Space as Reference: Representations of Space
in Electroacoustic Music

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Abstract

This article discusses in detail the use of spatial references in electroacoustic music, which is the fourth of the five senses of space I identified in a broader investigation on the meaning of space in music, electroacoustic music and sound art. The expression *space as reference* refers to the use of the referential properties of sound to suggest or produce spatial impressions and associations. I start discussing the controversies related to the use of referential meaning in music, and how, since the development of electroacoustic music, it has become a crucial aspect in the characterization and definition of its different branches and aesthetic orientations. Then I discuss how a number of composers of electroacoustic music have conceptualized and worked with reference in their compositional practice. In the next section I discuss how soundscape composition has been working with spatial reference as a central aspect of its aesthetic principles. Afterwards, I expose how representation has been used as a structural element in the works *Night Song I* and *Night Song II*, and how these works can be characterized in terms of the terminology suggested by the aforementioned composers. In the conclusion, I discuss how the categories of abstraction and representation can be understood as relative and complimentary concepts, suggesting that, for the composer, it would be interesting to keep both aspects in mind, as both of them are relevant for the reception of their compositional work.

1. Introduction: Five Senses of Space and the Role of Representation in the Arts

In a broader investigation on the meaning of space in music and sound art[1], five different uses of space have been identified in association with sound and music: [1] space as *metaphor*, [2] space as *resonance*, [3] space as *sound spatialisation*, [4] space as *reference* and [5] space as *location*.

Space as *metaphor* consists in the use spatial images and metaphors to describe abstract concepts or perceptual experiences related to sound and music. Examples are the use of spatial concepts for the description of aspects of music not necessarily related to their spatial properties, such as *structure*, *materials*, *form*, and the notions of *high* and *low* related to pitch. Spatial concepts suggested by music writers such as *sonic space*, *noise-colouration space* and *timbre-space* (Wishart 1998); *tonal pitch space* (Lerdahl 1987) and *spectral space* (Smalley 1986 1997) also fall within the category of space as metaphor, as they do not refer to the actual perception of the spatial properties of sound, but to specific aspects of music, such as the compositional properties of sound, perception of pitch in tonal music and the perception of sound in electroacoustic music, respectively.

Space as *resonance* is related to the acoustic effects of the environment on sound, produced by phenomena such as *sound reflection*, *diffraction*, *resonance*, *acoustic shadows* and *reverberation*. The reverberation of music performance spaces has influenced the characteristics of the music performed in them since ancient times (Blesser and Salter, 2007: p. 92), being also a fundamental aspect of recorded and electroacoustic music (Smalley 2007). The acoustic effects of the environment on sound have been explored by a number of composers of experimental and electroacoustic music – among them Alvin Lucier, Barry Truax, Pauline Oliveros, Denis Smalley and George Crumb – and also by sound artists – Michael Asher, Michael Brewster, Maryanne Amacher and Edwin van der Heide, among others (LaBelle 2006).

Space as *sound spatialisation* is related to the surroundability of the auditory field and the ability of the auditory system to perceive distance, direction and motion of sound. Since the 1950s a number of composers – among them Pierre Schaeffer, Karlheinz Stockhausen, Pierre Boulez, Iannis Xenakis, Henry Brant and John Chowning

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– started to explore the perceptions of distance, direction and motion of sound as structural elements in their works, giving rise to the concept of *spatial music* (Harley, 1993: p. 128). Also, since the early 1970s, a number of sound artists – such as Howard Jones and Bernard Leitner – started to explore these same features in works of sound installation and sound sculpture (LaBelle 2006).

Space as *reference* is related to the ability of the auditory system to recognize sound sources. It refers to the power of sound to recall the experience of different places through the use of the referential properties of sound and will be the main subject of this article.

The fifth and last sense of space in music and sound art, space as *location*, is related to a broader sense of space, with all its social, cultural, historical and environmental implications. This sense of location is produced by the global perception of space produced by the information provided by all sensory channels. A number of composers of experimental music – especially John Cage and his followers – and sound artists – Maryanne Amacher and Bill Fontana, among others – have also worked with this global sense of space in their works. In most cases the works that explore space as *location* create a sense of *dislocation* by playing, in a given place, sounds which are not normally heard in that place. This creates a sense o dislocation in the viewer/listener, produced by the contradictory spatial impressions produced, on the one hand, by the sound, and, on the other hand, by the actual presence of the listener/viewer in a real place which does not correspond to the spatial impressions produced by the sound.

Representation has been a key subject in the aesthetics and philosophy of the arts, and a fundamental concern in a number of important debates in the field, such as the definition and classification of the arts, the characterization of its genres and sub-genres, and the process of reception. The subject has often been discussed in terms of the opposition between *abstraction* and *representation*. In this sense, abstraction is present when the work supposedly does not refer to anything external to itself, and has as its main characteristic the interplay of the purely perceptual qualities of the matter, or, in Dufrenne's terminology, the *sensuous* (Dufrenne, 1973: p. xxiv). Representation is present when "the sensuous quality of matter becomes a sign" (Dufrenne, 1973: p. 311). By becoming a sign, the work of art points to something other than itself – a real, legendary, mythic or imaginary being or object, an idea or a concept. As Dufrenne

(1973) points out, "what characterizes representation [...] [is] an appeal to concepts. The represented object is an identifiable object which demands recognition and which expects an unending analysis on the part of reflection". (p. 312)

The function of representation varies in different artistic modalities, having been used by Souriau as the foundation for his classification of the arts, according to which the visual arts – painting and sculpture – are representational, while decorative arts, architecture and music are non-representational (Dufrenne, 1973: pp. 311-312). Although these notions may be no longer valid in the context of the contemporary arts, they are present in the conceptions of music as a pure and abstract art, and in the representational character of most pre-modernist painting and sculpture. Since the advent of modernism, however, and even before, these notions have been challenged both in theoretical and practical terms by different artists and musicians. On the one hand, abstract artists such as Kandinsky, regarding music as the prototype of non-representational art, have used musical metaphors – rhythm, harmony and melody, among others – to describe their work (Dufrenne, 1973: pp. 247-300), using also music as source of inspiration and model for their abstract conceptions of painting (Welten, 2009). On the other hand, musical modernism brought to the fore the representational aspect of sound. As Weiss (2008) points out, "modernism brought a new theoretical and practical dimension to the role of the anecdotal (if not quite the programmatic) as a mode of referentiality, placing an increasing strain on the supposed abstraction and self-referentiality of the musical system". (p. 74)

The development of the technologies of photography and sound recording also had an important effect on the meaning of representation in visual arts and music, bringing to the fore the features that used to be regarded as non-essential aspects for their their definition, and challenging further the conceptions of music as a non-representational art and the visual arts as representational arts. As Wishart (1998) points out:

> The impact of technology on music and painting has been in opposite directions: the tape recorder has introduced the representational more easily into music, while the camera has tended to replace the figurative role of painting and allow painting to pursue the non-figurative domain. (p. 134)

The development of the technologies of recording, and, later, synthesis and artificial manipulation of sound, have been the basis of the development of electroacoustic music. By making the function of representation more evident, music technology brought to the fore, in an unprecedented way, the possibilities of using representation as a structural element in composition. Representations of space have become, then, one of the most interesting and important subjects and practices in electroacoustic music. In order to discuss the use of space as reference in electroacoustic music, the next section of this article starts with a discussion of the role of representation in the arts, followed by a short account of the problem of referential meaning in music. The third section discusses the problem of reference in acousmatic music, and the fourth examines the most relevant approaches to referential meaning in electroacoustic music. The fifth section discusses how soundscape composition has clearly and explicitly articulated the use of referential meaning as one of its central aesthetic principles. In the sixth section I show how the referential properties of sound have been used as structural elements in the composition of *Night Song I* and *Night Song II*, and in the seventh how the terminology suggested by the authors previously discussed can be used to describe and conceptualize the referential aspects of the aforementioned works. In the conclusion I discuss how the categories of abstraction and representation can be useful as aesthetic references to make compositional decisions in the process of creation of electroacoustic music.

2 Referential Meaning in Music

The representational value of musical sound has been the object of intense controversy and debate within the field of musicology and music studies. As Weiss (2008) points out, "the history of European musicology is perennially revised around a central ontological debate: whether music is a representational or an abstract art" (p. 11). At one extreme, music has been conceived as a pure and abstract art detached from any kind of representation. According to this conception, music should be appreciated as a pure discourse of sounds, devoid of any associations with the external world, either the immediate context – the referential, mimetic and narrative uses of musical sound – or the broader context – the historical, political and cultural context surrounding the work.

Following this reasoning, Dufrenne (1973) says that music "can be treated as a representational art only insofar as it ceases to be perceived as music" (p. 318).

Butor (1981), on the opposite extreme, criticizes this purist conception of music as the incapacity to recognize the influence of the historical context in the constitution of music and musical meaning. He says that, while in other domains it is firmly established that "there is no meaningless painting or poetry, or art without a precise historical situation" (p. 448), the idea that music can be a form of art detached from its historical context is still regarded as an acceptable position in certain musical circles. "This conception", he adds, "makes music literally inexplicable, and [...] the last bastion for the believers in art for art's sake" (Butor, 1981: p. 448).

Why has the referential aspect of music and the influence of the cultural and historical context been so controversial in music studies, when it has been largely accepted and recognized in the study of other artistic modalities? Ferrara believes that the traditional avoidance of referential meaning in music studies is due to the methodological challenges posed by the subject. As he points out "the absence of the referential level in music analysis arises from issues of method and not from what music is capable of meaning [...] many analysts conclude that the analysis of referential meaning in music could result in analytical chaos" (Ferrara, 1991: p. 8).

In spite of the traditional avoidance of referential meaning in musicology, however, contemporary music analysis starts to recognize the relevance of reference in music, which is evident in the work of authors such as Ferrara (1986, 1991), Agawu (1991) and Zbikowski (2005). As Weiss point out, "to the extent that musical mimesis is increasingly recognized as less marginal and more complex than previously believed, not only will new forms of musical representation most certainly arise, but innovative modes of listening will be demanded for older musical forms" (Weiss, 2008: p. 90).

3 The Problem of Reference in Acousmatic Music

The possibility of using recorded sound as material for composition has put in evidence the referential properties of sound and brought to the fore the controversies related to the use of reference in music, a central point in the theories and practices of electroacoustic music, and a fundamental aspect for the definition of its different trends and aesthetic orientations. The problem of reference in electroacoustic music has been

first discussed by French composer and theorist Pierre Schaeffer, and his views have been supported and further developed by the advocates of acousmatic music. Acousmatic music inherits from traditional musicology the purist conception of music as a non-referential art, giving to the old discourse a modernist flavor and using it as the basis for a compositional practice.

Schaeffer derived the idea of 'acousmatic situation' from the accounts that the disciples of Pythagoras listened to his teachings from behind a curtain, comparing this situation with the changes that electroacoustic technology brought to listening, in the sense that sounds coming from a loudspeaker do not have their original sources visible to the listener (Schaeffer, 2004: p. 77). Schaeffer's concepts of *reduced listening* and *sound object* are central for the theory of acousmatic music. Reduced listening "focuses on the traits of sound itself, independent of its cause and of its meaning" (Chion, 1994: p. 29). The notion of *sound object* is based on the perceptual and morphological properties of the sound, such as duration, presence or absence of pitch and noise elements, dynamic development and contour, characteristics of attack and decay, and spectral and timbral characteristics (Schaeffer, 2004).

Within the practitioners of acousmatic music, it is a common understanding that works that use reference or narrative as structural elements have limited musical value, being often qualified as "radiophonic" or "anecdotal". More abstract works, "concerned with developing discourses of sound types and timbres" (Emmerson and Smalley, 2001: p. 61) tend to be regarded as the true representatives of the acousmatic aesthetic. The avoidance of referential sound is, therefore, an important aesthetic principle for composers working with acousmatic music. However, in spite of this avoidance, in different degrees and with different compositional functions, the use of reference can be found as structural elements in a number of important works of the acousmatic repertoire, something that creates a tension between the aesthetic principles advocated by the composers and their compositional practice, as perceived by the listeners.

4 Reference in Electroacoustic Music

The concepts of *reduced listening* and *sound object*, and the acousmatic approach to music are important contributions to contemporary music, not only to electroacoustic composition, but also to vocal and instrumental music in general. However, a problem

arises when composers expect reduced listening to be the primary mode of reception of their music, not only because it is a highly specialized listening mode, but also because the auditory system naturally recognizes the sound sources as part of the process of listening. At some point in the development of electroacoustic music, the recognition of this aspect of the auditory system started to be become evident for a number of its practitioners. As Emmerson (1999) points out, "it proves very difficult to hear sound only in terms of an appreciation of its shape and spectral properties [...] [as] we listen to any sound conditioned by our primeval past and evolution." (p. 136)

Therefore, when the composer tries to build an abstract discourse using sounds with clearly recognizable sources, the listener may face a perceptual impasse, confronted with two conflicting arguments, "the more abstract musical discourse [...] and the almost cinematic stream of real objects being hit, scraped or otherwise set in motion" (Emmerson, 1986: p. 18). Because of the difficulty to avoid the recognition of sound sources, and because of the compositional possibilities brought by the use of reference in electroacoustic music, a number of composers have discussed and intentionally incorporated in their works the use of referential sound.

4.1 Mimetic and Aural discourse, Abstract and Abstracted Syntax

In his discussion of the relation of language to materials in electroacoustic music, Emmerson (1986) examines the links between sounds and the mental images associated with them, and the function of mimesis composition. Image is defined as something "lying somewhere between true synaesthesia with visual image and a more ambiguous complex of auditory, visual and emotional stimuli" (p. 17) and mimesis as "the imitation not only of nature, but also of aspects of human culture not usually associated directly with musical material" (p. 17). Emmerson creates a typology to classify the different kinds of musical discourses, taking into consideration two characteristics: (1) the presence or absence of mimesis, which characterizes the kind of discourse; and (2) whether the structure of the work is derived from the aural properties of the materials or conceived independently of them, which defines the kind of syntax.

The presence or absence of referential meaning defines three positions on a continuum, which defines three kinds of discourses. In aural discourse, the composer intends the listener to appreciate the purely aural properties of the sound. In mimetic

discourse the composer expects the listener to recognize the sound sources, being this recognition an important element in the reception of the work. In the intermediate category, combination of aural and mimetic discourse, both characteristics are present.

The second level of Emmerson's analysis is related to syntax, which can be abstract or abstracted and describes how the materials in the composition are organized in terms of formal structure. In abstract syntax, the formal principles of organization are defined independently from the materials, as if it was "an abstract architectonic form into which the material [...] [is] poured" (ibid: p. 36), and includes the use of any external principle of organization not derived from the aural properties of the material, such as serial principles, chance operations or the Fibonacci series. In abstracted syntax, the structure of the work derives directly from the aural properties of the material, as it ideally should happen in acousmatic music. There is also an intermediate category, called combination of abstract and abstracted syntax, in which both principles can be found. The crossing of the two sets of three categories generates nine categories, shown in Table 1, with examples.

Emmerson's Grid			
	Aural discourse dominant	**Combination of aural and mimetic discourse**	**Mimetic discourse dominant**
Abstract Syntax	(1) Aural discourse dominant/ abstract syntax Milton Babbitt: *Ensembles for Synthesizer* Stockhausen: *Two Electronic Studies* John Cage: *Williams Mix* and *Fontana Mix*	(4) Combination of aural and mimetic discourse Luigi Nono: *La Fabbrica Illuminata*	(7) Mimetic discourse dominant Stockhausen: *Telemusik*
Combination of abstract and abstracted syntax	(2) Aural discourse dominant/ Combination of abstract and abstracted syntax Stockhausen: *Momente* Harvey: *Mortuos Plango Vivos Voco*	(5) Combination of aural and mimetic discourse/ Combination of abstract and abstracted syntax Michael McNabb: *Dreamsong*	(8) Mimetic discourse dominant/ Combination of abstract and abstracted syntax Trevor Wishart: *Red Bird*
Abstracted syntax	(3) Aural discourse dominant/ Abstracted syntax Smalley: *Pentes* Parmegiani: *De Natura Sonorum*	(6) Combination of aural and mimetic discourse/ Abstracted syntax Bernard Parmegiani: *Dedans-Dehors*	(9) Mimetic discourse dominant/ Abstracted syntax Luc Ferrari: *Presque Rien no. 1* Luc Ferrari: *Music Promenade*

Table 1 Emmerson's classification of kinds of aural discourse and musical syntax (adapted from Emmerson, 1986: pp. 24-39).

4.2 Sound Landscape, myth and metaphor

Trevor Wishart's concept of *sound landscape* is also closely linked to the perception of real or imagined sound sources and to the referential properties of sound. He uses three characteristics to classify the kinds of landscapes that can be found in electroacoustic music: the *nature of the acoustic space*, the *disposition of sound-objects in space* and the *recognition of sources* (ibid: p. 140). The criteria of recognizability of sound objects and space, which can be *real* or *unreal*, are used to classify the kinds of soundscape into four categories, shown in Table 2. In order to characterize an object or space as real, the composer must be aware of the referential properties of the sounds used in the composition, using them without transformation to maintain their recognizability or transforming them in a way that maintains their recognizability.

Wishart's Sound Landscapes				
	Real-objects	Real-space	Unreal-objects	Unreal-space
Real landscape	X	X		
Imaginary landscape [1]		X	X	
Imaginary landscape [2]			X	X
Surrealist	X	X		

Table 2 Wishart's categories of sound landscapes, based on the combination of different kinds of objects and spaces: real (recognizable) and unreal (unrecognizable) (adapted from Wishart, 1998: p. 146).

4.3 Source Bonding, Indicative Fields, Surrogacy

Smalley's theory of *spectromorphology* has been developed as an attempt to describe sound in terms of its *intrinsic* features, being recognized as one of the most important theoretical approaches to acousmatic and electroacoustic music. In spite of his focus on the morphological features of sound, Smalley recognizes the importance of *extrinsic* meaning in music, suggesting three concepts to describe and discuss the referential aspects of sound and music: *source bonding, indicative fields* and *surrogacy*. *Source bonding* is defined as "the natural tendency to relate sounds to supposed sources and causes, and to relate sounds to each other because they appear to have shared or associated origins" (Smalley, 1997: p. 110).

The concept of *indicative fields* is derived from the first of Schaeffer's four listening modes. Smalley expands Schaeffer's idea, to include a broader frame of reference of what can be experienced by the listener outside and beyond the purely musical (Smalley, 1992: p. 519). Smalley suggests nine categories to classify the various ways by which the musical experience of the listener can be related to the experience of the external world, summarized in Table 3.

Smalley's Indicative Fields	
Gesture	Related to the physical gestures (including instrumental gesture) that produced the sound.
Utterance	Related to language and voice.
Behavior	Related to the contextual relationship between sounds in a musical context.
Energy	Related to the energetic profile of the sound, in terms of pitch, dynamics, timbral evolution.
Motion	Related to the physical motion of sound or its associations in musical contexts.
Object/substance	Related to the physical materials that produced the sound or to its imagined causes.
Environment	Related to the incorporation of environmental sounds in musical contexts.
Vision	Related to visual associations produced by sound only.
Space	Related to the spatial aspects of sound (articulation of musical discourse, affective aspects and diffusion).

Table 3 Smalley's nine categories of indicative fields (adapted from Smalley, 1992: pp. 521-532).

Smalley's concept of *surrogacy* describes to what extent real or imagined sources can be associated to recorded, synthesized or electronically transformed sounds. He first suggests three (1986) and, later, four surrogacy orders (1997), summarized in Table 4. *First order surrogacy* is related to non-musical contexts, when the sound source and gestural activity are clearly recognizable. *Second order surrogacy* corresponds to gestures performed in traditional musical instruments using recognizable performance skills, or to synthesized sounds modeled on traditional instruments. In *third order surrogacy*, "a gesture is inferred or imagined in the music [...] even though we do not know exactly what the source might be" (Smalley, 1997: p. 112). *Fourth order surrogacy* "is concerned with gestural vestiges. Source and cause become unknown and unknowable as any human action behind the sound disappears" (ibid: p. 112).

Smalley's Surrogacy Orders	
First Order	Non-musical contexts, sound source and gestural activity clearly recognizable.
Second Order	Musical contexts, sounds of musical instruments (real or synthesized) and conventional instrumental gestures.
Third Order	Inferred or imagined gesture. Uncertain sound source.
Fourth Order	Gestural vestiges. Unknown or unknowable sources and causes.

Table 4 Smalley's four surrogacy orders (adapted from Smalley, 1997: p. 112).

4.4 Storytelling, Real-world sounds, Real-world Music

In her account of the aesthetic implications of the use of *real-world* sounds in *real-world music*, Norman (1996) also discusses the importance of referential meaning in electroacoustic music. She compares the activity of the composer of real-world music with the activity of the storyteller in oral traditions, bringing to the fore the narrative possibilities of electroacoustic music. "Real-world music", she says, "makes musical stories from everyday sounds, it makes musical sense from 'ordinary' listening and it evokes an emotional response to the timbres of experience" (Norman, 1994: p. 109).

Norman identifies three listening modes that are important for real-world music: *referential listening*, related to the identification of sources and catching of information; *reflexive listening*, "a creative, enjoyable appraisal of the sound for its acoustic properties" (Norman, 1994: p. 5); and *contextual listening*, related to the memory, personal story and context of the listener (Norman, 1994: p. 8). These three listening modes interact with one another when the listener listens to real-world music, when both *remembered content* and *imagined content* come into play. In spite of its connections with the real world, however, real-world music should not be understood as a strictly descriptive and realistic art. As she points out, "real-world music is not concerned with realism, and *cannot* be concerned with realism because it seeks, instead, to initiate a journey which takes us away from our preconceptions, so that we might arrive at a changed, perhaps expanded, appreciation of reality" (Norman, 1996: p. 19).

4.5 Other Approaches to Referential Meaning in Electroacoustic Music

Other authors have also discussed the subject of referential meaning in electroacoustic music. Young (1996), in his discussion of *realism* and *abstraction*, speaks in terms of a *reality-abstraction continuum*, in which the notions of reality and abstraction "appear to the listener to be in constant flux" (p. 83). According to him, abstraction can be understood on different levels, and the notion of complete abstraction something difficult, if not impossible, to achieve in practice. As he points out "our conditioning by the sources and causes familiar in environment and culture means that we are seldom without some mental schema to which the origins of a sound may be potentially related, however vestigial or remote this may seem" (Young, 1996: p. 83).

In a critical review of Emmerson's typology, Fischman (2008) suggests the addition of two other continua to Emmerson's grid: [1] the *phonographic-constructed continuum*, used to describe the extent to which the composer keeps the material intact – the *phonographic* pole – and the extent to which the composer transforms the material – the *constructed* pole; and [2] the *real-unreal continuum*, used to describe the extent to which the virtual spaces created by the composer resemble reality – the *real* pole – or tend to imaginary spaces – the *unreal* pole. Referring to the aforementioned categories suggested by Wishart, he also suggests the *surreal* as an intermediary category.

5 Space as Reference and Soundscape Composition

Soundscape composition is the branch of electroacoustic music in which the spatial implications of referential sound are most explicitly articulated. *Soundscape composition* originated from the context of *soundscape studies*, later called *acoustic ecology*, an interdisciplinary field initially suggested by Murray Schafer's writings, focused on the study of the relationship between human beings and the sounds of the environment (Schafer, 1994: pp. 3-4). The reflections about the nature of music and its relationship with the sounds of the world, undertaken within soundscape studies, led to the development of two different kinds of musical practices: *live soundscape music*, or the use of outdoor spaces as performance places, and *soundscape composition*, or the use of environmental sounds as materials for electroacoustic composition.

Sometimes erroneously described as a development of acousmatic music that uses environmental sounds as material, soundscape composition has its own aesthetic

principles, in some aspects opposed to those advocated by acousmatic music. "Each soundscape composition", Westerkamp says, "emerges out of its own context in place and time, culturally, politically, socially, environmentally" (Westerkamp, 2002: p. 52). The referential aspect of the materials and the relationship with its original context are fundamental for soundscape composition. As Truax (2002) points out, "soundscape composition always keeps a clear degree of recognisability in its sounds [...] in order that the listener's recognition of and associations with these sounds may be invoked." (p. 6)

Truax (2002) describes the *found sound approach* and *abstracted approach* as two extremes of a continuum, in which different degrees of reference may be present. In the *found sound* approach the composer does not use any noticeable transformations of the original sounds. In the *abstracted approach*, the referential aspect of the sound is still present, but not as the main principle of organization and source of meaning. In practice, however, most compositions that use environmental sound can be placed at some point between these two extremes, regardless of the aesthetic affiliations of the composer.

6 Spatial Design and Spatial Narrative in *Night Song I* and *Night Song II*

In order to exemplify how the referential properties of sound can be used as structural elements in electroacoustic composition, this section describes the *spatial design* and *spatial narrative* of a set of two eight-channel pieces composed as one of the compositional results of the reflection on sound and space summarized in this article. The term *spatial design* is used to describe the general spatial features of a piece, or of a section of a piece, which has a clearly defined spatial identity. The term *spatial narrative* is used to describe how the overall spatial structure of a piece, or of a section of a piece, changes over time. *Night Song I* and *II* were composed primarily with sounds of nocturnal animals and natural phenomena, most of them taken from the Wildlife Archives of British Library. Although other aspects of sound were taken into consideration for their selection – spectromorphological and spatial properties, expressive potential, beauty and technical quality – their referential properties were a key element for their choice, as the pieces were conceived, from the start, as an exploration of the potential of referential sound to produce spatial associations.

The spatial narrative in *Night Song I* and *II* is based on the idea of an imaginary journey of a silent bird that flies through different environments. The environments visited by the bird-listener are described by the subtitles of the piece, *In an Open Forest, In the Sky with Bats, In a Cave* and *Valley of the Owls*. These soundscapes were created around a number of wildlife and environmental sounds associated with each of them. Sounds with different levels of transformation, and the unnatural sound of the organ clusters were also used. The use of eight-channel format allowed the production of an immersive sound environment which increased the realism of the soundscapes, when this realism was desired, and also the creation of perceptual effects not possible with stereo sound, such as motion of sound and the perception of sounds coming from different distances and directions.

6.1 *Night Song I*

Night Song I has three parts. In the first section, *In an Open Forest* the spatial design follows the spatial distribution of sounds in an open forest: sounds coming from all directions surrounding the listener. The foreground sounds are sounds of the black grouse and the wart-biter cricket. Sounds of new forest cicadas, natterjack toads, nightjars, mole crickets and organ clusters create the background atmosphere. Sounds of thunder and rain suggest a large open environment. The sounds of thunder, moorland and rain were transformed (decorrelated) and spread through different loudspeakers to produce envelopment and to enhance the atmosphere of a large open natural space.

The second section, *In the Sky with Bats* was composed using echolocation sounds of pipistrelle and noctule bats. The material was first expanded using a digital sampler, and then used to create a number of short four-channel fragments, which were panned to different sets of four loudspeakers in the eight-channel array. The idea was to translate aurally the experience of flying with bats, imagining how it would be to hear the direct and reflected sounds of echolocation coming from different directions.

The spatial design of the third section – *In a Cave* – followed the idea of placing different animals in a reverberant cave. The contrast between the outdoor spaces of the two previous sections and the enclosed space of a cave is achieved with the use of long cave convolution reverberation. The effects of motion of sound and sounds coming from different directions were achieved using the technique of panning of mono and

quad files. The hissing noise-like sounds were created by the transformation of sounds of barn owls, adders and grass snakes with pitch shifting, time-stretching and artificial reverberation, distributed through different speakers, to give a sense of envelopment. This spatial distribution is invested with symbolic value. As owls and snakes are the predators of most species sharing the cave, their presence would cause other species to get quiet, either because they would have been actually killed or because of their fear of death. The effect of envelopment enhances their threatening nature and their symbolism of danger and death, as they cannot be localized. The table below shows the structure of *Night Song I*. The referential aspects of sound, as it can be observed, were fundamental for the creation of the piece, and are also expected to be important in the reception of the work.

Night Song I			
	Part 1 – *In an Open Forest* (00'00" - 5'14")	**Part 2 - *In the Sky with Bats* (5'14 - 7'00")**	**Part 3 - *In a Cave* (7'00' - 11'05")**
Materials used	New forest cicada Wart biter cricket Natterjack toad Organ clusters and tree frog Rain on foliage Field cricket Moorland Mole cricket soundscape Nightjar Thunderstorm Black grouse	Echolocation sounds of Noctule and Pipistrelle bats	Echolocation sounds of Noctule, Pipistrelle and Daubenton's bats Pine Marten Stoat Barn Owls (hiss) Adder (hiss) Grass Snake (hiss)
Spatial design and Spatial Narrative	Bird-listener in an open forest Sounds coming from different directions Spatial separation used to emulate a natural environment and to enhance stream segregation Sounds of thunder, rain and moorland ambience spread through the different loudspeakers to produce envelopment	Bird-listener flying in the sky with bats Sounds of bat echolocation emulating the motion of flight (different directions, different pitches)	Bird-listener in a cave (suggestion of territorial dispute Cave reverberation to convey the experience of an enclosed natural space Spatial counterpoint of the sounds of different animals Sounds of barn owl, adder and grass snakes spread through different speakers to produce envelopment
Spatialisation techniques	Decorrelation (with pitch shifting) Spatial counterpoint of short fragments	Panning of quadraphonic files Digital delay Artificial reverberation	Panning of quadraphonic files Artificial reverberation
	Panning of stereo and mono files (using bus automation and direct output)		

Analytic table 1 Spatial design and formal structure of *Night Song I*.

6.2 *Night Song II*

Night Song II has three parts in terms of spatial design, each one corresponding to one of the three sections of the piece defined by its subtitles: *In a Cave*, *Valley of the Owls* and *In the Sky with Bats*. The general idea for the spatial design and the compositional techniques used for Section 1 – *In a Cave* – is similar to that described for the session of the same name in *Night Song I*. The main difference is that other species are heard here: water shrew, water vole, edible dormouse and yellow-necked mouse. Their calls were pitch-shifted and spatialised using the same technique described above. The

environment suggested is of a quiet cave, in which the bird-listener is placed, and which it leaves behind gradually while it moves to an outdoor space, suggested by the sounds of wind, which produce a gradual transition to the next section.

Section 2 – *Valley of the Owls* – starts with sounds of owlets (*barn owl* and *little owl*) panned in the octophonic space to different directions, suggesting a space with nearby nests in trees surrounding the bird-listener. This is followed by sounds of little owls, which were slightly pitch-shifted and panned to different combinations of two speakers. The sounds of wind, which appear in the end of the previous section, become increasingly more present, and were decorrelated with pitch shifting and spread through different speakers. The extremely time-stretched sounds of little owls (glissandi) become increasingly more important, breaking the atmosphere of realism previously built by sounds of wind, owlets and little owls and suggesting a space increasingly less realistic. These slow-changing sounds, spread through different regions of the spectral space, were panned to different directions of the octophonic space. Extremely time-stretched glissandi-like calls of the long-eared owl complete the unrealistic soundscape, developing slow circular trajectories around the listener.

The general idea for the spatial design for Section 3 – *In the Sky with Bats* – is similar to that described for the session of the same name in *Night Song I*, but the spatialisation technique is slightly different. The original stereo files of Natterer's echolocation bats, which already had an interesting difference between the channels, were spectrally split (with different equalizations) and panned through different speakers, describing circular trajectories around the listener. In the final sequence, the same sounds developed a slow back-front motion crossing the octophonic space, ending the composition with a slow fade-out.

Night Song II				
	Part 1 - *In a cave* (0'00' - 3'10'')	**Part 2 - *Valley of the Owls* (3'10'' - 9'00'')**		**Part 3 – *In the Sky with Bats* (9'00'' – 11'05)**
Materials used	Water shrew Water vole Edible dormouse Yellow Necked Mouse Low pitched wind Howling wind	Nestling owlets (barn owl and little owl)	Long eared owl Little owl	Long eared owl (processed - glissandi)	Bat echolocation sounds – group of Natterer's bats.
		Little owl call (processed - extreme time-stretching)			
Spatial design	Bird-listener in a cave with little mammals and rodents Cave reverberation Spatial counterpoint	Bird-listener in a natural space which becomes increasingly surreal. Owlets in a nest in nearby trees – big valley with little owls all around – surreal soundscape (high-pitched glissandi)			Bird-listener flying in the sky with bats under the moonlight
Spatialisation techniques	Panning of quadraphonic files Artificial reverberation	Sounds with different pitch and spectral components spread through the different loudspeakers to produce envelopment and motion of sound. Spectral splitting Non-realistic reverberation (time-stretching) Decorrelation (pitch-shifting)			Spectral splitting Panning of stereo sounds
		Panning of stereo, mono and quadraphonic files Decorrelation (pitch shifting)			

Analytic table 2 Spatial design and formal structure of *Night Song II*.

7 The use of Reference in *Night Song I* and *II*

The categories of analysis presented in the fourth section of this article can be used to describe the structural aspects and the use of reference in *Night Song I* and *Night Song II*. According to Emmerson's terminology, the two pieces are examples of a *combination of aural and mimetic discourse*, as, in different moments, the referential properties and the purely aural properties of the sound become prominent, being both of important for the appreciation of the pieces as a whole. In terms of formal structure, the pieces fall into the category of *combination of abstract and abstracted syntax*, as both the aural properties of the material and an external principle – the journey of the bird –

were important structural elements for the definition of the structure of sections and parts.

In terms of Wishart's terminology, in different moments the four kinds of landscapes are present. The *real landscape* can be identified in the realistic moments – *In a Cave*, for instance – when both the objects – animals – and the space – the reverberant cave – are intended to be realistic. As the piece evolves and both the objects and space become less realistic – first part of *Valley of the Owls*, for instance – the *imaginary landscape* is evident. The *surrealist landscape* can be identified, for instance, in the beginning of *Night Song I*, when the sounds of organ clusters – unlikely to be found in an open forest – are mixed with sounds of insects and birds.

In terms of Smalley's terminology, many of the indicative fields can be found in *Night Song I* and *II*: *gestures*, in the bat echolocation sounds; *utterance*, in the voices of animals; *motion*, in the motion of spatialized sounds; *object/substance* and *environment*, evident in the sounds of natural phenomena; *vision*, in the many referential sounds that produce visual associations; and *space*, in the spatial design and spatial narrative of the pieces. Different surrogacy orders are also present: *first order*, in all sounds that are clearly recognizable, such as rain, thunder, bird song and insects; *third* and *fourth order*, when the sound sources are uncertain or vestigial, such as in the sounds with different levels of transformation of owl calls (glissandi) bat echolocation sounds (percussive sounds) and snakes (hiss-like sounds).

In terms of Norman's terminology, the *narrative* function is also present in *Night Song I* and *II*, in the idea of the bird-listener that flies through different soundscapes. The two pieces can also be described as *real-world music*, in the sense that they use the images and references to the real world not in strictly realistic terms, but as a point of departure and arrival, and in the sense that they may change the listener's perception of the soundscapes portrayed in the works.

In terms of the aesthetic principles advocated by *soundscape composition*, *Night Song I* and *II* cannot be characterized strictly as pieces of *soundscape composition*. Although the referential properties and the recognizability of sound sources are important for their reception, they are not documents or portraits of specific or real soundscapes. In terms of Truax's terminology, the different sections can be situated at different points between the *found sound approach* and the *abstracted approach*, as in

some moments the sounds are used with little or no transformation – *found sound approach* – and in other moments they are transformed in different degrees – *abstracted approach* – sometimes to the point of no longer being able to be recognized as referential sounds. In aesthetic terms, the pieces can be situated at some point between soundscape composition and acousmatic music, in the sense that both the referential and the purely aural properties of sound are important structural elements, and that both aspects are also expected to be important from the point of view of their reception.

8 Conclusions

In spite of all the controversies related to the use of reference in music, at the moment it seems to be one of the most important aspects of electroacoustic music. In spite of the recognition of its importance, however, it should be clear that the use of reference in composition, does not mean that the attention to the morphological, formal and more abstract aspects of sound should be disregarded or minimized. It appears that the best approach would be to cultivate the awareness of both aspects – on the one hand, the formal and more abstract aspects of sound and, on the other hand, its referential properties – in order to explore their potential for generating structures and different levels of meaning in the various categories of artistic works that use sound as material: fixed-media, live electronics or instrumental music, and works of sound art.

At some point in their creative process, in a more or less conscious way, composers decide to use or not to use representation, a decision that may have important implications for the reception of their work. As it happens in any artistic modality, in music, the awareness of the formal properties of the matter is an essential aspect of the process of their creation. When the artist decides to create a work that stands for itself as an autonomous work of art, with little or no connection with the external world, the avoidance of representation and the focus on the purely formal properties of their art is a purposeful choice. In this case, representation may be regarded as a weakness or a kind of undesirable interference that distracts the viewer/listener from the pure interplay of the formal properties of the matter, and, as such, something to be avoided. In this sense, Duffrene's warning against the dangers of representation is pertinent:

> Representational art risks being no more than a means in the service of representation. [...] authentic art, refusing to fall back on the subject as a basis for

determining aesthetic value, tends to press this refusal, to the point of wishing to expel the subject from the structure of the work altogether. (p. 313)

The focus on the purely intrinsic features of the matter may show the skills of the artist, and the extent to which they have a good command of the formal and structural elements of their craft. If this is the basis and the purpose of the artist and a conscious choice, the avoidance of representation and the lack of connection with the external world do not necessarily need to be regarded as a weakness, but a matter of personal choice.

On the other hand, the use of representation opens up another universe of meaning, in which the artist may express their ideas and perceptions regarding different aspects of their experience of life and reality. In some cases, especially in modern art, the subject chosen may be secondary, and only an occasion or a pretext for the work. In other cases, however, the subject reveals the main concerns of the artist and the very purpose of the work. In this sense, the use of environmental sounds in Ferrari's *Presque Rien No. 1* (1970) or Westerkamp's *Kits Beach Soundwalk* (1989), the birdsong imitations in Messiaen's *From the Canyons to the Stars* (1971-1974), and the use of the thematic of war in Penderecki's *Threnody to the Victims of Hiroshima* (1960) or Crumb's *Black Angels* (1974) goes far beyond the merely accidental. In these cases, the artist transcends the ordinary aspects of the represented object, revealing their potential for expression and meaning and the artist's deepest impressions about the themes and subjects portrayed in the work. As Dufrenne (1973) points out, "whatever geographers have excluded from landscapes, historians from events, and photographers from faces [...] *this* is what the artist must say […]. He always represents it, but he does so in terms of a truth which is not that of objective knowledge." (p. 317)

In a post-acousmatic and post-soundscape era, whichever the choices of the composer working with recorded sound may be, it seems to be important to find a balance between the representational and abstract aspects of sound, as both aspects will interact with one another in the reception of the work. As Drever points out, "the challenge to soundscape composition artists is whether they can balance musical with representational concerns" (2002: p. 26). As the use of representation and abstraction is a core issue not only in soundscape composition, but also in other fields of contemporary artistic practices involving sound, this challenge may be extended to any

composers and sound artists working with electroacoustic, instrumental or live electronics music and sound art.

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