THE UNIVERSITY OF HULL

The Sounds of Displacement: A Portfolio of Binaural Compositions

being a Thesis submitted for the Degree of Doctor of Philosophy

in the University of Hull

by

Matthew John Alexander Barnard, BA

May 2010

Submitted Works

CD 1

1. *Closely Observed Trains*	18’46”
2. *The Piano Makers*	16’21”
3. *Steam*	13’44”

CD 2

1. *The Billows That Break*	14’53”
2. *Woche (with apologies to Ruttmann and Brock)*	26’38”

CD 3 (Appendix 5)

1. *Interpretations of Façade*	9’23”

List of Sound Examples (CD 4)

1. *Closely Observed Trains* - Door mechanisms 3’57” to 4’30”
2. *Closely Observed Trains* - Door explosions 5’15” to 6’05”
3. *Closely Observed Trains* - Rhythmic reinterpretations 13’38” to 14’50”
4. *The Piano Makers* - Stringing process 4’00” onwards
5. *The Piano Makers* - Sanding process 8’24” onwards
6. *Closely Observed Trains* - Steam engine interior 10’10” to 12’10”
7. *Steam* - Steam engine interior recapitulation 8’45” to 11’18”
8. *The Billows That Break* - Submergence 7’00” to 8’05”
9. *The Billows That Break* - Woman on phone 9’29” to 11’20”
10. *Woche* - Pace montage 12’50” to 14’17”
11. *Woche* - Clapton cut 12’38” to 12’48”
12. *Woche* - Ruttmann pastiche 18’50” to 20’20”
13. *Closely Observed Trains* - Contextual transit 1’50” to 3’56”
14. *Steam* - Platform activity 7’10 to 7’32”
15. *Woche* - Musical Chairs movement 4’00” to 5’17”
16. *Woche* - Slides scene and lift conversation 7’45” to 8’42”
17. *Closely Observed Trains* - Internalised tonal material 6’03” to 9’20”
18. *Woche* - Toilet Break movement 17’40” to 18’20”
19. *Steam* - Sudden head movements 11’58” to 12’10”

List of Figures

Abstract

The portfolio presented comprises of five binaural acousmatic works composed primarily for headphone reproduction but also for multi-channel loudspeaker concert diffusion. The commentary traverses the programmatic and aesthetic considerations involved in the construction of the portfolio and the influence of the in-ear binaural method of recording and reproduction thereof. The spectral watermark (the effect of the recordist on the resulting recording), negative space (the space left by the recordist, subsequently occupied by the listener), spatial strategy and the contextually rich results of the method are discussed, along with their creative applications within the portfolio.

1 Soundscape Aesthetic

> "From 1963 on I listened to all the sounds which I had recorded, I found that they were like images. Not only for me who could remember them, but also for innocent listeners. Provide images, I told myself, contradictory images which catapult in the head with even more freedom than if one really saw them. Play with images like one plays with words in poetry."
>
> Luc Ferrari, *I Was Running in So Many Directions*[1]

> "Any time a sound is selected -- whether recorded, or just singled out ("listen!") -- attention has already transformed it."
>
> Joel Smith, *The Word 'Phonography'*[2]

The study of naturally occurring soundscapes reveals what R. Murray Schafer enthusiastically described as "..a continuous field of possibilities lying within the comprehensive dominion of music… the new orchestra: the sonic universe! And the musicians: anyone and anything that sounds!"[3]. If we subscribe to the assumption that all sound is potentially musical and that music itself is simply a method of listening, we can turn our attention to the potential musicality of the sonic environments we are continually experiencing – the musical potency of the everyday. Under this assumption, branches of acoustic ecology and the various forms of 'phonography', the practice of recording the sounds of a location as a document (analogous to photography[4]) are classed as music. The world is performing a constantly unfolding, naturally occurring composition, of which we are all part: we just have to listen.

---

[1] Ferrari L, 1996, I Was Running in So Many Directions, in: Norman K ed, *A Poetry of Reality, Composing with Recorded Sound*, Contemporary Music Review, 15(1 - 2), Harwood Academic Publishers, pp 95-102.

[2] Smith J, 2001, *The Word 'Phonography'* [online], Phonography.org. Available: http://www.phonography.org/word.htm, [accessed 15 November 2006].

[3] Schafer, R Murray, 1994, *The Soundscape; Our Sonic Environment and the Tuning of the World,* New York: Knopf, p 5.

[4] 'Phonography' literally means 'sound writing'.

The composer of acousmatic music, usually also the recordist and sound designer, must tackle with the notion of documenting this sound. Capturing and communicating the sonic environment, be it in the studio or in the field, is of great concern to a composer whose musical excursions often rely upon the semiotic fidelity of a sound recording, to convey the intended imagery and meanings.

Soundscape composition, defined by Hildegard Westerkamp as "…artistic, sonic transmission of meaning about place, time, environment and listening perception"[5] encourages a focus upon the fidelity of message, of musical idea involving soundscape and appraisal of the numerous recording and reproduction techniques available to the contemporary sound recordist.

Considering this preoccupation with communicating the characteristics of a sonic environment that permeates the aesthetics of soundscape composition, an approach that assists greater accuracy in representation (a moot characteristic?) or perhaps reduces discrimination during the recording process would result in a more comprehensive result.

The wider issue of representation within recordings is one that breaches the boundaries of this commentary, but surfaces during some aesthetic detailing of the portfolio. The issues of spatial representation and perspective, however, are areas of research explored during the course of study and bleed into the compositional framework utilised during the creation of the pieces.

---

[5] Westerkamp H, 1999, *Soundscape Composition : Linking Inner and Outer Worlds* [online], Simon Fraser University at Vancouver. Available: http://www.sfu.ca/~westerka/writingspage/articlespages/soundscapecomp.html [accessed 15 March 2009]

2 Programmatic Outline

2.1 Overview

> "I transform sound in order to highlight its original contours and meanings, similar to the manner in which a caricaturist sharpens the contours and our perception of a person's face."
>
> Hildegard Westerkamp, *Transformations*[6]

The portfolio is comprised of five substantial binaural acousmatic fixed-media compositions, designed primarily for headphone reproduction, but also for multi-channel loudspeaker concert diffusion. Aside from being unified by the binaural method, the portfolio revolves around the sounds of natural space and the musicality thereof.

Each of the pieces that constitute this portfolio involves a degree of departure from the source material. The sensibility of the composition style presented lies in the musicality of the natural sonic environment and the magnification of that musicality through manipulation.

The separate pieces entail certain particular programmatic concepts, each of which shall now be detailed, along with a number of canonical observations.

2.2 *Closely Observed Trains*

With no direct reference to the film of the same name, *Closely Observed Trains* is a piece that explores the sonority of the railway and underground network of England, using recordings of journeys undertaken from Scarborough to Nottingham, Nottingham to London and numerous journeys on the London Underground network. In the first

[6] Westerkamp H, 1996, *Transformations*, CD liner notes, Canada: empreintes DIGITALes.

piece to be composed for the portfolio, the orientation of interest lies in the direction of the mechanics involved in this form of transport, the sense of trajectory, its cultural significance and poetic qualities, the canonical importance of the sounds as material source and the sheer spectral variety of the sonic environments experienced during the excursions.

The material capture was observational, with various perspectives auditioned and recorded. The idea was to participate in the journeys in a conventional fashion, with some consideration made for the recording of particularly engaging sonic material, such as the automated door mechanisms, that contributed much of the derived material used in the piece.[7]

The main dynamic of the composition is that of soundscape juxtaposition and superimposition and the extraction and development of self contained gestural and tonal materials, in a series of acousmatic meditations. The term meditation is used tentatively, reflecting the attitude assumed when aiming to draw a sharp focus upon the intricacies of the material. One such example of this is during the movement at 3'57" to 4'30" (Sound Example 1), where the neat gestural material of the door mechanisms opening and closing is developed in a procession of warping phrases that increasingly reveal the internal dynamics. The concept is that of slowing and focusing, achieved through granular techniques allowing a 'scan' of the material. This idea is recapitulated in developed form in the section at 5'15" to 6'05" (Sound Example 2). The door material is processed in such a fashion as to give the impression of explosion and reformation, with a gestural dynamic of slowing time and perspectival shift to a more intimate aspect and back: a movement from an outer to an inner perspective of the material.

[7] Including the engine section at 10'10" that has been synthesised using the door sounds.

The public space of the station platform allowed not only the capture of fellow passengers' sound-creation but also a perspectival dynamic between the external (the most commonly studied) and internal sound of the train.

The significance of the train as a sound source within the acousmatic canon is far-reaching. The evocative and immediately recognisable sonic character of the technology has been the subject of numerous compositions.[8] Pierre Schaeffer's seminal *Etudes aux chemins de fer* is a piece from which direct influence was taken. The tape-splicing technique of early musique concrète informed the technique of the movement from 13'38" to 14'50" (Sound Example 3). Schaeffer's montaging of the mechanical clunks and rhythmical track transitions of trains is acknowledged by the slicing of similar recordings into small chunks that were then rearranged intuitively into new rhythmical interpretations.

2.3 *The Piano Makers*

The Piano Makers represents a slight technical and conceptual deviation to the other works in the portfolio. Whereas each of the accompanying pieces in the portfolio are composed from material obtained by passively experiencing certain sonic environments, *The Piano Makers* is constructed of recordings undertaken at the Kemble piano factory in Milton Keynes, during an organised visit. In addition to this, an abundance of recordings were made in the studios at the University of Hull, Scarborough Campus, of a grand piano and a Yamaha Disklavier piano[9] using the Jecklin disc technique of stereo recording.

---

[8] See Barry Truax *Pendlerdrøm*, Matthew Adkins *Melt,* Alistair McDonald *Dreel*, Pierre Schaeffer *Etudes aux chemins de fer*.

[9] A proprietary electronically controlled mechanical piano.

Inspiration for the piece was found in the book 'The Piano Makers' which detailed the history and process of piano manufacture. One fact triggered acousmatic imaginings: "The strings and frame of a grand piano must withstand about 20 tonnes of pressure."[10] The concept of the piece is largely derived from this thought: of tension and material, of process, and the musical representation of these things. An analogy of tension is drawn from the sounds of the rubber band, and a number of sounds were derived from playing the piano in unconventional ways, such as bowing the strings with the hair of a violin bow, muting the strings by hand and a number of scraping and percussive techniques of sound creation. The 'extra musical' sounds of the instrument were also studied, such as the creaking of the piano stool, the squeak of hinges and the associative material soundings. The very book from which the idea was derived features in the piece, reflecting the programmatic concept of reading and reflecting upon the intricacies of piano manufacture.

The field-recording facet of the piece has phonographical significance. The Kemble piano factory was the last to exist in the United Kingdom until its recent closure and relocation to Indonesia and Japan. Representing the last bastion of a distinguished history of piano manufacture in the country, the factory hosted a bustling production line that produced a number of models and makes in a step-by-step operation that was located in a snaking, largely open-plan building. This circumstance resulted in a 'lo-fi' soundscape[11] that proved difficult to treat in a manner that communicated the intricacies of the various techniques of manufacture effectively when posited in a composition. The reality that this sonic environment no longer exists endows the recordings with an

[10] Wainwright D, 1975, *The Piano Makers,* London: Hutchinson, fig. 52 caption.

[11] Schafer, R Murray, 1994, *The Soundscape; Our Sonic Environment and the Tuning of the World,* New York: Knopf, p 43.

importance beyond the musical exploitation of the piece, into the realm of acoustic ecology and phonographical documentation.

A number of select manufacturing processes were focused upon for the composition, namely the hammering of the tuning pins into the frame, the sanding of the soundboard, the stringing of the instrument and the sewing and cutting of the veneer. These processes were selected for either their programmatic implications or sonic qualities and provide referential foil for the occasionally ambiguous material that was gathered from the piano.

The material aside from the factory recordings was processed in select ways that reflected the concept of tension and pressure. The rubber band, anchoring the idea of tension, is convolved with the muted key strikes of the piano, retaining the fundamental character of each, but resulting in elastic, punctual passages of material. At 4'00" (Sound Example 4) this springy, bouncy material is juxtaposed with the recorded factory process of the stringing of the frame, with the intent of drawing contrast between the reality and the acousmatic interpretation whilst simultaneously encouraging the musical and programmatic relationship.

At 8'24" (Sound Example 5) the movement focuses on the sanding of the soundboard around the frame, a process that naturally produced complex harmonics. The bowing of piano strings with violin bow hair produced spectrally similar results and the similarity is drawn upon as the movement progresses. The pure sanding harmonics are lifted from the space and focused upon, before tonal slides 'slacken' the tension momentarily and a tonal rise and transformation take place into the bowed piano harmonics.

The piano is a sound source that has been employed in a variety of fashions within the tape music canon, from Javier Alvarez's *Papalotl*, Jonathon Harvey's *Tombeau De Messiaen* and Denis Smalley's *Piano Nets*: works for tape and piano; to Adrian Moore's *Superstrings*, Olly Wilson's *Piano Piece* and Matthew Adkins' *Silk to Steel*: fixed-media works. *The Piano Makers* marks a departure from the trend of previous compositions to focus on the instrument as a sound maker and shifts the emphasis onto the wider, contextual area of manufacture. The use of abstract association, with the use of the rubber band, and the study of less conventional piano-based sounds, such as the bowing technique, are a deliberate departure from the canon.

2.4 *Steam*

> "By comparison with the sounds of modern transportation, those of the trains were rich and characteristic: the whistle, the bell, the slow chuffing of the engine at the start, accelerating suddenly as the wheels slipped, then slowing again, the sudden explosions of escaping steam, the squeaking of the wheels, the rattling of the coaches, the clatter of the tracks, the thwack against the window as another train passed in the opposite direction – these were all memorable noises."
>
> R. Murray Schafer, *The Lore of Trains* in *The Soundscape*[12]

The steam railway network of North Yorkshire forms an anachronistic attraction to a great number of faithful enthusiasts around the country. This obsolete technology holds a romantic grip, with a culturally significant spectral fingerprint. Schafer would make the case that the steam railway system affords the area a soundmark, almost peculiar to the region and immediately betraying a broad semiotic network.

Steam is based upon the sounds of the station platforms and the steam locomotives that frequent them. In addition to this phonographically anchored tangent, the imagined

[12] Schafer, R Murray, 1994, *The Soundscape; Our Sonic Environment and the Tuning of the World,* New York: Knopf, p 81.

sounds of the steam engine are explored in a series of fabricated movements, attempting to communicate a sense of energy and trajectory.

A number of stations were visited during the sound gathering process, including Scarborough, Pickering and Goathland. In addition to the sounds of the public attending the platforms, the locomotives and carriages were recorded, mainly when stationary, and the sound of coal was obtained in a shameless demonstration of acousmatic skullduggery. The cellar of the author's home was the location of the recording undertaken for the sounds of coal, and these sounds are deployed in the composition, through association, as symbolic of the coal tender and firebox activity in a steam locomotive driver's cab.[13]

With obvious parallels to the theme of *Closely Observed Trains, Steam* is essentially part of a two-piece cycle, with a similar preoccupation and sound world. In fact, some aspects within *Steam* are references and extrapolations of moments within *Closely Observed Trains*.

The development at 10'10" to 12'10" (Sound Example 6) in *Closely,* the imagined activity of a steam engine, is stifled before properly attaining crescendo, never fulfilling the moment to its potential. The movement at 8'45" to 11'18" (Sound Example 7) in *Steam* is a recapitulation by proxy, achieved with some overlap of source material, with an extended dynamic register allowing a maturing of the idea and a fulfillment of the moment. The opening phrase of the piece is also a mirror of that in *Closely Observed*

[13] Following the performance of *Steam* on the 12th September 2009 in Scarborough, an audience member asked how the author obtained permission to record in the driver's cab of a locomotive, and was surprised by the true origin of the coal sounds.

Trains, with a similar typological grounding and gestural contour, but a contrasting resolution, highlighting a divergence in musical direction.

As described earlier, the train has a long and illustrious history in the realm of tape music, and the Schaefferian reference resurfaces in *Steam*, but in a more direct manner. In the coda of *Steam*, the locomotive has pulled away and before the sounds of creaking carriages conclude the piece, a whistle punctuates the soundscape. This sequence is almost identically homologous to the coda of Pierre Schaeffer's *Etudes aux Chemins de Fer*, and is a canonical observation not easily overlooked.

2.5 *The Billows That Break*

The Scarborough seafront is a location that provides a plethora of sonic activity: that of the sea, the wind, the anthropogenic activity of tourists and boatmen, the raucous calls of seagulls and the relentless electronic pulses of the seafront arcades. This reality, coupled with the unpredictability of the weather, made the recording of the material used in *The Billows That Break* quite challenging. The aim of this composition was to study various sonic manifestations of wave and wind energy around the south bay seafront and the sonic environments that accommodate them.

The Billows That Break is essentially in rondo form, with a recurring theme of water that appears in a number of incarnations, often through shifts in perspective. A billow is an old fashioned term for a large sea wave, and the main dynamic of exploration in the piece is the scale of the bodies of water being modulated by tidal and wind forces.

Canonically, the sounds of the sea, or less specifically the sounds of water, have been explored to a great extent[14], notably by Jean-Claude Risset in his *Sud* cycle, a 'sound photograph – a phonograph' of sounds recorded at the Calanques range in Marseilles.[15] This piece is perhaps the most relevant to this discussion due to its broader concern with the sonic environment surrounding the water source and Risset's intent to 'transpose profiles and flows of energy' between the sounds sources that include birdsong, insects, wood and metal chimes. Risset states:

> "The pulse of recorded sea sounds is thus imprinted on certain other sounds, whereas at other times sounds reminding of breaking waves are unrelated to the sea." [15]

This concept has been extrapolated in *The Billows That Break*. The piece begins with modest lapping of water at the harbour steps and progresses into larger waves crashing on the shore and further still into the sound of substantial waves colliding into the seawall and sea defenses. This dynamic is interspersed with the sound of gale-force winds that are presented in unprocessed and modulated form. The modulation is an abstract syntax,[16] created by vocoding heavily processed creaks and scrapes from moored boats swaying in the harbour. The gestural contour of the wind modulations are mirrored at 7'00" to 8'05" (Sound Example 8), where a perspectival shift takes place from the surface of the water to that of being completely submerged. The underwater phrases were created using the same vocoding technique and modulation source, recapitulating the opening wind phrase profiles.

---

[14] See Jonty Harrison *Streams*, Andrew Lewis *Cable Bay*, Robert Dow *Alluvion*, Yves Daoust *Water Music*.

[15] Risset J C, 1987, *Sud. Dialogues,* CD liner notes, Paris: Ina-GRM

[16] Emmerson S, 1986, The Relation of Language to Materials. In: Emmerson S ed, *The Language of Electroacoustic Music*. London: Macmillan, p 24.

Like each of the pieces of the portfolio, *The Billows That Break* is circumscribed to a particular location. The piece is not only concerned with the elemental forces of the Scarborough coast, but also the surrounding incidental occurrences witnessed during the recording process. The sounds of fleeting visitations by various people are strewn across the recordings, imparting further layers of discourse to the musical language presented. This is exemplified by the inclusion of the recording of a woman on the telephone to a sales representative at 9’29” to 11’20” (Sound Example 9), representing a departure from the main theme, but an insistent communication of the reality of the sonic environment.

2.6 *Woche (with apologies to Ruttmann and Brock)*

> "In London, as in all large cities, even a short walk can involve abrupt transitions from one sonic, and social, environment to another."
>
> Katherine Norman, *London E17*[17]

> "Since I began in the cinema, I had the idea of making something out of life, of creating a symphonic film out of the millions of energies that comprise the life of a big city."
>
> Walter Ruttmann, *Filmnotes for Berlin: Die Sinfonie der Großstadt*[18]

Woche is the most substantial work in the portfolio. Drawing on a number of influences, ideas and sound sources, it is also the most comprehensive demonstration of the aesthetic research that was conducted during the construction of the portfolio.

Woche presents a broad range of situations to the listener, in a series of scenes detailing a variety of sonic environments that could otherwise be inconspicuous without the scrutiny of the microphone and the intensification of the musical disposition.

The main subject of the composition is the city of London. However, it should be noted that the aim of the composition, programmatically, is not to communicate the fact that it is London, but referential material will reveal this to the listener familiar with the city.

The recording of the material used in the piece was undertaken during a week-long visit to the capital in March 2007, in a combination of locations that included the

[17] Norman K, 1993, *London E17,* Programme Notes [online], Novamara. Available: http://www.novamara.com/catalog.php [accessed 5 November 2006]

[18] Ruttmann W, no date, In: Sadoul G, 1972, *The Dictionary of Films*, University of California Press, p 31.

underground network, the Greenwich Observatory, the Tate Britain and Tate Modern galleries, the Imperial War Museum and the streets of the city. The piece also draws upon ideas influenced by two films by German filmmaker Walter Ruttmann, and sources sound material from the soundtracks of both.

Ruttmann's 1927 film *Berlin: Die Sinfonie der Großstadt / Berlin: Symphony of a Great City* is a silent work[19] that uses footage of metropolitan activity, shot in a semi-documentary style, to impart some impression of the rhythm and pace of the city of Berlin. Using a combination of montage and juxtaposition, numerous scenes, shot over the course of a year, are combined to represent the passage of a single day.

The style of rhythmical montage[20] employed in the film inspired the composition style of *Woche* to quite an extent. The section at 12'50" to 14'17" (Sound Example 10) is a manifestation of the idea of pace, with the hordes of commuters onrushing the listener in a series of waves.

The editing style is a reference to the film, abrupt and intuitive: the utterances of people are cut short, a busker's interpretation of an Eric Clapton number at 12'38" to 12'48" (Sound Example 11) is mercilessly (or mercifully) truncated and sound environments are changed with varying frequency, potentially before their nature is fully understood.

Further than only referencing the film in the abstract, Timothy Brock's 1995 soundtrack to *Berlin: Die Sinfonie der Großstadt* was sampled and utilised as source material for

[19] A score written by Edmund Meisel was composed for the premiere.

[20] A technique understood to have stemmed from Soviet Montage Theory.

the composition.[21] The role of this material is twofold: in addition to strengthening the reference to *Berlin:...,* the material, being of a symphonic nature, is chiefly tonal, and provides an extension to the sound palette offered by the natural environments recorded.

The second of Walter Ruttmann's films to be referenced in the piece is his experimental *Wochenende / Weekend*, made in 1930. *Wochenende* is thought to be the world's first imageless film, with only the soundtrack portion of the film used to create an aural montage.[22] Charting the story in sound of a family during a weekend in 1920s Germany, *Wochenende* can be regarded as a precusor to musique concrete, with a similar splicing technique used to achieve the abrupt, primitive editing style, but with an aesthetic anchored in the anecdotal.

The recording of *Wochenende* was directly sampled, with the intent of overt reference. The piece grows out of the confines of a low fidelity, monophonic, senescent audiotape, and into a high fidelity, binaural space, launching into the procession of junctures and spaces that shaped the experience. The concept of accounting a period of time, in this case a weekend, was extrapolated into the course of a week in *Woche,* the period of time over which the recording of material took place.[23] The sounds of the timekeeping mechanisms at the Greenwich Observatory help anchor this concept at 0'46" onwards and the recapitulation at 16'57" onwards.

---

[21] This soundtrack was, incidentally, partially recorded binaurally when visiting the Tate Modern gallery and thus actually contributed to the sonic environments experienced in the city.

[22] Hinant G M, 2005, *An anthology of noise & electronic music,* first a-chronology 1921-2001, CD liner notes, volume 1, Brussels: Sub Rosa.

[23] 'Woche' is German for 'Week'

The dynamic between the deteriorated tape of *Wochenende* and the clarity of the binaural space is further explored in a rather overt exchange of events. The movement at 18'50" to 20'20" (Sound Example 12) is a combined pastiche of the *Wochenende* approach to material and also a demonstration of some remarkable similarities between Ruttmann's recordings and the recordings made for *Woche*: the spectral and typological similarities of the horns of passing traffic, lively confabulation between people, laughter, distant shouting and various mechanical exertions. These similarities, however distinct, are purely serendipitous, but usefully reinforce the reference. The gestural contours of the 1930 original were mimicked and reinterpreted, extrapolating the syntax into the contrasting binaural space.

3 Binaural Aesthetics

3.1 Introduction

This body of works was composed in a manner that focused upon the binaural method of recording and reproduction as a vehicle for acousmatic music composition. The in-ear binaural method[24] was used for the field-based soundscape recording, with the Jecklin-disk[25] method employed for the few studio-based recording sessions undertaken. The importance of the binaural method should be clarified: not used simply for added-effect or gimmick, the technique offers several aesthetic artifacts and forced certain influential creative decisions and considerations during the compositional process. Therefore, the portfolio of works presented has been composed with this recording method at the forefront of many, but certainly not all, compositional decisions.

3.2 Current Praxis

3.2.1 Perspective

Initially, in order to frame the aesthetics of the portfolio and contextualise the research, it is important to discuss practitioners who share the binaural method of recording and reproduction as the medium of their musical explorations, identify their aesthetic preoccupations and finally distinguish how they differ from the author's.

---

[24] In brief, binaural recording exploits the manner in which humans aurally interpret the environment. Binaural refers to the use of both ears. A small microphone is worn in each ear. As a recording technique, the anatomical effects of the body and, more significantly, the head and ears (head-related transfer functions or HRTFs) result in the capture of particular spatial cues in the form of stereo recordings. When reproduced over headphones, a spatially-vivid virtual soundstage is recreated that, with a varying degree of success, will sound alike to the recorded environment as heard by the recordist.

[25] Put simply, the Jecklin-disk is an acoustic baffle used for stereo recording, positioned in-between two omni-directional microphones, enhancing the separation between the stereo channels, mimicking the binaural effect.

A unifying characteristic of existing binaural audio art practice is recognition of the peculiar perspective that the medium offers to both the composer and listener, and how this can be exploited during the capture of a sound environment. Dallas Simpson, a composer of binaural soundworks, considers the method distinct:

> "The binaural recording technique is unique in that a fair, if somewhat variable and limited, representation of human three dimensional perception of sound may be achieved. This represents my acoustic reality of that location and the art of my experience and communion with it."[26]

When discussing perspective within film, both visually and aurally, Michel Chion identifies a distinction, and Jon Aveyard attributes it to the binaural method[27]: *spatial point-of-audition* (a soundscape heard through the perspective of a non-presence) and *subjective point-of-audition* (a soundscape heard through the perspective of a participating but not necessarily audible recordist)[28].

The points-of-audition provide a perspectival framework for the acousmatic composer to explore and, although mutually exclusive, the avenue exists to roam between both of Chion's outlined perspectives within a composition. This is a compositional dynamic explored subtly within the portfolio, and is discussed later.

---

[26] Simpson D, no date, *The Art of Binaural Location Performance* [Online], Available: http://www.dallassimpson.com/BinauralPerformance.cfm [accessed 21 March 2007]

[27] Aveyard J, 2008, Electroacoustic Compositions for Headphone Playback using Binaural Recordings, *Royal Music Asssociation Annual Conference* 2008, Aberdeen, 15th July.

[28] Chion M, 1994, edited and translated by Gorbman C**,** *Audio-vision: sound on screen,* New York: Columbia University Press, p 89.

3.2.2 Interventionism

One result of the quite organic in-ear recording method is a seemingly raised awareness of the recordist to their presence in the soundscape. This has led to an interventionist style of 'soundwalk' where the recordist can 'appear' in the soundscape and alter the surrounding environment, imparting new sonic activity, animating or *performing* the space. Barry Truax defines this aspect of soundwalking as *soundmaking*.[29]

Jon Aveyard has composed works exploring this method, both as soundwalks in natural spaces and as object-based performance, where he interacts with the sound material in a more isolated, focused manner. Dallas Simpson's soundwalk technique can involve such interaction:

> "I seek out a location. I perceive the sound universe of that location – this represents the acoustic reality of that space. But a large component of my perception of that space is visual and there may be tactile and olfactory components of that perception also. These latter perceptions have no reality in sound. They are literally non-existent in the acoustic soundspace. As an artist I may desire to explore that environment in such a way that I transform some of the acoustically invisible visual (or other) realities into sound."[30]

This participation creates a distinction of aesthetic. In a sense, this interventionist subjective point-of-audition is a conducting of the soundscape: awareness of Schafer's sound event extrapolated into the realm of the inanimate, requiring a performer to reveal and aurally objectify features of interest that would otherwise not be transmitted through the acousmatic medium.

---

[29] Truax B, 1999, In: *Handbook for acoustic ecology*, CD-ROM edition version 1.1, Truax B ed, Canada: Cambridge street publishing.

[30] Simpson D, no date, *The Art of Binaural Location Performance* [Online], Available: http://www.dallassimpson.com/BinauralPerformance.cfm [accessed 21 March 2007]

3.2.3 Site-Specificity and Spatial Superimposition

Following the theme of perspective, some composers choose to employ narration or commentary as a method of revealing to the listener what Simpson designates as 'acoustically invisible' features of an environment.

Composers Janet Cardiff, Sara Heitlinger and Lucy Stevens have utilised the binaural method to compose narrated soundwalks, where the listener is guided by voice-over accompanying a soundscape recording, presented with varying degrees of compositional intervention. These soundwalks are of a site-specific nature, which requires the compositions to be heard in the same location as they were recorded.

This site-specificity indirectly reveals another exploitable feature of the binaural method. Cardiff states:

> "...the walks are pre-recorded on the same site that you then later get led through. Even in sound we recognize space, and so if I were to record somewhere else and play it back here, people would realize that, oh, the sound of the water isn't coming from the right place … and that would bother them. But when it is being replicated or verified by the same environment it fits in so well that it becomes a new reality. Also it becomes a soundtrack for the physical reality, almost like physical cinema. The visual aspect of the world becomes the visuals for the soundtrack that you are listening to."[31]

Binaural recordings, when reproduced in the proper manner (over headphones), are externalised. Unlike most conventional stereo signals, that can sound internalised or intra-cranial, the sound is enveloping, representing a circumspace[32]. An appropriate

[31] Cardiff J, 2006, In: *Janet Cardiff and George Bures Miller interviewed by Michael Juul Holm* [online], Louisiana Contemporary: Janet Cardiff & George Bures Miller. Ed. Michael Juul Holm, and Mette Marcus. Exh. cat. Louisiana Museum of Modern Art. Humlebæk. Available: http://www.cardiffmiller.com/press/texts/JanetCardiff_GeorgeBuresMiller_by_Michael_Juul_Holm.pdf [accessed 25 June 2009]

[32] Smalley D, 2007, Space-form and the acousmatic image, *Organised Sound*, 12(1) pp 35–58.

analogy is that of a window: a conventional stereo signal is akin to looking out of a window from within a room, whereas a binaural signal would be like stepping through the window and into a surrounding environment. The listener is framed by the sound and when listening to a binaural recording within the same space that the recording took place, the sounds are effectively superimposed onto the environment, betraying an aural past that is given new significance when presented in such a fashion. Begault defines this visual attribution of virtual sound image to real-world object as the 'ventriloquist effect'.[33] The relationships between the virtual and actual soundscapes can be explored and exploited[34], and the juxtaposition of the externalised soundscape recording and the intra-cranial narrator forces spatial counterpoint, with a clear delineation of perspective between the two elements.

3.2.4 Portfolio Context

Aside from an active community of phonographers who adopt the binaural recording method, the use of the technique is not particularly widespread within the acousmatic community. There are very few examples of compositions that involve levels of digital signal processing similar to those applied to the material within this portfolio and, in general, the employment of the technique for the composition of fixed-media acousmatic works is unusual.

---

[33] Begault D R, 1994, *3-D Sound for Virtual Reality and Multimedia*. London: AP Professional, p 84.

[34] This site-specificity and layering of soundscapes is at a tangent to the thread of the portfolio presented, but is a technique that was explored by the author for a collaborative project held at the Woodend Creative Space in Scarborough, as part of the venue's launch in October 2008. Details of this project can be found in Appendix 6.

Of the binaural aspects discussed above, the notions of perspective and interventionism are those that permeate the aesthetics of the portfolio presented, with the former a fundamental detail and the latter a compositional consideration. The issue of site-specificity is one that does not apply to the body of works included in this portfolio.

3.3 Gravitation Towards Context

3.3.1 The Nature of Omni-Directional Polar Pick-up Patterns

> "Just like the camera, the recorder never lies. But it only tells the truth permitted to it."
>
> R. Weidenaar, *Composing with the Soundscape of Jones Street*[35]

Although this discussion is not routed within the technical, there are a number of technological factors that have informed the compositional process during the selection and construction of the material. One of these, and perhaps the most significant, is the nature of the polar pick-up pattern required for binaural recording.

Omni-directional microphones are as close to indiscriminate as is practically possible, given the restrictions of diaphragm-based microphone construction that results in a front face and surrounding casing. As the binaural method works under the premise of recording what is heard by the recordist, the capture of sonic environments becomes intuitive: what you hear is what you get. Aside from the practical advantages of this, such as the freedom from monitoring the recorded signal separately, it results in a recording that by comparison to conventional stereo recordings, is very comprehensive, to the possible extent of seeming too active, as all sonic activity within earshot is captured. The selective nature of common directional stereo recording has been

[35] Weidenaar R, 2002, Composing with the Soundscape of Jones Street, *Organised Sound*, 7, pp 65-72.

abandoned and the truth permitted to the recorder is broader and more detailed. This characteristic draws the discussion to one of the main areas of interest within the portfolio: the issue and aesthetic of context.

3.3.2 A Context-Centric Approach

The natural soundscapes that formed most of the source material of the presented works are, or were, bristling with activity: the public spaces of the city of London in *Woche*; the modern railway networks of England in *Closely Observed Trains*; the obsolete but defiant steam railway network of Yorkshire in *Steam*; the now closed Kemble piano factory of Milton Keynes in *The Piano Makers;* and the elemental seafront of Scarborough in *The Billows That Break.* These spaces translated into recordings that, although busy, are rich with referential, anecdotal sonorous activity that offer many tangents of meaning and symbolism. An inability to eschew the additional activity that isn't necessarily of immediate interest, forces the hand of the composer to consider a musical language inclusive of the situations surrounding engaging sound events.

The adoption of a context-centric approach shifts the aesthetic away from Pierre Schaeffer, toward R. Murray Schafer: material is presented, to the larger extent, in a dialogue of sound events, explicit in their representations and implications, whilst the role of the idealistic sound object is an implicit one.

Simon Emmerson recognises the duality of meaning in sound divorced from source and suggests a consciousness of both potential meanings:

> "For the composer of electroacoustic music this duality in content may be used to advantage. Even for those not interested in manipulating these associated images in composition, it must at least be taken into account." [36]

This duality is used as advantage: sounds are often selected for either their symbolism or spectral quality, and if the former, the surrounding referential material is not sidestepped, but embraced and deployed within the composition as additional discourse. A prime example of this can be heard at 1'50" to 3'56" (Sound Example 13) in *Closely Observed Trains*, where the main thread of discourse is that of transit, as the scene blends into the sound of a journey on the London Underground. The listener is placed in the seat and, in addition to the mechanical sonority of the train, hears activity that is unusually not commonly associated with the sound of public transport: the sounds of fellow passengers. Indeed, the coughs and sneezes of the passengers are posited in such a manner as to encourage consideration by the listener, with the use of repetition and occasional spectral reinforcement. Sounds such as these don't necessarily define the sonic environment exclusively, but they contribute to the perceived whole and reflect the reality of the situation. When discussing context in soundscape composition, McCartney states:

> "An attention to context means that composers often choose to work with the sounds of particular places, listening intently to the sources, relationships, reverberations and movement of sounds within those places, in order to understand them sonically, then to express that understanding."[37]

---

[36] Emmerson S, 1986, The Relation of Language to Materials. In: Emmerson S ed, *The Language of Electroacoustic Music*. London: Macmillan, p 19.

[37] McCartney A, 2000, *Soundscape Composition and the Subversion of Electroacoustic Norms*, [online] eContact 3.4, CEC. Available: http://cec.concordia.ca/econtact/naisa/soundscape.html [accessed 14 February 2009]

This observation succinctly identifies this preoccupation, which not only grips onto the notion of the sound event, with its complex network of signifiers, but also extends into a consideration of acoustic ecology: the relationship of individuals and communities to their sonic environment.[38] The focus of *Closely Observed Trains* and *Steam* is not only the technology of railway transport, but also the culture that it envelops. The activity of the public stood on the platform at Scarborough station as the Scarborough Spa Express pulled in is captured and used in *Steam* at 7'10 to 7'32" (Sound Example 14). The enthusiasm of a young boy is heard, as he runs along the platform to see the locomotive, despite the declaration that his trousers are falling down; elsewhere in the piece, a plea to Harry to move out of the way of a photograph and a father enthusiastically describing the actions of the crew to his son can be heard. Although this activity was not the focus during the recording process, it contextualises the programmatic focus and, to appease Westerkamp, results in a more comprehensive 'artistic, sonic transmission' of the sonic environments experienced. The preoccupation with context (and the approach of working with whatever is recorded) results in a symbolically dense soundwork. Sound material is deployed in a manner that affords the listener a number of threads to engage with, in parallel to the main compositional vein: the extra-musical becomes thoroughly the musical.

3.4 Capturing the Natural

3.4.1 The Discreet Nature of the Method

Soundscape aesthetics revolve around a preoccupation with observation and representation. The sonic environments that pervade the portfolio compositions have been captured in a fashion that, largely, minimises the effects of the recordists presence

[38] Truax B, 1999, In: *Handbook for acoustic ecology*, CD-ROM edition version 1.1, Truax B ed, Canada: Cambridge street publishing.

on the phenomena of interest. The physical form of the in-ear binaural microphone is discreet in relation to alternative stereo microphone forms (see Figure 1).

Figure 1. SoundProfessionals SP-TFB-2 In-ear Binaural Microphones.

This discreet nature allows for an inconspicuous presence in the environment being recorded, and affords a certain candidness to the recording process. When contemplating the affects of the visible microphone on the behaviour of people in an environment, Dani Iosafat identifies the problem:

> "What is perhaps the most significant issue … is that it alters human-related features of place. Like any kind of observation, it disturbs the phenomenon: people are reacting in one way or another to the sight of a microphone. The primary concern was not the sonic quality of the result but the transparency of the process, in order to ensure that what is being recorded is unaffected by the presence of the recordist."[39]

This reluctance to capture any 'performance' by people during the recording process is a preoccupation shared by the author. The analogy of the film camera can be called upon: the tendency of people to 'play up to the camera', altering their behaviour in reaction to the observer's presence.

[39] Iosafat D, 2009, On Sonification of Place: Psychosonography and Urban Portrait, *Organised Sound*, 14(1), pp 47-55.

The in-ear binaural method negates this problem. Seemingly, the assumption is made that the recordist is listening to a personal stereo and there is no assumption of aural observation. This allowed for a number of interesting serendipitous vocalisations by people to be captured during the recording process and subsequently deployed in the resulting compositions. It is therefore argued that these moments would not have been captured with the same natural quality if using an alternative, conspicuous method of recording.

3.4.2 Acousmatic Exploitation of the Voice

> "We have split the sound from the maker of the sound. Sounds have been torn from their sockets and given an amplified and independent existence."
>
> R. Murray Schafer, *Schizophonia*[40]

These recorded moments have been exploited in a number of instances throughout the body of works: from brief utterances to fragments of conversations, the speech of the unsuspecting public is given new, musical meaning. In many cases, the sound of people talking is posited as a consequence of the context-driven aesthetic, in a manner that Cathy Lane would categorise as 'Narrative suggestion' where 'vocal events are not foregrounded but used to indicate human presence or human activity',[41] representational of the recorded situations. The disembodiment of the voice is an electroacoustic quality. When contemplating the effect of any sound being divorced from its source through electroacoustic capture, Schafer proposes the somewhat unsettling term 'schizophonics' to convey the split of sound and source, a term that hints at the resulting potential to alter the portrayal of these sounds and the variability of their interpretation, given the lack of

[40] Schafer, R Murray, 1994, *The Soundscape; Our Sonic Environment and the Tuning of the World*, New York: Knopf, p 90.

[41] Lane C, 2006, Voices from the Past: compositional approaches to using recorded speech, *Organised Sound,* 11(1), pp 3-11.

visual sustenance. This variability of interpretation, to which unspecific utterances made by the public are susceptible, has been explored to musical ends, an example of which can be heard in *Woche*, during the 'Musical Chairs' movement at 4'00" to 5'17" (Sound Example 15). The recording was made in the Tate Britain Gallery in London, in a currently unknown installation that involved the shadows of various objects, such as ladders and furniture, projected onto the walls of a large room. Luckily, there were some school children wondering around the gallery, and a small group entered the space and began to joke around, referring to the shadow projected by a chair. The ambiguity that arises from their references to visual subjects, "look at the chair", "watch this" etc. and the acousmatic reproduction thereof, opens up an opportunity to aurally define the subjects of their utterances that are otherwise 'acoustically invisible'. John Levack Drever, when deliberating the exploitation of such utterances, defines the power the composer holds:

> "The subject's persona is rendered, by the act of appropriation, into a ventriloquist's dummy, communicating the artists' messages as opposed to the subject's utterance."[42]

This 'ventriloquism' is manifested in the 'Musical Chairs' movement. The chair that the schoolchildren refer to is musically animated (the technique of accumulation of meaning through sonic association[41]), through the adoption of wooden creaks and squeaks and a tonal foil; a moment that grows with the enthusiasm of the utterances, until suddenly a child breaks wind, and disturbs the musical development. The vocalisations have therefore taken on a new nature, a musical nature of which the composer was free to define. This principle of positing the speech of the public within the weave of a composition is one that permeates the portfolio and is demonstrated further at 9'29" to 11'20" (Sound Example 9) in *The Billows That Break*, as one side of

[41] Lane C, 2006, Voices from the Past: compositional approaches to using recorded speech, *Organised Sound,* 11(1), pp 3-11.

[42] Drever J L, 1999, The Exploitation of 'Tangible Ghosts': Conjectures on Soundscape Recording and Its Reappropriation in Sound Art, *Organised Sound,* 4(1), pp 25-29.

a woman's conversation with a customer service centre is allowed to play out, staggered across a number of movements in the piece. The role of this material becomes extra-musical, contributing a comedic facet to the piece, celebrating the serendipitous nature of the recording and the aesthetic mechanisms that allow for it. It simultaneously contrasts with the sound material of the surrounding piece but represents that nature of the recording space: a public space. The gravitation toward context informed such compositional decisions.

3.5 Binaural Spatio-Musical Strategy

3.5.1 The 'Hardwired' Space

> "...the composer who creates the illusion of relative motion between the listener and the auditory space has a rich palette of meaning from which to draw."
>
> Barry Truax, *The Moving Perspective*[43]

Space is a powerful, much explored parameter in acousmatic music, and the binaural method procures a curious set of considerations and opportunities to the composer when engaging with the spatial details of a composition. A critical factor of binaural recording is its translation into only two audio channels. Alternative, multi-channel surround sound methods, including 5.1 and b-format ambisonics, offer the composer a number of post-recording spatialisation techniques, such as rotation and other parameters to control the disposition of the sound field. The limitations of stereo bind the binaural method to a fixed sound field configuration: the disposition of sounds in a binaural recording cannot be altered without jeopardising the delicate localisation cues that translate into the externalised, enveloping soundstage. In other words, the recorded binaural space is hardwired, unalterable and inflexible to perspectival rotations or repositions. A result of

[43] Truax B, 2002, Genres and techniques of soundscape composition as developed at Simon Fraser University, *Organised Sound,* (7)1, pp 5-14.

this fact means that, inevitably, the spatial syntax of a binaural recording is abstracted, to adopt Emmerson's language[44]. This is a critical consideration to be made by the binaural recordist, and calls for a spatial strategy in the first instance of composition: the recording stage.

3.5.2 Navigational Recording Strategy

Owen Chapman, a soundscape composer and researcher, considers the significance of the recording stage to the soundscape artist in general:

> "The creative instincts (and skill) of the soundscape composer are present even in seemingly simple production choices such as deciding where to walk and point a microphone. These constitute the first of many acts of mixing through listening for the soundscape artist."[45]

The reality of the hardwired space requires a raised consciousness to the position and direction of the recordist in a sonic environment of interest. All movement, be it movement around a space or a change of the direction in which the recordist is facing,[46] is translated into perspectival changes for the listener. Trevor Wishart categorised the motion of sounds in relation to the listener as either object or frame motion. Object motion is the perceived movement of a sound or sounds moving autonomously, whereas frame motion is the movement of a virtual environment that envelops the listener.[47]

---

[44] Emmerson S, 1986, The Relation of Language to Materials. In: Emmerson S ed, *The Language of Electroacoustic Music*. London: Macmillan, p 24.

[45] Chapman O, 2009, The Icebreaker: Soundscape works as everyday sound art, Organised Sound, 14(1), pp 83-88.

[46] Including subtle head movements.

[47] Wishart T, 1996, *On Sonic Art*, Emmerson S ed, Amsterdam : Harwood Academic Publishers, p 202.

Jon Aveyard has attributed this definition of frame motion to perceived movement in binaural recordings:

> "Following Wishart's definition, frame motion is where the entire soundscape moves in spatial synchronicity. This gives the impression either of the entire environment moving around the listener or of the listener moving through the environment."[48]

This consideration is critical when deciding upon a navigational strategy, during a 'soundwalk'. A natural sonic environment is diverse: minor changes in the position of the recordist in relation to the environment causes spectral and referential alteration, potentially drawing attention to or from a particular sound source or number of sources. This understanding has contributed to some compositional decisions made during the construction of the portfolio.

In contrast to the traditional studio-based recording method of performing spatial movements to the microphones, the binaural method requires the negotiation of an environment where the movement of the microphones are writing the spatial narrative: essentially an inversion of the process. This contributes to a composition in the form of reconstructed soundscapes that have been auditioned from a number of perspectives, that can suggest motion through a space and potentially become self-referential, through the verbal participation of people. In *Woche* at 7'45" to 8'42" (Sound Example 16), the listener is presented with the sound of screaming children, who are participating in the Tate Modern turbine hall installation *Test Site* by Carsten Holler: a giant slide.

The nature of the sound is far from immediately obvious to the listener, but due to a navigational strategy that involved auditioning the sonic environment from a number of

[48] Aveyard J, 2008, Electroacoustic Compositions for Headphone Playback using Binaural Recordings, *Royal Music Asssociation Annual Conference* 2008, Aberdeen, 15th July.

perspectives, a serendipitous moment was captured: the conversation, about the children screaming on the slides, between a mother and young daughter in a lift just next to the slide entrance. Helpfully, the child asks: "Why are they screaming?" and the mother replies, "They are excited.... or scared" to which the child declares, "I wouldn't be scared if I go on a really slidey slide." The reveal is made and the referential network of the scene has stronger foundations, with a verbal signpost. Consideration of capturing a number of perspectives lead to the possibility of this moment to be recorded and posited in the manner it was.

3.5.3 The Internal/External Dynamic

The characteristic of binaural recordings to be externalised by the listener, as opposed to sounding intracranial, has already been mentioned when discussing existing practitioners combining binaural soundwalks with narration. The soundwalk recording is externalised, but the voice of the narrator will sound intracranial, or internal, owing to the lack of binaural localisation cues. This difference between the binaural signal and the signal devoid of binaural cues extends the spatial register available to the binaural composer: the possibility to explore a spatial dynamic between the internalised and externalised aural space.

This aesthetic has been explored in each of the pieces to various extents. The complex and delicate spatial cues that define a binaural signal are easily jeopardised through certain digital signal processes that influence the stereo phase information of a recording. When this has occurred during the construction of the portfolio compositions, the decision was made to avoid artificial binaural panning and exploit the lack of binaural cues in heavily processed signals. This results in a more profound spatial dynamic within a composition, as the spatial register has been extended. An example of

this can be heard at 6'03" to 9'20" (Sound Example 17) in *Closely Observed Trains*, during a movement that explores a sweeping tonal space, derived from the screeching brakes of the underground trains. The binaural spatial cues were lost during the granular processing, and the contrast between this somewhat internal space and the external, binaural spaces in the neighbouring movements can be drawn upon.

In *Woche*, the dynamic between the monophonic, senescent tape of Ruttmann's *Wochenende* and the binaural recordings of the London soundscape is more overt exploitation of this dynamic. During the pastiche of *Wochenende* at 18'50" (Sound Example 12), the spatial contrast is at its deepest: the original is intracranial, the reinterpretation externalised and enveloping.

3.5.4 Revealing the Subject of Chion's Subjective Point-of-Audition

The aesthetic of interventionism on the binaural soundscape has been discussed previously, but the aesthetic of reflexiveness[49] as a dynamic has not. The subjective point-of-audition of in-ear binaural recording allows the listener an assumption of the nature of the perspective offered: that of the recordist. This presence is often hidden, as part of common binaural recording practice is to aurally remove oneself from the soundscape by minimising any sounds of movement (such as footsteps and the rustling of clothes) and noises of the body (such as swallowing and breathing). It can become, therefore, a powerful parameter to explore within a composition.

The majority of the portfolio maintains the shroud, presenting the listener with a perspective from which they are to observe, with no obvious reference to the presence of the recordist. However, in *Woche* at 17'40" to 18'20" (Sound Example 18) during the

[49] Reflexivity is the consideration of the effects of the presence of the agent or researcher upon what is being observed or investigated.

‘Toilet break’ movement, the recordist’s presence is revealed, during a hand-washing and drying scene: a peek behind the acousmatic curtain. The shroud is jeopardised further during the moment at 11’58” to 12’10” (Sound Example 19) in *Steam* when a quick (admittedly accidental at the time, but deployed deliberately in the composition) movement of the recordist’s head, a sudden frame motion, inconsistent with the spatial syntax of the piece, may discombobulate the listener, and the moment becomes more obviously reflexive.

3.6 Negative Space

3.6.1 Spectral Watermark and Listener/Recordist Symmetry

The nature of the binaural medium is peculiar: the human recordist is part of the recording apparatus, affecting the incoming signal before it reaches the electroacoustic black-box of the fixed media recording format. These combined affects, the head-related transfer functions, are stored in an indelible fashion on the recordings. The organic nature of this results in a unique spectral profile of the recordist existing in all in-ear binaural recordings made, a characteristic that can be known as the *spectral watermark*.

The intervention of the composer has begun at a fundamental level, prior even to the selection of recording location and perspective and ahead of any studio-based negotiation of the material. Musically, the implications of this are essentially inconsequential, in that the watermark does not impart any syntactically significant contribution, but aesthetically, its identification is significant: the recordings become carriers not only of what was heard, but how it was heard and the idiosyncrasy thereof.

The listener of a binaural recording has displaced the recordist and assumed their position in the now virtual space, a symmetry that raises questions concerning the space that is occupied in each of the recording and reproduction processes.

3.6.2 Negative Space

In visual art, negative space is defined as the area around and between the subject or subjects of an image, an important consideration in visual art composition, aiding definition. To further illustrate the notion, Rubin's *Vase* (See Figure 2) exploits negative space to the extent that it becomes the focal point of interest in the image. The reversal of figure (the vase) and ground (the surrounding canvas) reveals the profile of two opposing faces of a man: an optical illusion.

Figure 2. Rubin's *Vase* and silhouetted version

Negative space therefore defines the positive space, the point of interest or meaning, and the relationship is inextricable. Musical negative space is commonly defined temporally, denoting the silence or space between sounds in a musical passage that is necessary for defining a musical language.[50] The analogy of visual negative space is the interpretation

[50] Cummings C, *The Musical "Culture of Time and Space",* [online] ex-tempore.org, Available: http://www.ex-tempore.org/CUMMINGS.htm [accessed 14 February 2009]

of interest in this case, in an attempt to define the spatial, not temporal, characteristics of a binaural signal.

Firstly, a definition of positive binaural space is necessary. Positive space constitutes the areas of meaning, in other words, the actual sound heard in a binaural signal by the listener, and the disposition of these sounds in the virtual space. Spatially, it could be suggested that any silence in the soundstage, such as the space in-between sounds, constitute negative space, and this is perhaps a useful definition for extrapolating the concept to other techniques of sound recording and reproduction, such as multi-channel surround formats. In binaural recording theory, however, this definition doesn't quite reach far enough, not accounting explicitly for the presence of the recordist in the space during recording.

The affect of the recordist on the sound incoming to the in-ear microphones will be simplified to that of displacement. A useful analogy is that of a sink full of water and a glass. If the glass is lowered, upright or upside-down, into the water up to the rim, the water is displaced and a space exists in the middle of the glass, free of water. The water represents the positive space in a binaural recording: the surrounding sonic environment. The volume of the glass represents the space occupied by the recordist: a void to be inhabited by the listener upon reproduction.

The simple presence of the silent recordist during binaural recording doesn't translate into immediate discernable meaning to a listener that the recorded sounds do: the presence doesn't contribute any positive space. Therefore, the fact that the recordist's presence defines, quite profoundly, the resulting recording, particularly in terms of spatial disposition and definition; essentially delineating the aural space, but isn't the

focal point of meaning, denotes a spatially negative role. The in-ear binaural signal therefore has an inherent negative space that shall be occupied by the listener whenever reproduction is executed over headphones. It is critical to the definition of the sound image.

4 Conclusions

The binaural method of recording and reproduction offers the acousmatic composer, particularly the soundscape composer, a collection of aesthetic peculiarities and creative challenges. These aesthetics distinguish the method from other techniques of sound recording and reproduction: the role of the recordist as recording apparatus and its product, the spectral watermark; the nature of the first-person perspective and the negative space the listener occupies; the hardwiring of the inherent spatial parameter and the extended spatial register of the internal/external dynamic; the discreet nature of the apparatus and the advantages thereof; and the indiscriminate nature of the microphones, the earshot aesthetic and the contextually dense recorded results.

The compositions that have emerged from the study of the method are rich in reference and symbolism, evoking location and environment whilst exploring a dynamic of interpretation and musical magnification.

Appendix 1 - Programme Notes

***Closely Observed Trains,* 2008** **18'46"**

Comprising of reconstructed and transformed soundscape material, derived entirely from journeys I have undertaken on the train and undergound networks of England, *Closely Observed Trains* is a comprehensive study of the sonic environments experienced.

In-ear binaural microphones were used to record all of the materials, providing a unique window on the sonority of public transport spaces and a peculiar perspective of the sonic environments. Aesthetically, the train is observed from various angles of interest; trajectory, mass, material, mechanics, rhythm and the wider, poetic and symbolising characteristics.

No Nazi munitions trains were sabotaged during the making of this piece.

***The Piano Makers,* 2010** **16'21"**

From 'The Piano Makers', written by D. Wainwright:

The frame and strings
of a fully strung grand piano
must withstand the pressure
of about 20 tonnes

The Kemble piano factory in Milton Keynes was the last to exist in the UK until its recent relocation to Indonesia and Japan. Using binaural recordings made during a visit to the factory before its closure, *The Piano Makers* is a study of piano material and manufacture, and the idea of the tension and pressure that the instrument withstands. In addition to this material, unconventional sounds of the piano, including muted key strikes and bowing are deployed to explore the concept.

With thanks to Peter Corney and all of the Kemble Pianos Ltd. employees at Milton Keynes for obliging my intrusion.

***Steam,* 2009** **13'44"**

Recorded binaurally, this piece examines the sounds witnessed at various railway platforms in Yorkshire, where steam locomotives still operate. In addition to this, material that is associated with steam power, namely coal, was recorded and developed. The transformed and imagined soundscapes are woven into a piece that investigates the scale and energy of the obsolete technology.

***The Billows That Break,* 2010** **14'53"**

Billow
noun

a large undulating mass of something, typically cloud, smoke, or steam.

(Archaic) a large sea wave.

The Billows That Break explores the manifestations of energy in the sea and air around the Scarborough South Bay seafront and the sonic environments that accommodate them.

The manifestations are varied, real and imagined: the lapping of tide to the slapping of wave on seawall... the whistling wind to the blustering gale... the effervescence of eddies to the simmering phone conversation (?)

The Billows That Break was recorded binaurally.

Parental Guidance (Mild Language/Call Centre Animosity)

***Woche (with apologies to Ruttmann and Brock),* 2009** **26'38"**

"Ruttmann's film could scarcely be used to guide a stranger arriving in Berlin for the first time. It summarises far more the memories and residual moods of a traveller leaving that city. If nevertheless the film contains a characterisation of the city, it is not in the shots themselves, but through their montage and rhythm."

Anonymous

OR

"Barnard's piece could scarcely be used to guide a stranger arriving in London for the first time. It summarises far more the memories and residual moods of a traveller leaving that city. If nevertheless the piece contains a characterisation of the city, it is not in the sounds themselves, but through their montage and rhythm."

———

Using material recorded binaurally over a week long visit to London, *Woche...* aims, with reference to both Walter Ruttmann's *Wochenende* (1930), *Berlin: Die Sinfonie der Großstadt* (1927) and Timothy Brock's 1995 soundtrack for *Berlin:...*, to communicate on some level the pace and rhythm of the city, and the fleeting experiences of a visitor.

Greenwich I
Musical Chairs
City Symphony
Slides
A Soundwalk I
Too Many People I
Brock and the Escalator
Greenwich II
Toilet Break
A Ruttmann
A Soundwalk II
Too many People II

Appendix 2 - Performances and Presentations

Woche (with apologies to Ruttmann and Brock) **26'38"**

Concert Performance

- Soundings Festival, Reid Concert Hall, Edinburgh, 7th November 2009

Steam **13'44"**

Concert Performance

- LEAST (Leicester ElectroAcoustic Sound Team), St. Andrews Church, Leicester, 27th January 2010

- Scarborough Electroacoustics Postgraduate Day, University of Hull, Scarborough Campus, 12th September 2009

Closely Observed Trains **18'46"**

Concert Performance:

- "Sound, Sight, Space and Play" International postgraduate student conference, Music, Technology and Innovation Research Centre of De Montfort University Leicester, 2nd - 4th June 2010

As Installation:

- Royal Music Association Annual Conference 2008, Aberdeen, 15th -18th July 2008

- AVPhD "SOUND!" Tyne and Wear, The Centre for Research in Media and Cultural Studies, University of Sunderland, Sunderland, 4th July 2008

As fixed media performance:

- Australasian Computer Music Conference 2008, Sydney, 10th – 12th July 2008. *'Audio/Video Jukebox'*

As a featured work online:

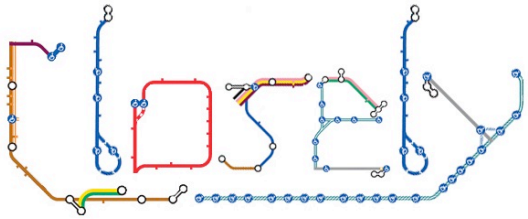
- URBANsoundWORKS as part of Fabbrica Europa 08 - City mix + Radio Papesse, Siena, 3rd – 30th May 2008, http://tinyurl.com/mbarnard

Variations on Façade **(installation)** **9'23"**

- Crescent Artspace at Woodend Creative Workspace, Scarborough, 4th - 14th October, 2008

Appendix 3 - Conference Presentation Format and Booklet

When exhibited in conference, the works have been presented in an installation via a headphone listening station, with numerous pairs of headphones available for auditioning of the works. The listening equipment has been accompanied by a supplementary booklet that contains photography, artwork, poetry and aesthetic musings that relate to the presented pieces. The pages of the booklet for *Closely Observed Trains* follow. The original document was printed on once-fold A4 textured card and presented as an A5 booklet.



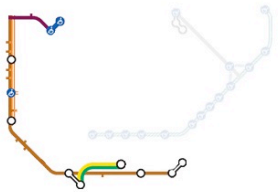
Observed Trains

Matthew Barnard THE UNIVERSITY OF HULL @ Scarborough

CLOSELY OBSERVED TRAINS

2007

DURATION: 18:43



Comprising of reconstructed and transformed soundscape material, derived entirely from sounds captured during journeys on the train and underground networks of England, *Closely Observed Trains* is a comprehensive study of the sonic environments experienced.

In-ear binaural microphones were used to record all of the materials, providing a unique window on the sonority of public transport spaces and a peculiar perspective of the sonic environments. Aesthetically, the train is observed from various angles of interest; trajectory, mass, material, mechanics, rhythm and the wider, poetic and symbolising characteristics.

No Nazi munitions trains were sabotaged during the making of this piece.

Train

noun

1 a string of railway carriages or wagons with a locomotive

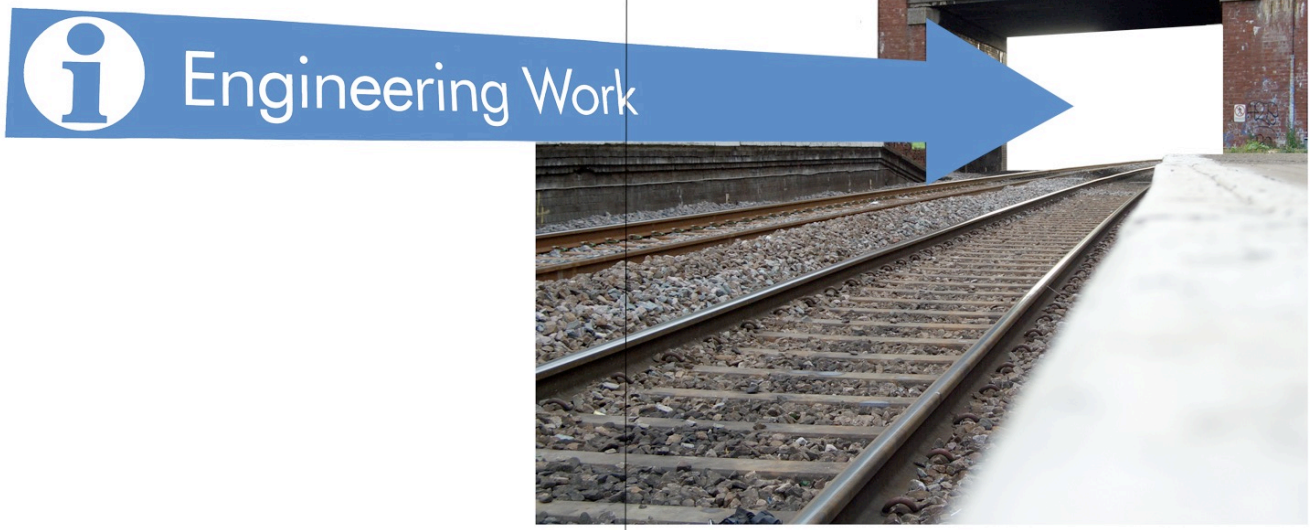
2 a connected series of events, actions, ideas, thoughts, etc


Class
STD
Ticket type
SAVER RETURN
Adult
ONE
Child
NIL
OUT
RTN
From
SCARBOROUGH
To
ABERDEEN
Start date
15-JLY-88
Valid until
14-AUG-88
Route
ANY PERMITTED
Price
£113.50
Validity
SEE RESTRICTIONS
Number
67356
2-PART RETURN


Look what you gain when you travel by train
Now: Reading to Bath, a smooth 51 minutes
Now: Reading to Bristol Temple Meads, a comfortable 67 minutes
Now: Reading to Cardiff, a relaxing 89 minutes
Now: Reading to Swansea, an easy 147 minutes
Pick up a free copy of the pocket timetable
Inter-City 125 makes the going easy
INTERCITY

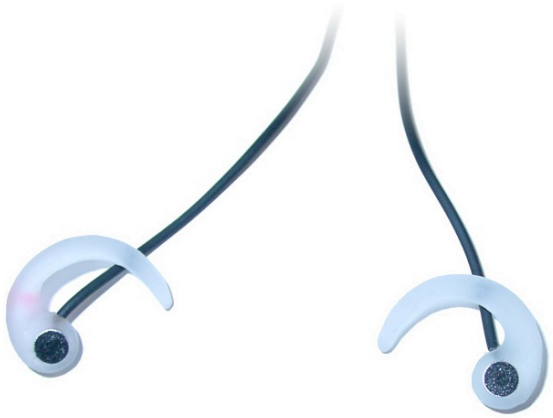

STEAM!
ELECTRIFICATION
SOUTHERN ELECTRIC
WINTER
SOUTH FOR
SUNSHINE


Motorists... Avoid road congestion and travel fatigue
WEST OF ENGLAND CAR TOURIST SERVICE
LONDON (PADDINGTON) AND CORNWALL (ST. AUSTELL)
ATTRACTIVE INCLUSIVE RATES FOR PASSENGERS AND THEIR CARS
EACH WEEKDAY
FROM 17TH. APRIL UNTIL 26TH. OCTOBER 1957
(EXCEPT GOOD FRIDAY 19TH APRIL AND EASTER MONDAY 22ND APRIL)
TRAVEL BY TRAIN AND LET THE RAILWAY TAKE CARE OF YOUR CAR
FULL DETAILS FROM STATIONS, OFFICES & AGENCIES
WESTERN BRITISH RAILWAYS REGION



(Services between *Here* and *There* are replaced by buses)

"Oh Mr Porter, what shall I do?
I wanted to go to Birmingham
and they've carried me on to Crewe"

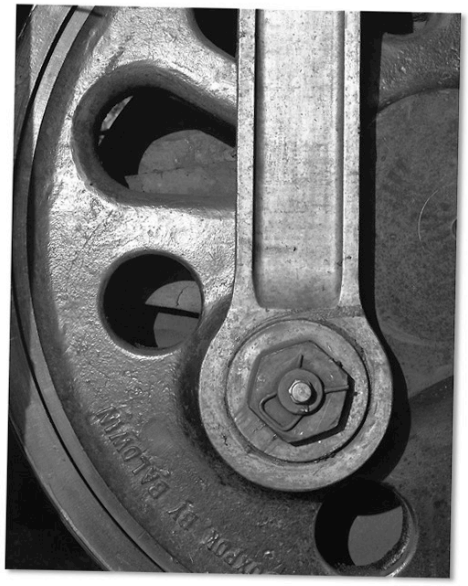


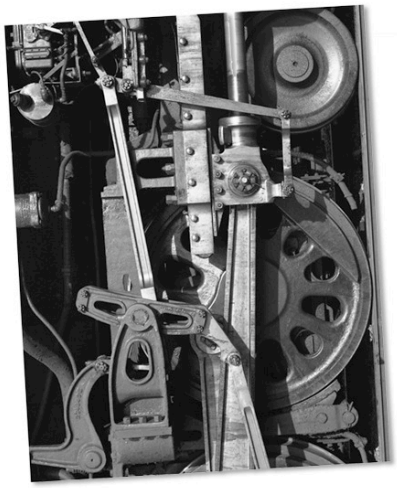
The
Binaural Method of recording and reproduction

The in-ear binaural method of recording involves two small omni-directional microphones placed in each ear of the wearer, providing a two channel signal for recording. The omni-directional pick-up patterns of the microphones, coupled with the head-related transfer functions and other discreet spectral transformations caused by the human anatomy, results in an accurate recording of a sound environment as heard by the wearer of the microphones.

When the signal is reproduced over headphones the sound environment is reproduced, to varying extents, as the microphone-wearer heard it.

In comparison to conventional stereo recordings, binaural recordings sound immersive and enveloping.



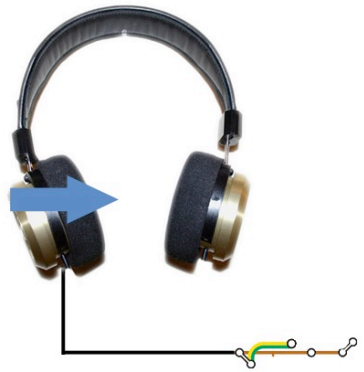


Kenilworth
a study in railway signalling

"...The last stop before Penzance is St. Erth, a journey of about fifteen by the slowest train. However according to the timetable, this particular train leaves St. Erth at 19.51 and arrives at 02.05, thus taking 5 1/4 hours to do 6 3/4 miles!"

S. W. Hewitt

You are here
(I was there)

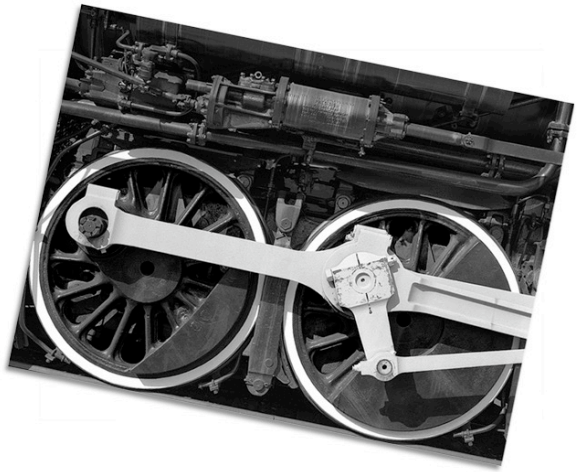


The recordings for ***Closely Observed Trains*** were made using the binaural method, with the composer wearing the microphones.

This means that the source recordings harbour a sort of 'watermark' as a result of my anatomical interference with the original sound: you are hearing what I heard, theoretically as I heard it.

This 'negative space' that I occupied during the recording process is now occupied by you, the listener.

How convincingly the soundscape is reproduced depends upon, the similarity of your head and ears to my own, and the quality and style of the headphones through which you are listening,



Matthew Barnard is a PhD candidate at the ***University of Hull, Scarborough campus,*** studying composition under the supervision of ***Joseph Anderson.***

Research interests revolve around the binaural method of recording and reproduction; its aesthetic implications, advantages and employment in the compositional process.

2008

m.j.barnard@drama.hull.ac.uk

THE UNIVERSITY OF HULL @ Scarborough

Appendix 4 - Notes on Binaural Listening

Binaural signals are designed for headphone reproduction. In an ideal situation, a high level of spatial fidelity will be achieved upon playback, with a well-defined panoramic soundstage and vivid disposition of sound sources. The success of the technique is, however, widely variable. A common issue to experience when listening to a binaural recording is an ambiguity between what is positioned in front and behind. This is thought to be due to the human tendency to aid sound localisation with head movements and the visual attribution of sound to source. The result of this can mean that listeners will experience a soundstage that appears to wrap-around the back of their head or alternatively an hourglass effect that results in a soundstage that appears to be pinched in the middle and sounds intracranial apart from the information in the left and right of the panorama.

Factors that can affect the success of the binaural fidelity include the difference of the listener's head-related transfer function to that of the recordist's and the design and quality of the headphones being used for audition.

Appendix 5 - *Variations on Façade,* 2008 9'23"

This installation piece was composed as part of an exhibition that aimed to give a contemporary insight into the artistic legacy of Edith, Osbert and Sacheverell Sitwell. Wood End, the former home of the Sitwells in Scarborough, North Yorkshire, was the venue for this collaboration between Crescent Artspace, students and tutors from the Yorkshire Coast College costume design department, Alan Ayckbourn Scholarship students from the Steven Joseph Theatre in Scarborough and the Creative Music Technology department of the University of Hull, Scarborough Campus.

The installation that was contributed by the author was a site-specific binaural composition that reinterpreted the poetry of Edith Sitwell. The overarching concept of the exhibition was the idea of evoking the ghosts of the former residents, through the reference of their creative output. Recitals of Edith Sitwell's poetry collection *Façade* were recorded binaurally in the second room of the Wood End space, with the performers being positioned in various orientations and distances from the recordist. This was undertaken with consideration that the listener would be positioned in approximately the same position as the microphones, thus exploiting the virtual/actual relationships of the sonic environment. In addition to the poetry, other sounds, such as footsteps, were also recorded in the space, and a number of sounds recorded binaurally or binaurally spatialised formed the pool of material.

Figure 3. Woodend Installation

The piece was played on loop, with two pairs of headphones available to listeners (See Figure 3). The piece was designed to be sympathetic to the accompanying artwork in the space that included sculpture, photography and other audio-based works, as well as following the vein of the overarching concept. This piece is not regarded by the author as particularly successful in musical terms, but constitutes a proof-of-concept of site-specific and binaural aesthetics, and therefore suffers greatly from reproduction outside of the intended space.

References and Bibliography

Aveyard J, 2008, Electroacoustic Compositions for Headphone Playback using Binaural Recordings, *Royal Music Asssociation Annual Conference* 2008, Aberdeen, 15th July.

Barreiro D L, 2010, Sonic Image and Acousmatic Listening, *Organised Sound,* 15(1) pp 35-42.

Begault D R, 1994, *3-D Sound for Virtual Reality and Multimedia*. London: AP Professional.

Borwick J ed, 2001*, Sound Recording Practice*, Fourth Edition, Oxford: Oxford University Press

Cardiff J, 2006, In: *Janet Cardiff and George Bures Miller interviewed by Michael Juul Holm* [online]*,* Louisiana Contemporary: Janet Cardiff & George Bures Miller. Ed. Michael Juul Holm, and Mette Marcus. Exh. cat. Louisiana Museum of Modern Art. Humlebæk. Available: http://www.cardiffmiller.com/press/texts/JanetCardiff_GeorgeBuresMiller_by_Michael_Juul_Holm.pdf [accessed 25 June 2009]

Chapman O, 2009, The Icebreaker: Soundscape works as everyday sound art, *Organised Sound,* 14(1), pp 83-88.

Chion M, 1994, edited and translated by Gorbman C**,** *Audio-vision: sound on screen,* New York: Columbia University Press.

Conrad J, *Optimum Stereo Signal Recording with the Jecklin Disk* [online], Josephson Engineering, Inc., Santa Cruz, CA. Available: http://www.josephson.com/tn5.html [accessed 3 March 2007]

Cummings C, *The Musical "Culture of Time and Space",* [online] ex-tempore.org, Available: http://www.ex-tempore.org/CUMMINGS.htm [accessed 14 February 2009]

Davis W, 1946, *The Pursuit of Music*, London: Nelson and Sons Ltd.

Drever J L, 1999, The Exploitation of 'Tangible Ghosts': Conjectures on Soundscape Recording and Its Reappropriation in Sound Art, *Organised Sound,* 4(1), pp 25-29.

Drever J L, 2002, Soundscape composition: the convergence of ethnography and acousmatic music, *Organised Sound,* 7(1), pp 21–7.

Emmerson S, 1986, The Relation of Language to Materials. In: Emmerson S ed, *The Language of Electroacoustic Music.* London: Macmillan.

Emmerson S, 1999, Aural landscape: musical space, *Organised Sound,* 3(2), pp 135-140.

Emmerson S ed, 2000, *Music, Electronic Media, and Culture,* Aldershot: Ashgate

Ferrari L, 1996, I Was Running in So Many Directions, in: Norman K ed, *A Poetry of Reality, Composing with Recorded Sound*, Contemporary Music Review, 15(1 - 2), Harwood Academic Publishers, pp 95-102.

Hinant G M, 2005, *An anthology of noise & electronic music,* first a-chronology 1921-2001 [CD liner notes], volume 1, Brussels: Sub Rosa.

Iosafat D, 2009, On Sonification of Place: Psychosonography and Urban Portrait, *Organised Sound*, 14(1), pp 47-55.

Kaye N, 2000, *Site-specific Art*, London: Routledge

Kern S, 1983, *The Culture of Time and Space:1880-1918*, Cambridge: Harvard University Press.

Lane C, 2006, Voices from the Past: compositional approaches to using recorded speech, *Organised Sound,* 11(1), pp 3-11.

Malham D G, 1998, Approaches to spatialisation*, Organised Sound*, 3(2), pp 167-177.

McCartney A, 2002a, Circumscribed journeys through soundscape composition*, Organised Sound*, 7(1), pp 1-3.

McCartney A, 2000b, *Soundscape Composition and the Subversion of Electroacoustic Norms*, [online] eContact 3.4, CEC. Available: http://cec.concordia.ca/econtact/naisa/soundscape.html [accessed 14 February 2009]

Norman K, 1993, *London E17,* Programme Notes [online], Novamara. Available: http://www.novamara.com/catalog.php [accessed 5 November 2006]

Nyman M, 1999, *Experimental Music: Cage and Beyond 2nd Ed*, Cambridge: University Press.

Parry A S, 2000, *Limits of Abstraction in Electroacoustic Music,* PhD dissertation, London: City University.

Proy G, 2002, Sound and sign*, Organised Sound*, 7(1), pp 15-19.

Risset J C, 1987, *Sud. Dialogues,* CD liner notes, Paris: Ina-GRM

Rudi J, 2005, 'From a musical point of view, the world is musical at any given moment': an interview with Bill Fontana, *Organised Sound,* 10(2), pp 97-101.

Ruttmann W, no date, In: Sadoul G, 1972, *The Dictionary of Films*, University of California Press.

Schafer, R Murray, 1994, *The Soundscape; Our Sonic Environment and the Tuning of the World,* New York: Knopf.

Scruton R, 1997, *The Aesthetics of Music*. Oxford: Oxford University Press.

Simpson D, no date, *The Art of Binaural Location Performance* [Online], Available: http://www.dallassimpson.com/BinauralPerformance.cfm [accessed 21 March 2007]

Smalley D, 1986, Spectro-morphology and Structuring Processes, In: Emmerson S ed, *The Language of Electroacoustic Music*. London: Macmillan.

Smalley D, 2007, Space-form and the acousmatic image*, Organised Sound*, 12(1) pp 35–58.

Smith J, 2001, *The Word 'Phonography'* [online], Phonography.org. Available: http://www.phonography.org/word.htm, [accessed 15 November 2006].

Truax B, 1994, The inner and outer complexity of music, *Perspectives of new music,* 32(1), pp 176-193.

Truax B, 1999, In: *Handbook for acoustic ecology*, CD-ROM edition version 1.1, Truax B ed, Canada: Cambridge street publishing.

Truax B, 2001, *Acoustic Communication*, Second Edition, London: Ablex.

Truax B, 2002, Genres and techniques of soundscape composition as developed at Simon Fraser University, *Organised Sound,* (7)1, pp 5-14.

Wainwright D, 1975, *The Piano Makers,* London: Hutchinson.

Weidenaar R*,* 2002, Composing with the Soundscape of Jones Street*, Organised Sound*, 7, pp 65-72.

Westerkamp H, 1999, *Soundscape Composition : Linking Inner and Outer Worlds* [online], Simon Fraser University at Vancouver. Available: http://www.sfu.ca/~westerka/writingspage/articlespages/soundscapecomp.html [accessed 15 March 2009]

Westerkamp H, 1996, *Transformations* (CD liner notes), Canada: empreintes DIGITALes.

Wishart T, 1986, Sound Symbols and Landscapes, In: Emmerson S ed, *The Language of Electroacoustic Music*. London: Macmillan.

Wishart T, 1996, *On Sonic Art*, Emmerson S ed, Amsterdam : Harwood Academic Publishers.

Young J, 2007, Reflections on Sound Image Design in Electroacoustic Music, *Organised Sound,* 12(1), pp25–33.