunately precludes a full investigation of this programme. However, even a brief examination reveals Schaeffer's consistent strategy of retaining and assimilating notions derived from real sources and instruments as an integral part of a theoretical framework derived from electroacoustic practice. Thus, the source in Schaefferian theory continues to inform the activities of composition as well as pre-compositional preparation.

## 8 Typology

The three principal groups of typological classification are: balanced, redundant and eccentric sounds, comprising about fifty types in total. Special cases of these types are included in an additional typology of varying sounds. Balanced sounds are the most explicitly "instrumental" as they display clearly defined dynamic evolutions and are of medium duration (though the impulse is included). They occupy a central position in the diagram *Tableau Récapitulatif de la Typologie* or TARTYP (Schaeffer, 1966: 459). Indeed, instrumental examples of each type were provided in the recordings accompanying the *Solfège des Objets Sonores*. Balanced sounds display the greatest potential for forming structures according to the relationship PCV2. To arrive at Schaeffer's nine balanced sounds three types of mass (definite, complex or varying) are combined with three types of *entretien*. Mass is defined as a generalised notion of pitch and *entretien* expresses how a sound's energy is initiated and maintained throughout its duration. There are three possibilities for *entretien*: energy produced as a short impulse, a longer and continuous evolution or a series of repeated bursts. There is, therefore, a clear implication of the behaviour of actual sound sources even though for the electroacoustic composer the sound objects are invariably entirely artificial. Moreover, *entretien* is connected with another Schaefferian notion: *facture*. *Facture* is a qualitative

term and confers a particular status on certain sound objects. A sound object has no facture if it is excessively long or too complex in its spectral constitution. Thus sound objects most closely resembling those from real sources, such as balanced sounds, are the most likely to have facture. Note that the notion of *entretien* still applies to redundant and eccentric sound objects which are much longer in duration; all sound energy is maintained in some manner (albeit briefly in the case of impulses). But, crucially, they do not have facture. Though the function of typology is classification, it acknowledges the likely role in compositions of sound objects analogous to those from real sources. The emergence of values is more probable between discrete, well-formed balanced sounds. However, no sound object is rejected and many electroacoustic compositions make use of long, complex sounds. Eccentric and redundant types will participate in a different kind of musical language - called "plastic" by Schaeffer. In such musics the listener will be encouraged to concentrate on spectral and dynamic development and it is likely that "instrumental" structures are replaced by more basic aspects of sound such as energy flow and motion. Thus the term *pseudo-source* might be applied in preference to *pseudo-instrument*.

## 9 Morphology

After classification by typology (and Schaeffer acknowledged that, due to context, classification might need to be modified) more precise description is provided by morphology. The number of morphological criteria was deliberately restricted to seven in number though many more are theoretically possible. These criteria are: mass, harmonic timbre, grain, dynamic, allure, melodic profile and mass profile. (The last two apply to sound objects which move in the pitch-field.) Significantly, criteria such as allure and grain refer explicitly to a listener's recognition of extra-musical experiences. Individual types of allure are designated as "mechanical" if they are extremely regular or "living" if slight fluctuations are perceived. Such descriptions imply actions performed by real executants. Likewise, grain evokes textures of real surfaces detectable both

visually and by means of touch.

## 10 Characterology

The third stage of PROGEMU reveals the purpose behind these processes of categorisation and description. Characterology facilitates the grouping of sound objects on the basis of common characteristics, as if they had originated from the same source. After typology and morphology the stage of characterology indicates a return to composition properly speaking. A composer, having classified and described sound objects, can begin to select and assemble them in families or "genres". To belong to a genre, sound objects must, naturally, display common characteristics. It is these common characteristics which will encourage the perception of values between the genre's individual members. Since the acousmatic composer can choose which aspects will function as values or characteristics, genres are not source-specific: they are perceptual constructs. It follows, therefore, that the imaginary causal origin of a genre will be a "virtual" source or a Schaefferian pseudo-instrument.

The use of the term pseudo-instrument rather than pseudo-source is significant. The pseudo-instrument implies a correspondence with the elaborated instrumental model proposed by Schaeffer. Traditional instruments are noteworthy for their embodiment of permanence of characteristics and variations of values (see section 6). In the case of the pseudo-instrument, the permanence of characteristics will be represented by the homogeneity of the genre. According to Chion: "Le *genre* remplacerait alors le *timbre* des instruments." (The *genre* will therefore replace the *timbre* of instruments.) (Chion, 1983: 104). However, the perceptual, cognitive processes involved in grouping sound objects on the basis of their immanent features must be acknowledged. Musicians develop these strategies by listening to sounds from real instruments which must, naturally, conform to the behaviours of physical systems. During an instrumental performance, notes will be played at various dynamic levels, pitch registers and with different articulations. Nevertheless, the listener is able - usually quite unconsciously and automatically - to

assimilate the delicate interdependence of the characteristics into a unified, consistent "timbre". Similarly, when creating a pseudo-instrumental genre, the acousmatic composer must be scrupulous in choosing and modifying (if necessary) each sound object. Any discrepancy might disrupt the genre's homogeneity and prevent the perception of values. It must be emphasised that taking account of the interdependence of characteristics inherent in real systems need not lead to naive imitation. As pseudo-instruments are not restricted to physical causality the composer is in the position to choose how the value/characteristic relationship will be established and even whether it might change during the course of the composition. In such acts of virtual "orchestration" there is the potential for networks of new relationships as genres are contrasted or merged.

Many examples of creating and mediating between genres are evident in Karlheinz Stockhausen's *Kontakte für elektronische Klänge, Klavier und Schlagzeug*. For example, a group of metallic, pitched notes occurs in subsection IC at 39.3 seconds. On inspecting the score three actual sources are revealed: the high register of the piano, antique cymbals and resonated electronic impulses. Slight differences in dynamic behaviours suggest a play of articulation within the genre which does not undermine its essential unity. (I am not suggesting that Stockhausen was consciously adopting Schaefferian principles; *Kontakte* was composed in 1961 and could, therefore, be described as a typomorphological work *avant la lettre*.) Sound objects from these three distinct sources combine to produce the impression of a "metallic percussion-resonance" genre and thus a pseudo-instrumental source. As a result, by means of the sounds' intrinsic qualities the worlds of real instruments and electronic synthesis make contact. The creation of such contacts is, of course, the composer's intention throughout this classic work.

## 11 Analysis and Synthesis

The final stages of PROGEMU are analysis and synthesis. If the composer wants to create structures based on the variation of values it is necessary to

arrange them in "scales" analogous to those of pitch. This is the function of analysis. For example, in order to create a variation of grain, sound objects displaying grain would be graded from very rough to smooth. A play of grain might then be manifested in a variety of ways such as progressing in discontinuous steps from smooth to rough or changing abruptly between extremely differentiated textures eventually stabilising on a medium degree of grain. For such structures the composer must identify any excessive gaps between the steps of a grain "scale" which could impede the chosen directed progression and, therefore, which steps might need to be synthesised. (Note, furthermore, the difference between Schaefferian synthesis and "ab initio" synthesis from basic sound elements such as sine-tones or filtered impulses.) Thus, despite the brevity of this summary, it is evident that instrumental concepts pervade each stage of PROGEMU.

## 12 Elaborations of Schaefferian Thought

Schaeffer acknowledged with admirable honesty (though perhaps excessive self-deprecation) that the *Traité des Objets Musicaux* had only partially completed the task he had envisaged. For a more comprehensive understanding and realisation of his theories a substantial body of musical works was required; theory and practice can then develop as a collaborative process. Although many early composers were prolific it is only now, after fifty years, that a suitably large repertoire exists.

Before examining Denis Smalley's assimilation and expansion of Schaefferian thought it will be helpful to summarise the adoption of Schaeffer's theories by electroacoustic composers in general. My deliberate emphasis in the present article has been to investigate the consequences of the acousmatic situation, PROGEMU and "instrumental" concepts. These are, in my opinion, still neglected by many commentators on electroacoustic music. However, the ramifications of Schaefferian theory can be detected in a wide diversity of musical languages. This general relevance is hardly surprising: Schaeffer's theories developed over many years and were frequently modified according to

his continuing researches and developing studio technology. Indeed, the evolution of Schaeffer's research groups is revealing: the Studio d'Essai was renamed the Club d'Essai in 1948. The purpose built studio stems from 1951 and was called the Groupe de Musique Concrète, Club d'Essai and this, in 1958, became the Groupe de Recherches Musicales. The Groupe de Recherches Musicales itself eventually became part of the Institut National Audiovisuel (a relationship that continues to the present day). It is, therefore, inconceivable that with such a long history and the involvement of so many different composers, Schaeffer's theories would be applicable only to a narrow range of musical concerns. They are relevant to many musical languages with vocabularies ranging from "real-world" sounds to the most abstract, unfamiliar sound objects created from transformed sounds or synthesis. In addition, consistent with Schaeffer's inclination for establishing interdisciplinary connections, his expanded concept of the "instrument" can also clarify the practices of sound installation, sound sculpture and performances with custom-built devices and interfaces. A number of defining traits, therefore, can be identified in Schaefferian thought which have been promoted explicitly and implicitly both by composers associated with the Groupe de Recherches Musicales and those with no formal connection to the organisation. These include "primacy to the ear", a distrust of technology for its own sake, the development of theory from practice, the creation of libraries of categorised sounds and "playing" with sound objects to encourage the emergence of musical discourse. Such attitudes do not, therefore, imply the formation of a "school" of composers with rigid adherence to a dogmatic body of theory and practice. On the contrary, composers and analysts from many backgrounds can use Schaefferian concepts to think intelligently and rigorously about sound and music.

There are, therefore, many composers who have developed their own approaches to composition within what can be described as a broadly Schaefferian ethos. A number have been active since the early days of Schaeffer's researches. One such figure is Pierre Henry who eventually left the

group to form his own studio. His collaborations with Schaeffer such as the "Symphonie pour un homme seul" (1950) and "Orphée '53" (1953) indicate a number of common concerns with sounds and language which, nevertheless, could not prevent Henry's ultimate decision to pursue his own interests. As an independent composer, he has produced many works in a variety of genres such as music for dance, film and even collaborations with rock musicians. Many of his compositions use material from an extensive collection of real-world sounds recorded over several decades. Furthermore, his continued adherence to analogue, rather than digital, technology ensures Henry's compositional techniques remain remarkably consistent with those of early musique concrète practitioners. There can be no doubt that Pierre Henry's individual approach and extensive oeuvre requires a detailed evaluation in any survey of contemporary electroacoustic music. Other members of Schaeffer's early research group included André Hodeïr, Pierre Boulez, Olivier Messiaen, Iannis Xenakis and Michel Philippot (though neither Boulez nor Messiaen retained close links). These were later joined by other composers including François-Bernard Mâche, Luc Ferrari, Bernard Parmegiani, Guy Reibel, Michel Chion, Ivo Malec, François Delalande and François Bayle. Unlike, Pierre Henry, these composers apparently felt able to work within the organisation without compromising their individual musical languages. For example, amongst Luc Ferrari's most celebrated works are those which explore the poetic qualities of the everyday sound-world. The sounds in compositions such as "Presque Rien No.1" (1970) and "Music Promenade" (1969) are clearly recognisable but by careful editing, juxtaposition and mixing, small scale narratives are created which can be both witty and occasionally unnerving. In these works Ferrari does not intend to exploit the abstractions promoted by PROGREMU. Nevertheless, they are clearly related to the vocabulary of certain early musique concrète compositions. By contrast, in "De Natura Sonorum" (1975) and "Dedans-Dehors" (1977) Bernard Parmegiani combines sounds from both electronic and concrete origins to create structures exploiting and extending the gestures and behaviours of real-world sounds. Similarly, François Bayle conforms to the Schaefferian practices of recording sounds and

subsequently abstracting concrete features to develop a distinct musical discourse. For example, in "Jeïta" (1970) recordings of water sounds from caves in the Lebanon are treated in an abstract manner reminiscent of Schaefferian methodology. Moreover, Bayle has even reworked this material for two additional compositions in 1985.

While Schaeffer's theories are firmly rooted in French culture and intellectual history they have been successfully exported to other countries (the principal English-speaking contribution is outlined below). However, it must be conceded that without lack access to French texts a more profound understanding of Schaeffer is severely inhibited. Several noteworthy composers who are active beyond Europe acknowledge their debt to Schaeffer. French-born Francis Dhomont now lives in Canada. When he started experimenting with tape recorders in 1947 he had no knowledge of Schaeffer's work. Later, he attended courses at the Groupe de Recherches Musicales and discovered common preoccupations. Dhomont is convinced of Schaeffer's status and has described Schaeffer as a "modern-day Philippe de Vitry" (at a lecture given at City University, London in February, 2000). This comment might appear wilfully obscure until the parallels between the two musicians - separated though they are by some seven centuries - are investigated. Philippe de Vitry was one of the leading intellectuals of his age whose expertise included not only music but also poetry. Schaeffer's own activities as a writer are well documented. In addition, both men were not only composers but theorists. In an affectionate homage to Schaeffer, Francis Dhomont has even inserted several "quotations" from Schaeffer's early studies in his composition "Novars" (1989).

### 13 The Researches of Denis Smalley

During his career as composer and academic Denis Smalley has elaborated many Schaefferian concepts. He claims, for example, that "gesture, sources and causes" (Smalley, 1997: 109) continue to be important concepts in electroacoustic music. The terms "sources" and "causes" reveal Schaefferian preoccupations while "gesture" indicates an extension of these notions and

explores the communicative aspect of the initiation of sound energy by physical means. Consequently, Smalley corroborates rationally and consistently Schaeffer's belief in aural primacy. Furthermore, for musicians with little knowledge of French his writings provide an invaluable insight into a rich intellectual field in which English translations are conspicuous by their absence. Amongst the many topics that could be considered the following are particularly noteworthy: spectromorphology, gesture and surrogacy, indicative fields and networks.

Spectromorphology is defined as: "the interaction between sound spectra and the ways they change and are shaped through time" (Smalley, 1997: 107). Spectromorphology emphasises the benefits for the composer in classifying and describing the varieties of ways in which spectral energy can be shaped and how this supports the listening processes as the mind searches for meaningful musical structures. However, Smalley does not attempt to replace the taxonomy of Schaefferian typology. Instead he suggests the notion of spectral typology, how this forms basic sound shapes and what potential these sound objects might have in creating structures exhibiting directional tendencies. A principal concern, therefore, is with processes of growth and motion. Spectral types will determine to what degree a source - real or imaginary - is evoked. As part of his explanation of morphology Smalley uses instrumental "notes" to exemplify sound objects whose intrinsic characteristics refer to the physical gestures and actions executed by agents on sound bodies. The notion of *gesture* thus assumes a position of considerable importance. Smalley suggests a natural tendency for the listener to relate sounds to possible causes or "source bonding". Furthermore, if gesture can lead to a spectral type by means of a source and cause, it follows that the reverse can be a legitimate process and sound objects can suggest possible causal origins. Accordingly, gesture leads to four types of *surrogacy*. For example, first-order surrogacy refers to sound objects displaying basic, elemental gestures which a composer might investigate as potential material. First-order surrogacy can only be conferred if the gestural qualities are explicitly recognisable such as a

crackling fire or bubbling water. If such sounds are transformed such that only imagined gestures are perceptible, higher levels of surrogacy are invoked. The stage furthest from first-order surrogacy is remote surrogacy where the sound object has only the weakest connection with recognisable gestural actions of human executants or natural phenomena.

Due to the forward movement intrinsic to spectromorphological change, gesture also implies motion. However, if a sound object develops too slowly facture is absent and the listener will tend to concentrate on the inner details - the texture - as the sound's initial phase of energy input recedes in the memory. Thus music can be either gesture- or texture-carried (or both). By means of these concepts Smalley suggests structural levels and functions of such sound objects. Arguably these notions could only be developed by a composer: theoreticians and analysts usually have little experience in verifying and supplementing these results according to the experiences of audiences.

Although the preceding remarks cannot do justice to Denis Smalley's extensive reflections on electroacoustic music, topics such as source, cause and gesture indicate a concern for the listening process. Smalley examined the four Schaefferian listening modes and how they interact. By elaborating psychological concepts of Ernest Schachtel, Smalley clarifies the nature of subject- or object-centred approaches according to autocentricity and allocentricity. These in turn lead to indicative fields and their networks. Such empirically investigated indicative relationships embrace extra-musical associations. As a result, the listener has recourse to communal and personal experiences as part of the process of appreciating the musical discourse.

### Conclusions

Schaeffer's researches are characterised by innovation supported by an essentially humanistic outlook. He attempted to understand how humans make and perceive music as a social activity and the extent to which this is mediated by modern technology. His constant preoccupation is the pedagogy of studio

practice thus confirming his belief that *homo faber* precedes *homo sapiens*. Explicit references to notions of source and instrument can be problematic for many who advocate a belief in "absolute" music and who regard such issues as a retreat into a naive form of mimesis. This is a fundamentally mistaken viewpoint. Schaeffer created a sophisticated theoretical framework whose elaborations are applicable to many areas of music. Both analysis and the composition of instrumental and vocal music can benefit from his taxonomic system. Nevertheless, there is little doubt that electroacoustic music is the genre to which his theories are most suited. Consequently, I believe that all musicians working in the electroacoustic medium would profit from a study of Schaefferian concepts. Such concepts stem, naturally, from the techniques of the early analogue studios. In these conditions contact with tape and the manner in which manipulations were achieved by equipment encouraged a sense of "craft" and the physicality of sound transformation. Today, these practices have been largely superseded by virtual substitutes on a computer monitor's screen. Such advances are inevitable and desirable - who would willingly abandon the accuracy and ease of digital editing, for example? However, for the composer such technology can also create a feeling of remoteness, a sense of distance from the actual processes of making. For this reason, the intelligent adoption of the Schaefferian programme's listening skills is needed more than ever. As a result, musicians using digital technology are in a position to inherit and extend a sophisticated framework from the very origins of electroacoustic music.

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