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Musique Acousmatique and Imaginary Spaces

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Due to technical developments in computer-based sound editing, the inclusion of imaginary spaces in electroacoustic music has been possible for quite some time. Imaginary spaces are those that are not perceivable in reality. These spaces arise when one alters the acoustic features or spatial indicators of the space so much that its space impression seems unrealistic or imaginary. In the formation of imaginary spaces, and even in the stimulation of the listener's imagination, electroacoustic music provides a degree of control that is superior to instrumental music. Electroacoustic music is thus suitable in many contexts — for instance, virtual reality computer games and film. Electroacoustic music also provides composers with flexibility in the formation of abstract ideas and the development of new musical languages based on sound metamorphosis. Such an art enables sounds — with unknown tone colours, unrealistic space impressions, and abstract contexts — to detach listeners from the real world and intensely activate the imagination. Although the use of imaginary spaces (or a combination of imaginary and real spaces in an abstract musical context) is nowadays common in all composed music, musique acousmatique identifies itself particularly with such a musical language. It is hence a music that serves subjective stimulation through sound metamorphosis in a narrative context. This paper tries to explore the role and importance of spatialization in the music of musique acousmatique composers and throws light on many theories and discussions around the topic.

Musique acousmatique and Musique concrète

The year 1948 marked a turning point in the history of music. The musical ideas of Pierre Schaeffer and Pierre Henry opened the door to a new world that would engage a multitude of composers for the next 60 years. The most important achievement of the so-called musique concrète composers was not the discovery of concrète sounds, which had already been known since the work of the futurists, but primarily a discovery of the musical potentiality of these sounds. Composers were able to observe how complex natural noises could morph in form by means of new technology. Rudolf Frisius summarizes the contributions of musique concrète in four points (Schäfer 1994, 15–16):

1. the discovery of noise, its technical storage and transformation possibilities;
2. the re-organization of sound space and the discovery of new compositional dimensions;
3. the re-definition of instruments in light of new technical possibilities; and
4. the re-definition of those components which pave the road for music in radio plays and audio films on one hand, and multimedia combinations of the audible and the visible on the other hand.

Apart from these contributions, it should also be emphasized that the relationship between compositional object and subject was defined anew with musique concrète. Christian Calon points out the similarities between working methods in electroacoustic music and film production, and on the other hand emphasizes the differences between a musical composition and a work of literature or a painting (Calon 1993, 38). Karl Mikael Karlsson compares Francis Dhomont with Andrei Tarkovsky and Luchino Visconti. (**1** <#1>) A similar point of view

1. In an interview with the author at EMS, Stockholm in Summer 1997.

can be found in Marvin Minsky, who says: "I will try to explain… that hearing music is like viewing scenery and… when we hear good music our minds react in very much the same way they do when we see things" (Minsky 1989, 647). Although musique concrète marks an important transition from subjective to objective conditions in the music of the 20th century, its most important successor — musique acousmatique — demonstrates the extent to which subjectivity plays a decisive role, if not in composition, then most definitely in the listener, as he or she engages in the design and decoding of a mysterious musical language. In this respect it can be understood why after 40 years François Bayle claimed that in the GRM, musique concrète had always been *composed*. At the same time, it should be admitted that the term *musique acousmatique* (which was coined by Bayle in 1974) was not just a renaming of an existing music concept. It also referred to a new phase of development of this music, characterized by an extension of the potential of sound and the introduction of dimension and new listening situations:

> Extension du domaine instrumental, le potentiel électroacoustique fournit de nouvelles sources, de nouveaux modes d'énergie, de jeu, de gestes. Extension du champ perceptif, le registre acousmatique substitue à la fixité des sources la logique des images, auditives ou mentales. [**2** <#2>] (Bayle 1988, 17)

2. As an extension of the instrumental domain, the electroacoustic potential provides new sources, new types of energy, of performance, of gestures. As an extension of the realm of perception, the acousmatic *register* substitutes the immutability of the source with the logic of auditory and mental images.

Musique acousmatique can be distinguished from musique concrète with respect to two important points: first, while musique concrète is seen mostly in connection with Paris and influential names such as Pierre Schaeffer and Pierre Henry, musique acousmatique looks outwards and engages many composers from America, Australia, and several European countries. Musique acousmatique establishes its own directions, among which British and Canadian contributions are particularly noteworthy. Second, while in musique concrète "the sound itself" and sound synthesis carry considerable weight, the main elements of musique acousmatique relate to the function of morphological deformations of sound. Thereby auditory information can be understood as converting into visual forms; for example, Robert Normandeau called musique acousmatique *cinema pour l'oreille* [cinema for the ears]. By these means, a type of music has emerged that has become detached from the real world and its visual phenomena in order to build an independent virtual world of imagination. Something is heard in it that is reminiscent of something else. Ligeti says: "Music is not only itself, but the imagination of something else" (Ligeti 1974, 7), a statement that applies to musique acousmatique in a very powerful way.

Musique acousmatique and the Visual Arts

Music behaves differently if it stands alone as opposed to arising in combination with other art forms. The combination of music and other performing arts is important here. Visual perception is more primary in our lives than aural perception, and it strongly influences the latter. Many authors have called the human being an "eye creature". Regarding space and spatial perception, visual influence is particularly critical. Gary Kendall emphasizes this influence, but understands visual and auditory phenomena as complementary to each other: "there is no area in which the visual and auditory systems would seem more complementary than in spatial perception" (Kendall 1991, 72). Henry Brant has also engaged with the issue in the context of musical instruments, but he maintains that visual factors in the performance of music are unnecessary and very disturbing (Brant 1967, 241–42). It is not difficult to come upon concepts or terms, even in technical literature, that point to the power that vision holds over our perception. For example, the term "visual capture" describes visual dominance over spatial localization. Begault offers another relevant example: "… although a loudspeaker may be displayed from the actual location of a visual image on a television or movie screen, we can easily imagine the sound as coming from an actor's mouth or from a passing car" (Begault 1994, 15). This is also noticeable in the performance of electroacoustic music when frontal visual attractions affect the perception of sounds originating from behind. Stockhausen found visual elements in a concert situation disturbing, especially with respect to the perception of distance.

> While listening, the impression of distance plays an important role for vision; and as in enclosed areas for practical reasons, the list of the instruments or speakers prepared at different distances always pose a great difficulty, sound distance remains as variable property even more limited than it is already brought by nature; that's why one would hear such music in dark areas, in which the sound distance has an important function. (Stockhausen 1963, 167)

Another example marking the priority of visual perception takes form in the term *Ventriloquism Effect* (Begault 1994, 84), which holds that when visual and aural perceptions do not match each other, the spatial perception of visual factors will dominate. It is not by chance that attendees at performances of musique acousmatique prefer a dark atmosphere with visual influences reduced to a minimum. For example, the concert series Rien à Voir (held annually in Montréal from 1996–2004) emphasized this type of restrictive setting, where the absence of visual representation is even reflected in the title of the series, "nothing to see". (**3** <#3>) In an effort to create an imaginative sound environment, musique acousmatique attempts to break from the visual world at the outset. The equation of the terms *musique acousmatique*, *musique de son fixés*, and *pure loudspeaker music* — in which the audience loses contact with the real in various ways — generalizes the concept of this music as a domain where content will quite consciously be avoided and listeners are to rely only on the absence of contact. Denis Smalley writes: "at its simplest, the adjective *acousmatic* may be applied to the process of apprehending any sounds whose source is invisible" (Smalley 1991, 21). In this sense we could understand a Beethoven symphony projected over loudspeakers to be just as acousmatic as a composition by Francis Dhomont.

3. The term is a *double-entendre* in French, also meaning that one thing has "nothing to do with" another, e.g. *Cela n'a rien à voir avec…*

The Role of Imagination

The role of subjectivity as an important component in musique acousmatique has already been mentioned. Francis Dhomont departs directly from this subjectivity and defines acousmatic art as follows: "Acousmatic art is the art of mental representations triggered by sound" (Dhomont 1995, 50). Musique acousmatique describes not only a hearing situation in which the original sound sources remain invisible, but also a music style that began in the 1970s after overcoming the initial theoretical and technical problems marked by the discoveries of musique concrète. The starting point in the definition of musique acousmatique as a style is the breadth of expression possibilities by means of which sound morphology — or as Smalley calls it, *spectromorphology* — can provide a wide spectrum of abstract and real sound atmospheres. Two inherent qualities of sound — i.e., the power of raising dual associations and the anchoring of a sound in reality — have inspired different musical concepts. Musique acousmatique is a good example of the application of defamiliarized sounds in order to provide a virtual sound atmosphere in which "the listener's aural imagination can be drawn into personal, psychological realms quite different from other musics" (Smalley 1991, 21). The idea is based on human capabilities that interpret unreal sound structures arbitrarily and connect real and virtual worlds.

> When the source cannot be identified with certainty or is ambiguous, there is a strong tendency either consciously or unconsciously to scan one's experience for significance beyond the immediate musical context. (*ibid*.)

But the emergence of a composition has two sides. Indeed, spectromorphology forms only the technical means for the production of music. Reception and perception of the temporal development of the morphological figures are, on the other hand, based on the mental ability of the listener to connect distorted aural images to a corresponding reality.

> The listener proceeds to identify the sound by comparing perception of the present event with the spectromorphologies of past experiences retained in the memory. This reference-bank of correlations between sound and experience enable the listener to synthesize in the imagination a mental *image* of activity or behaviour associated with the perceived spectromorphology. The decoding process is primarily concerned with identification as a result of which human (re)action may be required. (*ibid*.)

So it is about the revival of a reality (not necessarily the original one) in the mind of the listener, based on sound material that once existed but has lost its identity. Patrick Ascione describes this process as the presentation of an illusion, the embodiment of a dream which is marked individually and differently by every composer (Ascione 1998).

Categories of Space

In the acousmatic world of ideas, space has a special position. Dhomont distinguishes between three types of space: *le figuratif*, *le symbolique*, and *l'artificiel* (Dhomont 1988, 37). According to Dhomont, musique concrète is the best example of figurative space, in which the composer is still connected with the main ideas of instrumental music. Musique concrète goes a step further to explore undiscovered areas of instrumental music, and moves gradually away from real space. Dhomont considers figurative space to be real space that (despite different transformations) remains faithful to its anecdotal properties. At the same time, it is distinguished from pure landscape space by mutations — like jumps in the virtual world of sound. Figurative space also marks the beginning of a virtualization concept, which has played a crucial role in the development of musique acousmatique. Figurative space can be recognized in many musique concrète works. (**4** <#4>) With the term *l'espace symbolique*, Dhomont comes closer to musique acousmatique. *L'espace symbolique* not only marks the entrance of musique concrète into a new development phase of Paris-based electroacoustic music, it exceeds the systemic limits that were set for centuries by instrumental music. These spaces are used together with sound metamorphoses to build a virtual world of ideas that is beyond tangible reality and establishes its own criteria. (**5** <#5>) *L'espace artificiel* means simulated space. The realization of such spaces has become possible only in computer-based music. Indeed, one can consider space synthesis or space simulation as one of the indicators of computer-based music. Although computer technology has been an important pre-condition for developing the technical requirements of musique acousmatique, space simulation doesn't find its true place in this music. This is also true for musique concrète, which is conceptually distanced from music based on synthetic sounds. Many examples show that composers of musique acousmatique take advantage of the creative utility of these spaces. Nevertheless, that is not to say that the use of synthetic spaces amounts to a characteristic feature of this music. Dhomont traces the idea of using artificial spaces in electroacoustic music back to psychoacoustics and synæsthesia. In analogy to film, painting and sculpture, two- and three-dimensional movement is introduced in the context of music (*ibid.*, 38–39). Unlike authors who link the categorization of space types with the objective conditions of the listener-sound-projection relationship, there are some who view the variety of spatial possibilities as a result of different subjective experiences of space. In this context, different kinds of psychoacoustic factors come into question, which foregrounds the relationship between audience and performance instrument. Smalley speaks of objective stimulations in an experimental network, and defines the relationship of the listener to the whole as *indicative* (1991, 21).

4. See, for example: Pierre Schaeffer — *L'Etude aux chemins de fer* (1958); Philippe Carson — *Turmac* (1961); Michel Chion — *Requiem* (1973), and *La Tentation de Saint Antoine* (1984); Francis Dhomont — *Signé Dionysos* (1986/89); Jean-Claude Risset — *Sud* (1985); Michel Redolfi — *Desert Tracks (Mojave, Death Valley, Palm Canyon)* (1987/88).

5. See, for example: John Cage — *Imaginary Landscape* (1952); Karlheinz Stockhausen — *Telemusik* (1966); Christian Clozier — *Quasars* (1980); J.F. Minjard — *Peur dans l'escalier* (1986); Francis Dhomont —*Sous le regard d'un soleil noir* (1981), *Citadelle*; Robert Normandeau — *La Chambre blanche* (1986); Annette Vande Gorne — *Noces noires* (1986).

At the same time, François Bayle distinguishes three types of space, and relates the distinguishing criteria to modes of space perception. He speaks of three *espèces d'espaces* that depend on space-time-consciousness. Cognitive hearing and analytical intention could be understood under *présentification*, *identification* and *interprétation* (Bayle 1988, 24). The first mode — or *présentification* — is characterized by a passive hearing state, in which sensorimotor perception of the radiating sound through differentiation in direction and distance leads to an intuitive hearing scenario. The second mode, *identification*, refers to a cognitive listening state, in which the perception of space takes place through a selective and associative space-time awareness. Here, the auditory inputs are manipulated in order to differentiate external reality. *Identification* is different from *présentification* by "*l'Emergence de formes et de schemas causatifs*," which — through focused attention and functional hearing — encourages a state of hearing that aims to identify the external space. *Identification* is made possible by understanding the "*objets, bordures, contours, et de leur identification*," which in turn are determined by an *extérieur local* and *extérieur temporel*. Bayle recalls here the *processus-types* of Piaget, who presented a similar concept in his theory of cognitive development. The third mode is called *interprétation* or *musicalisation*, and unlike *présentification* and *identification*,

6. See, for example: "l'espace-diffus" in *l'Aventure du cri* (1969), "l'espace-intermédiaire" in *l'Epreuve par le son* (1971), "l'espace-scène" in *Le Langage des fleurs* (1970/71), and "l'espace-objet" in *La Preuve par le sens* (1971).

analytic listening is in the foreground (*ibid.*, 25). With *interprétation*, the role of the listener runs counter to that in the first category, in the sense that listeners interact with the space as active perceivers, compose the space according to their own concepts, and affects its configuration via subjectivity. The systematization and theorization of subjective spaces by Bayle is also cited in numerous examples of his work. (**6** <#6>)

Sound Projection Strategies

Although every single electroacoustic work inevitably defines a relationship between the listener and the performance instrument, this relationship points out certain trends for many composers and interpreters of musique acousmatique. It is important to emphasize that the spatial configuration of the sound components in an acousmatic composition plays a decisive role in the design of an acousmatic texture. The liberation of music from the studio and its projection over a loudspeaker system in real space requires other considerations. At the end of his definition of musique acousmatique, Dhomont makes a short mention of this realization phase: "It [the term acousmatique] refers to a theoretical and practical compositional approach, to particular listening and realization conditions, and to sound projection strategies" (Dhomont 1995, 50). Sound projection strategies not only form a bridge between the compositional and performance ideas of this music, but — apart from the strong dependence of their texture on the sound space — they also connect this music to real space in a way that makes space one of the most important components in its makeup. As a result, musique acousmatique is on its way to extrapolating a virtual world in real space; thus, it can be understood as spatial music in the truest sense. Jean-Marc Duchenne compares this music with architecture and writes: "*Comme l'architecture, et beaucoup plus que la musique, l'acousmatique me semble être fondamentalement un art de l'espace*" [**7** <#7>] (Duchenne 1991, 82). Darren Copeland clarifies the term, and unlike most authors, who attribute the definition of musique acousmatique to its sound- or space-metamorphoses (thus referring to limited internal configurations), he moves performance practice aspects directly to the foreground: "…the term can be used more generally in referring to the diffusion of studio-made music through loudspeakers" (Copeland 1995, 52). Apart from compositions that are designed for a certain space, the unpredictability of acoustic features in performance spaces yields many problems that can have a considerable influence on the impression of an audible space. Due to the necessary technical extravagance, there are not many studios that can offer composers a working environment in which the spatial behaviour of composed sounds can be experienced. Thus, since the birth of electroacoustic music, this sound art has had to deal with acoustic compromise and artistic interpretation — or, as it is called, sound diffusion or spatialization. The role of the interpreter, who tries to realize composed sounds in real space, is comparable with the role of the conductor. Both involve much more than technical processing of musical substance. In many countries, the performer of electroacoustic music is not recognized as an artist, but as a technician. However, we must remember that this duty requires a high level of flexibility, a unique temperament, and a great deal of musical skill. So the task of the performer goes far beyond the technical processing of musical substance. The interpreter must allow the spatial potential of the composed space spread and depart from real space in favour of the articulation of both the imaginary and simulated spaces. Marc Favre summarizes the responsibility of the performer in the following three points (Favre 1999):

1. La nuance, comme l'interprète d'œuvres romantiques (trouver la juste intensité relative des phrases musicales, amener judicieusement les crescendi, etc.);
2. L'espace : la mise en plan cinématographique en profondeur (schématiquement gros plan, plan moyen, plan lointain) les changements de plan et les plans de coupes qui font l'articulation de l'œuvre;
3. Le geste : la mise en valeur cinétique des dynamiques et des déplacements d'objets (travelling) par la dextérité à la console, le mouvement bien dosé en fonction de l'esprit de l'œuvre.

   Il faut que ces points soient suffisamment clairs pendant la diffusion pour que l'auditeur ressente une forme, un espace et une cinétique cohérente. (**8** <#8>)

7. As with architecture, and much more so than with music, musique acousmatique seems to me to be fundamentally an art of space.

8. 1) Nuance, as for the interpreter of Romantic works (finding the appropriate intensity relative to the musical phrase, judiciously articulate the crescendi, etc.); 2) Space: establishment of the cinematic framing (close-ups, medium and long shots); 3) Gesture: kinetic enhancement of the dynamics and the displacement of the objects through skills at the console, with the

Although Patrick Ascione believes that "*Rien ne prouve non plus que l'intérêt de l'acousmatique soit de reproduire des espaces et de créer des paysages virtuels, internes aux œuvres, plutôt que de penser ces œuvres pour l'Espace !*" [**9** <#9>] (Ascione 1991, 70), we must admit that most musique acousmatique works are not composed for a specific performance space, nor do they typically require strict acoustic pre-conditions. Because of this ambiguity, the performer plays a crucial role in correcting any undesirable acoustic characteristics of the performance space and bringing about a live space-sound relationship between the audience and performing instrument. In this context, Smalley formulates the relationship between the composed and performance spaces using concepts such as *diffused space* and *spatial consonance / dissonance*. These concepts mirror the non-compliance or conformity of space (Smalley 1991, 121). Dhomont also characterizes the diffusion of musique acousmatique via a comparison to film projection. He highlights the role of the performer, thus pointing to the vitality of music (Dhomont 1988, 17). Normandeau considers the performance of an acousmatic work to be a ritual (**10** <#10>), and writes: "Acousmatic diffusion will come of age as a ritual when its proponents question the relationship of the public to the diffuser, and the public to the loudspeakers" (Normandeau 1988, 32). More specifically, however, Bayle explains how a performer can actually influence the "delivery" of musique acousmatique in a concert situation. He draws attention to the sculptural qualities of sound, and sees space as *paysage morphogénétique* — that is, as a figure engendering a landscape that in turn characterizes itself by external contours, density, impact, volume, movement and speed (Bayle 1988 and 1999).

movement in proper proportion to the spirit of the work. These three points must remain sufficiently clear during the diffusion in order for the listener to perceive form, space and a coherent cinematography.

9. Nothing at all proves that the interest of acousmatic composition is to reproduce spaces and to create virtual landscapes as content of the works, as opposed to thinking about such works in terms of Space!

10. Mauricio Kagel has compared the concert with a ritual as well.

Stereophony vs. Multi-Channel Projection

When it comes to electroacoustic music in general, we can say without doubt that stereophony has been a key technical innovation. Stereophony has a longer history than multiphony, but it is also accessible, inexpensive, and requires very little physical space. The idea of stereophony dates back to the 19th century. In 1881, Clément Ader realized it in Paris using a two channel analogue method (Schlemm 1972, 195). The most significant experiments with stereophony took place in the 1930s, with Walt Disney's *Fantasia* being the first film to employ the technology. Although *stereo* is a Greek word referring to solidity, hardness and three-dimensionality, in its 60-year existence, stereophony has strayed from its semantic origin and now refers to placement on the left-right axis. While stereophonic loudspeaker systems allow only limited possibilities for truly accurate localization in space, they do offer many possibilities for virtual localization and the formation of a meaningful impression of space. Günther Theile discussed this phenomenon and emphasized that when there is an inter-aural correlation between stereo channels, optimum simulation of spatial perspective may occur (Theile 1991, 761). The effectiveness of stereophony with regard to the formation of spatial transformations has given creators of musique acousmatique occasion to recognize the technique as a character-building factor in their music. The great advantage of the stereo technique lies in its flexibility and suitability for many performance spaces. Duchenne emphasized this capacity while also cautioning against risks:

> Un des avantages du système stéréophonique, outre sa parfaite adéquation avec certaines écritures, est de pouvoir s'adapter assez facilement à n'importe quel dispositif et acoustique, moyennant certains risques et compromis. [**11** <#11>] (Duchenne 1991, 82)

11. One of the advantages of the stereo system, aside from its perfect appropriateness to certain types of composition, is that it can be adapted with ease to just about any setup and acoustic, reducing certain risks and compromises

Annette Vande Gorne portrays musique acousmatique as "*cadrages, profondeurs de champs, mouvements fictifs*" and considers this music as "*composition avec l'illusion de perception de l'espace*" [**12** <#12>] (Vande Gorne 1991, 126). She concludes that stereo is well suited for musique acousmatique, as it can reliably fulfil these tasks. (**13** <#13>) In addition, stereophony works for Vande Gorne as a small instrument that supplies a large number of services: "*On peut alors constater combien, avec une très grande économie de moyens, les espaces virtuels conduisent et font résonner l'imaginaire*…" [**14** <#14>] (Vande Gorne 1991, 126). In a stereophonic listening situation, the listener must stay fixed at a point of equal distance from the loudspeakers in order to perceive an accurate spatial impression. When the listener moves to more extreme positions, the spatial illusion is greatly weakened. Normandeau writes:

> Listening through two loudspeakers is similar to a public reading, like those of the theatre, and as valuable as this exercise is, it can never be considered a replacement for the true specialization with an orchestra of loudspeakers." (Normandeau 1988, 30)

12. Framing, depths of field, fictitious movements… composition with the illusion of the perception of space.

13. Annette Vande Gorne in a workshop in Montréal, February 1998.

14. We can therefore confirm just how much, with a very large economy of means, virtual spaces guide and reverberate the imagination.

Douglas Doherty points out that three adverse factors affect the performance of stereo music: phase cancellation, a non-central listening position, and unwanted space reflections (Doherty 1998, 9–10). Mark Poletti also mentions two limitations of stereophonic technology:

> A limitation of the stereophonic system is that the recreation of the correct pressure and velocity fields for sources within the pickup angle is imperfect. A second limitation is that the localization of sounds outside the pickup angle is not correct." (Poletti 1996, 952)

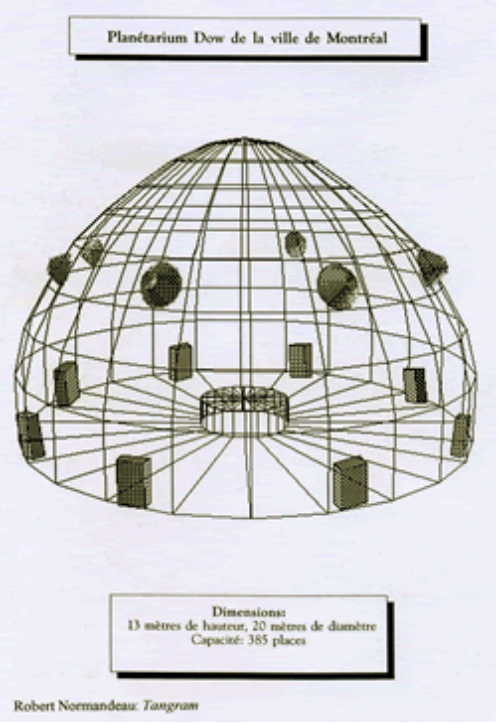
Accordingly, composers and performers of electroacoustic music have noted that the accurate delivery of acousmatic structures by a two-speaker system for an audience scattered in a performance space is nothing but a pipe dream. The immediate solution would be to increase the number of speakers. Early examples include the three linked speaker system from Bell Laboratories and the system designed by Paul W. Klipsch. These were first used in cinema. Subsequent applications can be found in the Surround Sound System and television audio systems. In the early 1990s, Robert Normandeau developed a loudspeaker orchestra housed in Montréal's Dow Planetarium for performing musique acousmatique works so that the compositional element of space can be treated with due importance. It is true, as mentioned, that musique acousmatique is identified with stereophonic technology over a multi-speaker system. But this is not the whole truth. The rapid development of multi-channel sound technology in the US and Japan (which has become an important part of the so-called Home Theatre) has directly and indirectly influenced the development of electroacoustic music as a performing art. As shown by the increased interest in multichannel composition, composers of musique acousmatique have not allowed associated difficulties to overshadow the appeal of this technology. Performances using 72 audio channels in the Galleria Nazionale d'Arte Moderna in Rome in 1977, 62 audio channels in Avignon in 1979, and 104 channels of audio in Sound Cupola in Linz in 1984 are just a few examples. That multichannel techniques could not entirely replace stereophonic technology is partly due to the fact that stereophony occupies a very well-established place in musique acousmatique. But it is also connected with the emergence of new problems, such as the complex performance control of multichannel systems. Ascione emphasizes that, despite technical problems, multichannel composition offers the composer many opportunities, and in the end, such works achieve a more expressive language. Another problem for composers like Jean-François Minjard, who works in the multichannel medium, concerns the lack of standards:

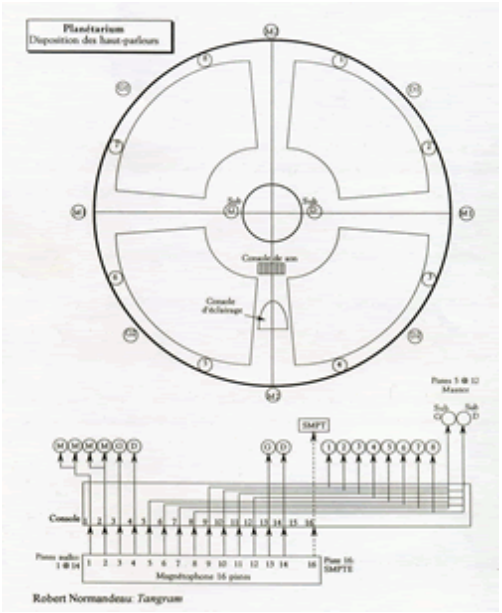
> Jusqu'à présent je ne me suis jamais confronté à l'écriture multipiste et la totalité de mon travail de composition acousmatique est pensée et réalisée en stéréo, sans que je me sente à l'étroit… je pense que nous avons encore beaucoup à dire avec une banale bande stéréo. [**15** <#15>] (Minjard 1991, 73)

15. Until now I have never explored multichannel composition and the entirety of my acousmatic compositional output is in stereo, which has never been a limitation for me… I feel there is still much to be done with a simple stereo tape.

Many composers have composed multi-channel acousmatic works, notably, in Canada, Christian Calon and Robert Normandeau. For Normandeau, multichannel composition is extremely meticulous work, and this has significantly affected his working method. He feels frustration from the fact that his multichannel works are

often produced in stereo format. Because of standardization, commercial media and radio versions are usually stereophonic. The only means of experiencing such compositions in their original form is via live performance in specific listening halls using advanced equipment. Performance of multichannel compositions with a multi-speaker system remains problematic in common performance spaces. Among Normandeau's multichannel compositions are *Bédé* (1990), *Eclat de voix* (1991), *Tropes* (1991) and the 16-channel work *Tangram*, which was first performed in 1992 in the Dow Planetarium in Montréal.





Figures 1a and 1b. Loudspeaker setup in the Dow Planetarium (Montréal) for the performance of Robert Normandeau's *Tangram* (1992). The entire setup was 13 meters high, 20 meters in diameter and accommodated 385 seats. [Click images to enlarge]

The Instrument of Musique acousmatique

It has already been established that creators of musique acousmatique prefer to project a stereophonic composition over a multi-speaker system. The need to develop a solid instrument for the performance of acousmatic works has given rise to new considerations, which in the early 1970s resulted in the concept of a performance instrument called the Acousmonium. The idea of the Acousmonium is based on a frontal view of scenic activities, which (because of its similarity to the concept of Italian theatre) is called Italian, as opposed to surround or periphony. Bayle's decision to situate a loudspeaker orchestra on the stage is mainly dependent on the fact that many acousticians believe spatial hearing in the forward direction encourages the most regular and sophisticated spatial perception on the horizontal level.

> Es hat sich gezeigt, dass der *Bereich des schärfsten Hörens* in oder nahe der Vorwärtsrichtung liegt und dass innerhalb dieses Bereichs von allen möglichen Ortsänderung der Schallquelle am ehesten eine seitliche Verschiebung zu einer Änderung des Hörereignisortes führt. [**16** <#16>] (Blauert 1974, 31)

16. Research has shown that the region of most precise spatial hearing lies in, or close to, the forward direction and that, within this region, a lateral displacement of the sound source most easily leads to a change in the position of the auditory event. (Jens Blauert, *Spatial Hearing*, The MIT Press: 1997, p. 38).

The role of Latin tradition and the dominance of theatrical representations should not be ignored. Another reason has been the lack of a musical organization for musique acousmatique. Merlier states: "Il y a dix ou vingt ans, la musique acousmatique avait un besoin essentiel de centres de création. Aujourd'hui, elle souffre du manque de centres de diffusion" [**17** <#17>] (Merlier 1999). With the Acousmonium in Olivier Messiaen Concert Hall in Paris, and the organization of annual concerts, an attempt has been made to build a permanent centre for musique acousmatique. François Bayle establishes the need for the Acousmonium on two grounds. First, he assumes that the dynamic character of the music in general requires a symmetrical distribution of technically identical speakers. Second, he believes that narrativity — a character-building factor in musique acousmatique — needs a spatially dispersed loudspeaker orchestra upon the stage which is capable of expressing and representing the inner structures of the music space (Bayle 1999). Although the idea of a frontal performance system is criticized because of its renunciation of the so-called *point excentré* — i.e., lateral sound localization and sound positioning on the median level espoused by composers and performers who prefer a surround, hybrid or periphonic system — the Acousmonium is nevertheless supported by the majority of musique acousmatique composers. In comparison with other systems, most composers consider the Acousmonium to be an appropriate system for musique acousmatique without major drawbacks. For example, for Vande Gorne, the Acousmonium is "*le prolongement naturel des images (i-sons), signes et illusions de perception inscrites sur le support-son*" [**18** <#18>] (Vande Gorne 1988, 45). She says that while a surround system better suits music based on synthetic sounds, a frontally positioned loudspeaker orchestra answers the needs of a musique acousmatique composition more satisfactorily. (**19** <#19>) Gabriel Poulard sees the strength of the Acousmonium in its major technical possibilities, its expression of the virtual stereophonic sound image, its creation of a differentiated impression of space and its independence from musical content. He fully supports the idea of a frontal performance system and believes that the effort of many composers to realize three-dimensional sound projection has not led to much success (Poulard 1991, 28).

17. Ten or twenty years ago, the music had an essential need for centres supporting acousmatic creation. Today the music suffers from a lack of centres supporting its dissemination.

18. … the natural extension of images (*i-sons*) symbols and perceptive illusions recorded on the support material.

19. In a workshop in Montréal, February 1998.

Conclusion

Space in musique acousmatique compositions is not only an inevitable universal musical structure that is unconsciously included in each composition, it is a full-fledged compositional tool. Similar to harmony, diastemic patterns, dynamics, and temporal structures, it will continue to be stylistically composed. Works within the musique acousmatique genre show a clear tendency for certain spatial concepts. Composers have a proclivity for transforming sounds and developing narrative musical languages from sound morphology. Here, space is given an imaginary quality via different types of transformation that (with exceptions) will be most faithfully projected on a frontally positioned stereophonic loudspeaker orchestra.

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