

Investigating Sound in Space: Five meanings of space in music and sound art*

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Since the 1950s the spatiality of sound has become a key concept in different fields of artistic practice, emerging as one of the most relevant subjects in the contemporary arts. Ideas related to sound and space have been used in different discourses and practices to refer to or to explore perceptually different facets of the spatiality of sound. In the field of fine art they have been associated with the emergence of sound art, while in music, they have been associated with spatial music. In spite of this widespread interest in sound and space, the uses of spatial concepts in relation to sound and music have been inconsistent, with different authors and practitioners referring to different aspects of the complex relationship between the two. In this article I suggest a typology with five categories to describe five meanings of space I identified in the recent literature of music and sound art: *metaphor*, *acoustic space*, *sound spatialisation*, *reference* and *location*. With this typology I expect to clarify the contemporary uses of space and spatial concepts in music and sound art.

1. INTRODUCTION

This article is primarily concerned with the emergence of an artistic practice that challenges the conception of sound that governs traditional Western music. Both spatial music and sound art are associated with the use of the spatial properties of sound as structural elements in their works. A fundamental change in the understanding of the potentiality of sound to deliver spatial information can be identified in these practices. Conventional musical analysis and musicology have incorporated the use of spatial metaphors such as *high* and *low*, *materials*, *form* and *structure* naturally in their vocabulary. However, perceptions related to the spatial properties of sound – *resonance*, *distance*, *direction* and *motion* of sound, as well as its *referential properties* – have not been conceptualised or incorporated in the terminology of traditional musical theory and practice. The migration of sound from orthodox forms of music into the domain of fine art has liberated the spatial properties of sound that, although latent throughout the history of music, had not been intentionally developed and conceptualised since the middle of the twentieth century. Although the relationship between sound and space had become, since then, a

fundamental subject in both fields, there seems to be no consistency in the use of spatial terms and expressions in reference to sound and music, remaining instead ambiguous, inconsistent and even confusing. In order to clarify the use of spatial terms and expressions in this context, I suggest a typology of five categories to classify them.

Before I do so I want to discuss briefly how space and time have, since the Renaissance, become important criteria in the classification of the arts, and how this process led to the conceptualisation of fine arts as visual arts and music as a temporal art. Then I discuss how spatial music and sound art emerged in the twentieth century as artistic practices that challenge the traditional boundaries between the arts, sharing a central concern with the spatiality of sound. Subsequently I present the suggested typology, according to which the different meanings of space can be grouped into five categories: *metaphor*, *acoustic space*, *sound spatialisation*, *reference* and *location*. To finish, I discuss briefly how this investigation started off as a research in music and expanded to a broader frame of reference, and how the ideas articulated here may be useful for musicians, sound artists and theorists interested in the relationship between sound and space.

2. TIME, SPACE AND THE ARTS

The use of time and space as categories to classify the arts evolved from the *paragone* literature in the Renaissance, in which, questions related to the nature of an artistic medium, its relation with its material properties and a set of conventions were raised for the first time (Wallenstein 2010: 2). This debate developed around the discussion of the relative value of different artistic modalities, initially focusing on the differences between painting and poetry, an ancient debate, and subsequently concerning itself with the differences between painting and sculpture.

These debates culminated in G. F. W. Hegel's system of the fine arts, in which the categories of time and space, together with the idea of transcendence, were used to build a hierarchy of the arts. From the lowest to the highest, the art forms classified by Hegel were: architecture, sculpture, painting, music and poetry. In Hegel's system, architecture, sculpture and painting

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were *spatial arts*, while music and poetry were *temporal arts* (Wallenstein 2010: 8).

Mikel Dufrenne also discussed the space–time divide in his phenomenological account of the aesthetic experience. Defining *aesthetic experience* as ‘the work of art as perceived’ (Dufrenne 1973: lii), and establishing it as the common ground for all the arts, he speaks in terms of the phenomenological *solidarity* of time and space, which happens both at the subjective level of the aesthetic experience and at the objective level of the *work of art*. According to Dufrenne, in the experience of the subject, any work of art is always experienced in time and space (p. 246). At the objective level of the work of art, the solidarity of space and time can be observed in the use of spatial metaphors to describe musical harmony and rhythm (pp. 249–64), in the parallels between architecture and music (p. 272) and the temporalisation of space in painting, expressed in the notions of movement, harmony and rhythm, as applied to the pictorial work (pp. 275–98).

The validity of Hegel’s considerations regarding the temporal or spatial nature of each art can be considered valid throughout most of the history of Western art and music up to Romanticism. With a few exceptions, during this period, the spatiality of sound had not been a constant or central issue in music or fine art. However, since Modernism, and especially since the late 1950s, the reflection about the nature and meaning of time and space gave birth to new art forms that challenged the space–time divide and the boundaries between the arts established in Hegel’s system. This reflection has been part of a broader movement, in which different artistic practices started to conceive of art as an *expanded perceptual terrain* – which includes non-visual modalities of perception – and as a *critical practice* – which addresses questions related to the nature and purposes of the arts, their critical potential and their connection with reality (LaBelle 2006: 95). The movement from the object to conceptual art led to the inclusion of temporality in practices such as performance art and happenings. It also led to an increased awareness of the space surrounding the work of art, in practices such as minimal art, happenings, land art, installation, site-specific practices and conceptual art (LaBelle 2006: 49–52). *Sound installation* and *sound sculpture*, which emerged in the late 1960s and early 1970s from this broadened conception of art, are the first categories of works of fine art in which the spatiality of sound has been systematically explored as a structural element, giving origin to what will be conceptualised as *sound art*.

3. SOUND ART AND SPATIAL MUSIC

Spatial music emerged as a branch of musical composition in the 1950s. The spatiality of sound has always

been a latent concern in different periods of the history of music, which is manifest in the preoccupations with the acoustics of performance places and its suitability for different styles of music. However, with a few exceptions, such as the antiphonal music of Venetian composers of the late Renaissance, until the twentieth century, spatial issues related to music have been given a secondary role in music. Since the 1950s, however, with the growing awareness of the spatiality of sound among composers, space started to be intentionally used as a structural element, giving rise to the concept of *spatial music* or *spatialised music*, defined by Maria Anna Harley as:

Music with a quasi-spatial structure defined by the composer in the score or in another medium of sound coding [...]. This quasi-spatial structure can assume different forms, including ensemble dispersion specified in the score, the movement of sounds, performers and the audience, and the juxtaposition and interaction of real and virtual sound sources. (Harley 1993: 128)

Regarding the nature and definition of sound art, there is little agreement among researchers, practitioners, critics and curators about its concept and boundaries. In the German-speaking world, since the 1990s, sound art – or *Klangkunst* – has been a well-established field of practice and theoretical research, primarily constituted by works of sound sculpture and sound installation that consist of an ‘investigation of both time and space, through ear and eye’ (Engstrom and Stjerna 2009: 11). In the English-speaking world, there is no conceptual unity in the field, and the idea of *sound art* is vague, loose and inclusive. Licht (2009), for instance, includes the work of experimental and avant-garde composers, composers of ambient music and electronica, and artists working with sound installation and sound sculpture. In a more consistent way, Brandon LaBelle (2006) traces the development of sound art to the cross-fertilisation between experimental music and the expanded concept of art developed since the 1950s, recognising the influence of John Cage, musique concrète, happenings, environments, Fluxus, installation art, minimalism, performance art and conceptual art, eventually identifying sound art primarily with sound sculpture and sound installation.

4. FIVE MEANINGS OF SPACE IN MUSIC AND SOUND ART

According to the typology suggested here, the different meanings of space identified in the recent literature on music and sound art can be grouped into five categories. The first category – *metaphor* – is a preliminary treatment of the subject, while the other four – *acoustic space*, *sound spatialisation*, *reference* and *location* – are related to specific aspects of the perception of sound in space.

4.1. Space as *metaphor*

The first meaning of space – *metaphor* – consists in the use of spatial images and metaphors to describe abstract concepts or perceptual experiences related to sound and music, not necessarily related to the spatial properties of sound. As such, it is more related to theoretical discourses on music – analysis, musicology, criticism and other forms of music writing – than to an actual musical practice. Traditional musicology and music analysis have assimilated without problem spatial metaphors for music description, as they can be easily integrated within the conventional conception of music as a temporal art, pure and devoid of any association with the real world.

According to George Lakoff (1993: 203), metaphor is a system of correspondences, a general mapping across conceptual domains, and an essential part of the conceptual system through which reality is conceived. As such, metaphors are present in all kinds of discourses, which include everyday language as well as scientific and academic discourses. *Spatial metaphors* are a special case of *image metaphor*, in which knowledge from the spatial domain – source domain – is mapped onto the target domain (Lakoff 1993: 216). As sound and listening are perceptual experiences that are difficult to describe using literal terms, the use of spatial metaphors to describe them seems natural and appropriate for sound and music description.

Current musical concepts such as *high* and *low*, *structure*, *materials* and *form* are examples of spatial metaphors. *High* and *low* have obvious spatial associations, *structure* and *materials* seem to be borrowed from architecture or engineering, while *form* seems to be borrowed from painting or sculpture. A number of authors have also used spatial metaphors as key concepts in systems for music analysis and description. Examples are the concepts of *space as one of the essentials of music experience* (Clifton 1983), used to describe texture in instrumental music; *sonic space*, *noise-colouration space* and *timbre-space* (Wishart 1998) used to discuss the possibilities offered by different kinds of material in sonic art; *tonal pitch space* (Lerdahl 1988) used to describe the relationship between notes, chords and harmonies in tonal music; and *spectral space* (Smalley 1986, 1997) used to describe and analyse the properties and behaviour of sound as perceived by the listener in electroacoustic music. In spite of the spatial associations that they may suggest, tonality, texture, timbre or spectromorphological properties are not understood here as spatial properties of sound, and the use of spatial concepts to describe them is, therefore, classified as metaphorical. For that reason, within the taxonomy/typology suggested here, *metaphorical uses of space* can be conceptualised as the use of spatial concepts for the description of aspects of sound and music not

necessarily related to their spatial properties, such as *overall structure*, *rhythm*, *tonality*, *timbre*, *texture*, *pitch* or *spectromorphological properties*. It is important to stress that, when using these spatial metaphors, these authors are not describing the same phenomena or referring to the same aspects of music. Spatial metaphors are just a way of describing the specific aspects of music that each of these authors were discussing in their theories.

Literal uses of space, however, are related to the spatial properties of sound, as perceived by the listener/viewer. The four meanings of space discussed below are all literal, in the sense that they are related to specific aspects of the perception of sound in space, or to a general perception of space and its relation with aural perception. What characterises the new artistic practices that work with the spatiality of sound is the very use of space in a literal sense. Space becomes, then, not only a metaphor to describe different aspects of music, musical structure or how music or sound is perceived by the listener, but also a physical reality that, in interaction with sound, produces different kinds of aural perception.

4.2. Space as *acoustic space*

The first literal meaning of space – *acoustic space* – is related to the acoustic effects of the environment on sound, especially *sound reflection*, *diffraction* and *resonance*. The place in which sound propagates invariably imprints its acoustic signature on sound, being the most direct form of interaction between sound and physical space. The natural reverberation of music performance places is determined by a number of different factors – such as size, shape and covering materials – defined by social and cultural forces that shape architecture, and also by what is understood as good acoustics at a given historical, cultural and geographical context. The resulting acoustics defines a number of features of the music performed in these spaces, relative to tempi, rhythm, harmony and favoured timbres. One of the clearest examples of this interaction is the acoustic effect of large cathedrals on plainchant (Blessner and Salter 2007: 92). The same interaction can be observed in other periods of music history. Although not specified in the score, the acoustic features of performance places have been a fundamental force in shaping different aspects of music throughout its history.

The effects of reverberation on sound are also a fundamental aspect of recorded and electroacoustic music, being used primarily in three ways: (1) recorded natural reverberation; (2) use of artificial reverberation to simulate natural acoustics; and (3) use of signal processing to create unrealistic reverberant spaces. These ways of using reverberation are among the basic techniques of composition of electroacoustic music

and production of recorded music. The interaction between the reverberation present in the recording and the reverberation of the place where the recording is played is also an important aspect in the performance of any kind of recorded music. This interaction has been discussed by Smalley (1991) in the concepts of *superimposed space* and *diffused space*.

A number of composers have explored the effects of acoustic space in their works. Alvin Lucier in *I Am Sitting in a Room* (1970) recorded his own voice in a reverberant room and played this original recording in the same room to achieve another recording with the same resonances, repeating the procedure until the original voice was covered by the resonance and reverberation produced by the room. In Barry Truax's *Basilica* (1992), the reverberant effects present in the piece are achieved with the convolution of the voice with the impulse response of the basilica. Pauline Oliveros (1995) has explored different aspects of reverberation in live and fixed media works such as *The Bath* (1966), *Deep Listening* (1988), *The Roots of the Moment* (1987) and *Inside/Outside/Space* (1991). Other composers have also explored unusual resonances and reverberation not normally heard from the usual perspective of the listeners. In *Theme* (1994), Alvin Lucier inserts small microphones in the mouths of various vessels, through which a poem by John Ashbery is read. Similarly, in Smalley's *Empty Vessels* (1997), the perspective of the listener is shifted inside a garden pot. In George Crumb's *Makrokosmos* (1972), the perspective and resonances taken from inside the piano are amplified and used as part of the composition.

In the field of sound art, a number of artists have worked with different aspects of acoustic space. Michael Asher has explored different acoustic phenomena in his works: *sound absorption*, in his installation for *Spaces* (1969); *acoustic phase cancellation* in his work for La Jolla Museum of Art (1969); and *acoustic amplification* in his work for the Pomona College (1970) (LaBelle 2006: 88–90). Michael Brewster explores phenomena such as *room resonances*, *standing waves* and *acoustic shadows* to create sound sculptures in rooms carefully planned to enhance and interact with specific frequencies, creating clouds and other patterns of spatial distribution of sound, in works such as *allAROUNDyou* (1998), *See Hear Now* (2001) and *full o'stuff* (2000). Maryanne Amacher explores the effects of *structural vibrations* and *structure-borne sound* to create installations in which sound interacts with the architectonic features of buildings. In *Music for Sound-Joined Rooms* (started around 1980), for instance, powerful loudspeakers are placed inside an old house, and the sound travelling in the walls is used to transform the house into a huge resonator (LaBelle 2006: 167–72). Also working with the interaction between sound and architectonic spaces, Edwin

van der Heide in *Speed of Sound* (2007) explores the *differences in time and reverberation* produced by four corridors in the shape of rings in the big *Wasserpeicher* in Berlin. Raviv Ganchrow in *Crescents* (2010) explores the *accumulation of time-delayed acoustic reflection* produced by the spherical domes of a huge hydroplane hangar in Tallinn's northwestern coast, in Estonia (Brandon and Martinho 2011: 284–95).

In all these examples the resonances, reverberation or acoustic features of the environment where sound propagates are essential elements of the musical structure or of the perceptions that the composer/sound artist intends to produce in the listener. In all these works, in one way or another, the manner in which sound interacts with or is modified by its surroundings is a central concern. This is what characterises them as works in which *space as resonance* is a central concern and a structural element.

4.3. Space as sound spatialisation

The second literal meaning of space – *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. Sound spatialisation is the distinctive feature of *spatial music* or *spatialised music*, understood here as synonyms, in which the sound sources – voices, instruments and/or loudspeakers – are dispersed throughout the performance venue, thus challenging the traditional front-oriented relationship characteristic of Western concert music (Harley 1993: 128). Composers working with spatial music incorporate the perceptions of *distance*, *direction* and *motion* of sound as structural elements in their works (Stockhausen 1959; Chowning 1971; Malham 1998; Harley 1999) as well as the use of effects such as *envelopment of sound* (Rumsey 2005: 38) and *stream segregation* (Stockhausen 1959; (Bregman 1990; Wishart 1998).

The technologies for sound spatialisation started with monophony and multichannel monophony (Baalman 2010: 211), which produced important works such as *Symphonie pour un Homme Seul* (Schaeffer and Henry 1950), *William's Mix* (John Cage 1952) and *Gesang der Jünglinge* (Stockhausen 1956). Then the use of stereophony, in association with orchestras of loudspeakers and the practice of diffusion, became for a long time the format of choice for most composers working with spatial electroacoustic music, producing important works such as Bernard Parmegiani's *De Natura Sonorum* (1975) and *La Création du Monde* (1982–84), Françoise Bayle's *Vibrations Composées* (1973) and *Grande Polyphonie* (1974), Jonty Harrison's *Klang* (1982) and Denis Smalley's *Pentes* (1974), *Empty Vessels* (1997), *Wind Chimes* (1987) and *Valley Flow* (1991–92). The use of

multichannel formats started in the 1970s with quadraphony, in works such as *Sidewinder* (1970) by Morton Subotnik, *Sabelithe* (1971) and *Turenas* (1972) by John Chowning. The development of surround formats for movies in the early 1980s and the popularisation of digital technology that followed it led to the use of different multichannel formats for multichannel music, especially 5.1 (Babour 2002: 25), and also octophony (eight-channel). Other technologies that started to be used in multichannel spatial music include Ambisonics, Wave Field Synthesis (WFS) (Malham 2001), Vector Base Amplitude Panning (VBAP), Distance Base Amplitude Panning (DBAP) (Baalman 2010) and Hyperdense Transducer Array (HTA). The techniques used to work with sound spatialisation include recording techniques with multiple microphones, panning of mono, stereo or multichannel files, the use of live diffusion and a number of techniques especially designed to work with multichannel formats, such as *multichannel granulation* (Barreiro 2010: 247) and *spectral splitting* (Wilson and Harrison 2010: 247).

Since the 1950s, a number of non-permanent structures have also been built for sound spatialisation, such as the pavilion created by Le Corbusier and Xenakis for the Brussels World Exposition (1958), the German and Japanese pavilions built in Osaka's World Fair (1970), Xenakis's multimedia structures such as the Polytope (Montreal, 1966) and the Diatope (Paris, 1978) and Leo Küpper sound cupolas (Küpper 1997). Since the early 1970s, a number of permanent or portable systems have been created, such as the *Acousmonium* in Paris (Bayle 2007), the *Gmebaphone* in Bourges (Clozier 1997), the BEAST in Birmingham (Harrison 1999a, 1999b), the ZKM Klangdom in Karlsruhe, the Sonic Lab at the Sonic Arts Research Centre in Belfast and the Allosphere, at the University of California in Santa Barbara. The emergence of these systems allowed the development of research and compositional work exploring different kinds of sound spatialisation and diffusion techniques.

In the field of sound art, a number of artists have also explored the effects of sound spatialisation in their works. In two of his *Three Sounds* (1971), Howard Jones explores motion of sound: in *Linear Relay* a metronome sound travels through 20 equidistant loudspeakers placed in wall-casings that can be aligned in different ways (mounted on the walls or on the floor, for instance), and in *Area Relay*, sounds played through a grid of nine speakers produce different perceptions of distance and direction for a listener placed in front of them (Coe 2011). In Bernard Leitner's sound installation *Sound Space* (Berlin, 1984) amplified sounds move through 48 loudspeakers hidden behind panels in the walls of a staircase hall, drawing different trajectories through the architectonic space (LaBelle 2006: 178–9).

In all these examples, the spatial properties of sound such as perceived distance, direction and motion of sound are essential elements in the musical structure or in the perceptions that the composer/sound artist intends to produce in the listener. In all these works, their creators request from the listener/viewer a kind of attention focused on the way sound is placed or moves in the physical space where it is presented. This is what characterises them as works in which sound spatialisation is a central concern and a structural element. Attempts to reduce these works to stereo versions or to perform them in environments which do not reproduce the original conditions intended by their creators typically proves to produce poor experiences when compared to performances where all the spatial requirements of the works are fulfilled.

4.4. Space as reference

The third literal meaning of space – *reference* – is related to the ability of the auditory system to recognise 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. In musicology and music studies, the representational value of musical sound has been the object of intense controversy and debate (Ferrara 1991: 4–22). On the one hand, traditional views conceive music as a non-representational art, detached from any form of representation and disconnected from any external reality (Dufrenne 1973: 318). On the other hand, others criticise this conception as the incapacity to recognise the referential properties of sound, arguing also that it reflects an emphasis on the visual sense that tends to underestimate the potential of senses other than vision to give reliable information about the external world (Butor 1981: 449). The emergence of electroacoustic music and the use of recorded sound as material for composition brought to the fore these old controversies related to the use of reference in music, as the process of recording sounds from the reality inevitably opened the door to the use of the referential properties of sound in composition.

A number of composers working with electroacoustic music have discussed the use of reference in composition. Based on the concept of *mimesis*, Simon Emmerson (1986) suggests a typology with nine categories to classify works of electroacoustic music in terms of the kind of *discourse* and *syntax*. Trevor Wishart (1998) suggests the concept of *sound landscape* to describe the link of the sound with real or imagined sound sources, classifying them into three categories: real, imaginary and surrealist. Smalley suggests the concepts of *indicative fields* (Smalley 1992) and, later, *source bonding* (Smalley 1997) to discuss the referential aspects of recorded and synthesised sound in electroacoustic music. Norman (1994, 1996) suggests the

concept of *real-world music* to describe the electroacoustic music that uses referential sound to create narratives that establish a dialogue with reality. Other authors that discussed the use of referential sound in electroacoustic music include John Young (1996), Rajmil Fischmann (2008), Gabriele Proy (2002), Aki Pasoulas (2011), Dante Tanzi (2011) and James O'Callaghan (2011). A closer discussion of the various nuances involved in this discussion goes beyond the scope of this article. However, what is important to stress here is that, although a controversial subject in traditional musicology, and also among composers of electroacoustic music, the use of reference in electroacoustic music is a well-established practice, recognised by a number of theorists and practitioners in the field as one of its essential aspects.

The field of electroacoustic music that most clearly articulates the referential properties of sound to suggest or produce spatial experiences in the listener is *soundscape composition*, which, among other practices, uses environmental sound as material for composition in a way that 'preserves a clear degree of recognisability in its sounds [...] in order that the listener's recognition of and associations with these sounds may be invoked' (Truax 2002: 6). Composers working with *soundscape composition* may use, for instance, wildlife sounds and natural phenomena to evoke natural spaces, or sounds of cities to evoke urban spaces. Examples of works in which the referential properties of the sound have a structural function, in the sense that the recognisability of the sound sources is fundamental for their appreciation, are: Luc Ferrari's *Presque Rien no 1*; Hildegard Westerkamp's *Fantasie for Horns* (1978), *Cricket Voice* (1987) and *Kits Beach Soundwalk* (1989); Barry Truax's *Island* (2000); Katharine Norman's *People Underground* (1991); and Steven Feld's *Voices of the Rainforest* (1991). In all these works, the referential properties of the sounds are used to evoke in the listener the spatial impressions and associations produced by them: a small village in Croatia, a harbour in Vancouver, crickets in a field, a beach, an island, the London underground and the rainforest, respectively.

The use of space as reference is particularly important in electroacoustic music, that is, a kind of music that has been, within its relatively short tradition, performed indoors in concert halls more or less adapted or designed to accommodate its technical needs in terms of acoustics, number and placement of loudspeakers and possibilities of diffusion. When one speaks in terms of reference, in a broad sense, different kinds of referential meaning are possible, and many of them not necessarily related to spatial experiences. Therefore, the expression *space as reference*, in the context of this typology, refers to the use of the referential properties of sound to produce or recall in the listener the experience of being in places other than the

place where the music is performed. When sound artists and composers started to create site-specific works and to use spaces other than the concert hall to show their works, another dimension was added: the spatial impressions produced by the actual presence in a place other than the concert hall, with all its social, cultural, historical and environmental implications. This is what characterises the last literal meaning of space – space as *location* – and what differentiates it from space as *reference*: the use of the spatial impressions produced by senses other than listening, and its dialogue and interaction with the spatial impressions produced by sound.

4.5. Space as *location*

The fourth literal meaning of space – *location* – is related to a broader sense of space, produced by the actual presence of the listener/viewer in a specific place, or to what has been conceptualised as spatial perception. In fine art this global perception has been associated to site-specificity. Gibson defines spatial perception as 'a basic type of perception on which other perceptions depend, that is, the detection of the stable permanent framework of the environment' (Gibson 1966: 59). Perception of space relies on information provided by all perceptual systems: the *basic orienting system*; the *haptic system*; the *taste-smell system*; the *auditory system*; and the *visual system* (Gibson 1966: 49). Sound is part of this global perception of space, as each place has its own characteristic sounds and arouses specific expectations associated with it: sounds of animals and natural phenomena are expected to be heard in a forest, in the same way that sounds of traffic are expected to be heard in a busy street and sounds of musical instruments are expected to be heard in a concert hall.

In a conventional sense, space as location has been present throughout the whole history of music. The place where music is performed stimulates, and often demands, specific kinds of behaviour and attention on the part of the listeners, also producing different kinds of meaning that can be attributed to sounds. Ceremonial or martial music performed in a street requires a different kind of attention than that demanded for concert music in a concert hall, religious music in a church, rock music in a large stadium or electronic music in a dance club. There seems to be a strict correspondence between the behaviours expected from the audience, the kind of music performed, the architectural features of the performance places and the listening modes employed by the listeners. In this conventional sense, location is the physical and cultural space where music and musical activities take place, a more or less neutral background over which the music happens.

Since the 1950s, however, composers of experimental music and sound artists started to explore different ways of breaking the expectations of their audiences relative to what kind of sound they would listen to in specific places and situations, producing with their works different kinds of dislocation between sound and space. At first these dislocations were related to music performance places and expectations. Later they became a broader investigation of the relationship between sound and space, applied to any kind of place, including urban and natural environments, indoor and outdoor spaces of different kinds. When John Cage composed his *Sonatas and Interludes for Prepared Piano* (1946–48), he was already breaking the expectations of what listeners would normally expect to hear from a grand piano in a concert hall. Instead of the usual sounds of the piano, the audience heard a profusion of percussive sounds resembling more of a gamelan than a grand piano. In his *4'33"* (1952), instead of the sounds of the piano, Cage used as materials for composition the very sounds produced by the audience and the sounds already present in the auditorium. When composers of live soundscape music, such as Murray Schafer in *Music for a Wilderness Lake* (1979), started to use natural settings for instrumental or vocal performances, they were incorporating in their music not only an element of chance and the natural sounds of the environment, but also the potential for signification that the place was adding to the reception of their works.

In the field of sound art, a number of artists also started to explore different kinds of dislocation between sound and space, stimulating the reflection about the role of sound in the constitution of a global perception of space. In *City Links* (1967–80), Maryanne Amacher installed microphones at distant locations, feeding them to loudspeakers placed at other places, far from one another, connecting, for instance, the Buffalo Airport to Boston Harbour (LaBelle 2006: 171–2). The effect was that a listener/viewer at Buffalo Airport, instead of the usual sounds of the airport, would listen to the sounds of the Boston Harbour, and vice versa. In *Sound Island* (1994), using wireless real-time broadcast microphones, Bill Fontana sent sounds from the coast of Normandy to 48 loudspeakers across the *Arc de Triomphe* in the centre of Paris (LaBelle 2006: 231–3). A listener at the *Arc* would hear not only the normal sounds of the city traffic, but also the ocean sounds of the coast of Normandy. In both works, the listener/viewer experiments a sense of dislocation between the global perception of space produced by the real presence in a place and the spatial impressions produced by the sounds of other places.

Sound sculptures and interactive structures such as Max Eastley's *Sutton Edge* (1991) – in which sculptures placed in the valley produce sounds that are carried across the hills – and William Louis Sorensen's *Landing Ground for Waders* (1983) – in which structures built with basic

materials (wine bottles, wood, plastic) respond with sound to the action of the wind – rely on the perceptual effect produced by the introduction of non-natural sounds in a natural landscape (LaBelle 2006: 234–6). In this case, the introduction of non-indigenous sounds does not produce a dislocation between sound and space, but a different kind of perception of the landscape by the addition of new sound elements, with the new sounds being integrated in the original landscape and soundscape.

Westerkamp's *soundwalks* – in which the audience is invited to walk natural environments through specific routes to listen to their sounds – and works such as Steve Peters's *Here-ings* – in which the viewers/listeners are invited to walk and listen to the sounds of specific locations in a landscape in central Mexico – are also intended as works that produce a reflection about the listening mechanisms used in the perception of the environment and the role of the sound in the constitution of a global experience of space (LaBelle 2006: 234–6). Although these works do not involve a sense of dislocation between aural perception and other senses, the intention is to listen to the environmental sounds *as* music, to bring to the foreground the aural perceptions that are normally in the background, and to produce a renewed interest in the environmental sounds. This characteristic of producing a reflection about the role of sound in the constitution of a global perception of space and about the interaction between different perceptual modalities in the production of spatial perception is what characterises all the works mentioned in this section as works in which *space as location* is a central and structural concern.

5. FINAL CONSIDERATIONS

The investigation presented in this article started as an inquiry into the meaning of space in music and an attempt to answer to the question 'What is space in music?', which led to a broader investigation on the meaning of space in music and sound art. This was a natural movement, as the relationship between sound and space cannot be confined within the limits of a single discipline or artistic practice, as I hope to have shown with the discussion of each meaning of space and with the examples taken from both fields. The reflection brought by the typology suggested may help the composer and sound artist in their processes of creation, when making decisions about the spatial design of their works, when deciding which aspect or aspects of space they intend to work with, and when reflecting which aspects of the relationship between sound and space will be addressed in their works. For the theorist, as I believe to have shown in the short descriptions and analysis of the examples provided, it may offer a conceptual frame to discuss, criticise and classify the different works that deal with sound and space. As it has already been suggested, the five meanings of space are not exclusive, and may be found independently or in

connection with one another in different artworks. The examples given are not exhaustive, and a broader application of the ideas suggested here will offer a rich and varied field for future research.

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