

# **A PORTFOLIO OF ACOUSMATIC COMPOSITIONS**

**BY**

**DAVID HINDMARCH**

A thesis submitted to  
the University of Birmingham  
for the degree of  
DOCTOR OF PHILOSOPHY

Department of Music  
School of Languages, Cultures, Art History and Music  
College of Arts and Law  
University of Birmingham  
December 2009

UNIVERSITY OF  
BIRMINGHAM

**University of Birmingham Research Archive**

**e-theses repository**

This unpublished thesis/dissertation is copyright of the author and/or third parties. The intellectual property rights of the author or third parties in respect of this work are as defined by The Copyright Designs and Patents Act 1988 or as modified by any successor legislation.

Any use made of information contained in this thesis/dissertation must be in accordance with that legislation and must be properly acknowledged. Further distribution or reproduction in any format is prohibited without the permission of the copyright holder.

## **ABSTRACT**

This portfolio charts my development as a composer during a period of three years. The works it contains are all acousmatic; they investigate sonic material through articulation and gesture, and place emphasis on spatial movement through both stereophony and multi-channel environments.

The portfolio is written as a personal journey, with minimal reference to academic thinking, exploring the development of my techniques when composing acousmatic music. At the root of my compositional work is the examination and analysis of recorded sounds; these are extrapolated from musical phrases and gestural movement, which form the basis of my musical language. The nine pieces of the portfolio thus explore, emphasise and develop the distinct properties of the recorded source sounds, deriving from them articulated phrasing and gesture which are developed to give sound objects the ability to move in a stereo or multi-channel space with expressive force and sonic clarity. There is also a strong use of the qualities and characteristics of the human voice in my work, particularly in the spectral domain – formant and resonant filtering processes are used in the pieces in this portfolio to enhance the organic nature of concrete, real-world sounds.

The combination of spatialisation, gesture and phrasing, with appropriate signal processing for the sound materials, form the basis of the nine works presented here.

## **DEDICATION**

To Sally Zimmerman, Secretary to the Elizabeth Eagle Bott Memorial Fund.

## ACKNOWLEDGEMENTS

Serena Alexander: For providing extended vocal material for two of my pieces.

Elizabeth Eagle Bott Memorial Fund: For providing me with substantial financial support during my PhD, as well as directly funding the PhD.

Rasmus Ekman: For making such an accessible application as Granulab. It would have been much harder to create the sounds I required without this wonderful program.

Simon Emmerson: For his support of my music throughout the PhD.

Jonty Harrison: For allowing me to undertake the PhD; it was a big risk since, as far as I understand it, I am the only blind person to have composed acousmatic music for multiple speakers.

Adrian Moore: For introducing me to some accessible VST convolution plugins and generally being supportive of my music.

Elisabeth C Newton: For proof-reading my portfolio and generally supporting me with the completing of forms and dealing with the paper enemy.

Carl Peberdy: For helping me deal with unfriendly software, and creating the most interesting instruments for me to compose my music. Without his help it would have been very hard to begin the PhD.

Simon B Smith: For his enthusiasm and encouragement, as well as constantly looking for new ways to help me access software and find original ways of composing new music.

Sally Anne Zimmermann: Who has personally supported me throughout my PhD as well as keeping my mind focused during the inevitable PhD blues.

## CONTENTS

Introduction .....	Page 1
Chapter 1 <i>Reach</i> .....	Page 8
Chapter 2 <i>Trebuchet</i> .....	Page 13
Chapter 3 <i>Proliferation and Experimentation</i> .....	Page 17
Chapter 4 <i>Two Complementary Works</i> .....	Page 26
Chapter 5 <i>Nature Room</i> .....	Page 31
Chapter 6 <i>Inside Out</i> .....	Page 33
Conclusion .....	Page 37
Appendix 1 .....	Page 42
Appendix 2 .....	Page 44
Appendix 3 .....	Page 46
Bibliography .....	Page 49
DVD 1 Stereo Pieces	
<i>Trebuchet</i>	
<i>Night Flight by White Noise</i>	
<i>Altered Materials</i>	
<i>Inside Out</i>	
<i>Material Movements</i>	
DVD 2 Multi Channel Pieces	
<i>Reach</i>	
<i>Gesture and Vista</i>	
<i>Inner Location</i>	
<i>Voicing the Substance</i>	
<i>Nature Room</i>	

## INTRODUCTION

In assessing the nine pieces which form this portfolio I shall explore how my relationship towards acousmatic music developed from that of a purely emotive response as a passive listener to being an active participant as a member of the BEAST (Birmingham ElectroAcoustic Sound Theatre) group of composers.

I will show how it became possible to develop and realise certain ideas that appeared in my PhD proposal and how that original proposal was expanded in order to broaden the scope of composition, developing notions concerning spatialisation and sound which were evolving as I began to compose for the PhD.

It is also necessary to highlight briefly the position I find myself in as a visually impaired person, trying to circumvent the problems of utilising inaccessible audio applications by constantly assessing my compositional procedures. The use of both computer hardware and software which has been specially scripted for a screen reader has allowed me to explore certain aspects of acousmatic music in which I have been interested for some years.

My personal journey of composition will highlight facets of acousmatic music which I have investigated through the exploration of my work. However, it will be important to describe my understanding of acousmatic music before I began composing with BEAST, which was as a passive observer from a position of ignorance.

I first heard acousmatic music on a BBC Radio 3 programme called *Music in Our Time*. Listening to such music was a new experience for me since the sonorities and timbres of the music seemed removed from anything I had ever heard before, although I found it deeply compelling. I did not attempt to differentiate between *Elektronische Musik* as defined by Karlheinz Stockhausen and Herbert Eimert, and recorded sounds which was referred to by Pierre Schaeffer as *musique concrète*, a term created by Shaeffer during the 1950's. For me, the shaping of the material and its clearly defined spatial movement seemed more important, and I could only imagine that it was composed with a sophisticated array of synthesisers as were heard in much of the popular music of the time, known as Electronica.

It was in 1997 that I made my first enquiries concerning written material on the subject of electroacoustic music and found that one book was available to me through the Royal National Institute for the Blind (RNIB) Student Tape Library. This was a copy of *The Language of Electroacoustic Music* by Simon Emmerson. Unfortunately, the master tapes were damaged so I could glean very little from this book. However, there was enough material to increase my understanding of the different aspects of electroacoustic music, and I began to see how academics in the field were thinking about acousmatic composition. Until reading Simon Emmerson's *The Language of Electroacoustic Music* I had considered acousmatic music that I heard as a complex form of electronic music practised within distant institutions. The way acousmatic music was presented on the radio seemed abstruse and unattainable to me as a listener and this served to differentiate it from that of other types of electronically generated music.



It seemed impossible for me to pursue an academic education in electroacoustic music at that time, due to perceived technological impediments; in this respect I was partly mistaken. I am now aware that such text based programs as CDP, Super Collider, and CSound, could have been used by a blind person with patience and programming skills. It is only recently that there have existed accessible real time solutions for composing acousmatic music which could be used by blind people, and it was by chance that I discovered a real time granular synthesis application in 2003. Between the years 2001 and 2005 I created two CDs of work. Both CDs represented a gradual development of compositional methods, evolving from the idea of music having narrative within soundscapes towards a more abstract and systemetised approach to composition. The development of my music coincided with advances in real time access to VST plugins along with accessible control surfaces such as the Evolution UC33.

The crafting of my music was given impetus through being exposed to two very different kinds of music. The first elements emerged during my attendance at the Huddersfield Contemporary Music Festival where I was struck by the music of Helmut Lachenmann and Salvatore Sciarrino as well as the music produced by the spectral composers Tristan Murail and Gérard Grisey. The microtonal and delicately textured music of Bent Sørensen was also deeply intriguing, allowing me to speculate as to how music such as this could be realised through acousmatic techniques. Hearing so much new music in such a short space of time, along with

my general interest in classical music, created a bedrock upon which to build a framework of procedural methods for composing acousmatic music.

The second kind of exposure came through attending concerts of acousmatic music at the CBSO Centre at Birmingham, presented by BEAST. When I first attended a presentation of acousmatic music at the CBSO Centre in 1999 I realised that I did not possess the technology or skills to compose acousmatic music to the same highly-crafted standards as the BEAST composers, but hearing this music did give me a long-term objective of musical refinement to pursue. However, it was a journey without end since I really could not envisage myself presenting a piece at the CBSO, or anywhere else. I was happy for the moment to try and compose music to the best of my ability.

The antecedents present in my music which emerged through careful listening to acousmatic music came mostly from the UK. I was influenced by the highly articulated and gestural acousmatic music presented by composers who had been part of BEAST before I joined in 2006 and which I tried to emulate, but the compositions of Denis Smalley and Trevor Wishart were of paramount importance in stimulating three important factors within my music. The tonal characteristics of pieces such as Denis Smalley's *Pentes*, *Empty Vessels* and *Wind Chimes* influenced my thinking of why and how resonance and tonal qualities should be applied to my music. Also the use of vocal harmonics and cadence in Trevor Wishart's *Vox 5* and *Tongues of Fire* were to have a profound effect upon my compositional voice. I discovered other composers who also created original ways of developing resonant

textures in their sonic material, such as Adrian Moore and Yves Beaupré. The third factor concerned spatialisation which was present in all the music that influenced me. I began to comprehend how a sound object contained intrinsic spatial information. The relationship between sound objects within a predefined space would become central to my musical thinking.

The characteristics of my compositional voice are drawn from a study of what became seminal works for me. The articulation of Jonty Harrison's music such as *Aria* as well as the composers who were presented on three volumes of BEAST works, were instructive in helping me develop as a composer.

Attending Huddersfield Contemporary Music Festival gave me new insights into how certain composers appeared to be greatly influenced by electroacoustic music with the emphasis upon timbre rather than pitch. This was effectively demonstrated to me through the music of Lachenmann. In Lachenmann's *Concertino*, conventional instruments are made to create new sonorities with the instrumentalists being placed around the auditorium, imbuing the sounds with real spatial characteristics. Lachenmann had also developed a comprehensive notation for realising the new sonorities within conventional instruments. Likewise, Sciarrino created a unique palette of sounds, as well as emphasising low dynamics and minimal instrumental forces in his work. This is apparent in his opera *Lohengrin* where the orchestra and singers silently file onto the stage, after which a flautist begins to play an intricate pattern of notes evoking a sense of isolation with repeated low whistling sounds which always seem to be changing. The flute is occasionally accompanied by strings

with the heroine, Elsa, vocalising her madness and creating a vast canvas of vocal utterances. The effect of hearing *Lohengrin* was to consider how vocal sonorities might be blended with other kinds of sonic material.

This music stimulated me to develop a personal way of composing and to consider how my particular kind of acousmatic music should be formed.

The prevalent characteristics in my music are articulated phrasing with clear gestures made by presenting sounds distinctly and with clear spatial movement. I also like to create continual tonal or non-tonal textures in my music. These continuous sound textures are generated to support gestural activity. I have placed textured sounds either in the foreground or background of the stereo field to create contrasting spatial perspectives. The placing of sound objects in a multi-channel array demands a different approach and I shall be exploring the problems of dealing with this in the chapters on my multi-channel pieces.

My pieces have an imposed form and are sectional, being subject to extreme changes which create a sense of tension and forward motion. The shaping of extremely clear and well defined sounds is paramount in my work, although I expect to hear a loss in clarity when a variety of sonic materials are fused to form a piece.

I am not so interested in exploring the nature of specific sound objects but in creating a variety of sounds from different sources and blending them to create a sonic tapestry. I feel that this presiding technique allows me to investigate broader notions,

such as the collision of many types of sonic material as in *Trebuchet*. My personal concept of multi-timbral acousmatic music allows me to create a variety of sound worlds giving me real flexibility when using sound recordings. However, I have also restricted myself to a specific sound source which formed my piece, *Nature Room*, where a stereo environmental recording was used to compose a multi-channel piece. Above all, structure and form are very important to me and I want the listener to be aware of this aspect to my work. It was these qualities which led me to join the BEAST composers at Birmingham.

After my informal interview with Professor Harrison in 2005 I felt that I must concentrate upon the above aspects when composing acousmatic music. It was with this in mind that I began work on a piece called *Material Movements* which lies outside this commentary but which is relevant to it, having the same concerns and preoccupations which engaged me when composing the pieces in the portfolio (see Appendix 1).

## CHAPTER 1

### *REACH*

*REACH*

Composed October 2006-January 2007

8.0 channels

13:00

*Reach* was based upon sounds recorded from a unique instrument designed by Carl Peberdy called the pebatar. I also recorded a vast number of ethnic instruments for the piece, including various kinds of whistle and percussion.

There are two notions governing *Reach*. The first is the predominance of sonic events occurring within the rear speakers in order to stimulate the flight instinct of the listener. These flight sounds also create a distraction, forcing the listener to reassess the movement of the sound objects within the speaker array, having an event occur from behind the listener which would result in a gesture in the front speakers. I extended the principle of flight sounds to my other multi-channel pieces, with the use of events being generated from behind the listener. This gives all of my multi-channel pieces distinct spatial characteristics.

The second notion concerned the main instrument, the pebatar, remaining anchored in a fixed space at the front of the cube for a given period, gradually merging with the other instruments demonstrating through spatial boundaries the nature of opposition and reconciliation between the pebatar and other instruments. I wanted to structure the piece as a kind of concerto for pebatar and ethnic instruments developing a discourse between the pebatar and the instruments in which spatial movement became as important as the sonic events.

The piece begins with a shrill whistle which is placed in the top back left speaker. It is followed by the small percussive instruments moving vigorously in the spatial field. The pebatar was made to interact with the other instruments producing a diverse number of sounds, percussive as well as harmonic. It could be bowed as well as plucked. We first encounter the sound of the instrument as plucked strings (3:07). These plucked strings are placed in the four front speakers of the cube.

The instruments are made to behave like moving animals in a forest, each type of instrument having different spatial characteristics. The whistles tend to flock around the listener, creating an immersive effect, or sounding like a bird in a tree when at a fixed position in the cube, contrasting with the percussion which behaves in a furtive and pronounced manner in its spatial movements, creating frenetic spatial gestures and localised sounds.

There were other elements introduced into the piece in the third section such as a balloon being rubbed, the movement of newspaper, and a door being slammed, which offset the idea that the music consisted of 'musical instruments' (3:20).

The music in *Reach* evolves from crude-sounding instruments to processed sounds, which are reconciled through spatial movement at the end of the piece. It is an environment where the instruments, including the pebatar, can exist throughout the spatial array, along with the processed material.

The pebatar was the principal sound source of this work. There is more tonal material in this piece than in any of my other music. This is due to the nature of the pebatar which inspired me to create simple tonal patterns (5:16). The pebatar had multiple strings as well as sympathetic strings which enabled it to cover a vast tonal range. These fragments or motifs exist within the music reminding us of the pebatar's identity (10:19).

The cube is a conundrum: The eight speakers of the cube gave me the space to generate startling sounds to disconcert the listener and create the illusion of being in a feral environment. I chose the cube as a spatial array because it provided three dimensions in which to move the sound material. It also meant that I could strategically place the pebatar within the four front speakers of the cube to create a separation between it and the other smaller groups of instruments. Unfortunately, I was too precipitate in allowing the pebatar to mingle with the other sound objects, which reduced the effectiveness of the illusion in not conveying to the listener a permanent sense of spatial division.



The cube presents disadvantages in other ways, with the listener having to be situated in the middle of the loudspeakers to obtain spatial equilibrium. I was also less happy with the general movement of material in the cube array because I was using stereo files and not always offsetting the channels to create broader sounds. This created a great deal of point source imagery where the sound became too localised. I certainly wished to have some point source material as at the beginning and throughout the piece as catalysts, but the movement of what felt like mono files in a vast three-dimensional space appears artificial and unnatural. Having material move in vectors, for example from the top back left speaker to the front low right speaker, caused difficulties, since the sounds tended to move around rather than through the listener creating a swerving effect. I endeavoured to redress this problem in a later piece, *Nature Room*.

*Reach* was my first multi channel piece and the spatial restrictions caused by the software and hardware meant that it was extremely difficult to create complex spatial structures. Unfortunately the audio and MIDI application that I was using called Sonar had a problem with its spatial pan which created glitching or clicking sounds when moving a file. These anomalies may still be heard within the first three minutes of the piece. However, despite the problems that I encountered with spatial movement whilst composing *Reach*, the treatment of the recorded instruments seemed effective and this led me to consider how recorded material might behave with other speaker configurations. In my future multi-channel works I felt safer

abiding by established ideas, such as the ring of eight speakers, a template used by many composers.

## CHAPTER 2

### *TREBUCHET*

#### *TREBUCHET*

Composed February–May 2007

Stereo

13:00

The trebuchet is a siege engine used to hurl objects from one location to another. It was used during the medieval period to destroy fortifications in order to end sieges. Such catapults could also be used for renewal, as a form of civil demolition, transforming seemingly impregnable buildings, replacing the old in order to build anew.

I first conceived this piece in a figurative sense with the mimetic sounds of trebuchets throwing objects from left to right, but this notion was thankfully replaced by a more encompassing idea. The title *Trebuchet* is meant to be interpreted as the collision and movement of objects with the consequences being analysed and explored through signal processing and granular transformations. With this in mind I began the piece, ordering the materials into distinct groupings which would undergo the same process of collision and falling away.

At the beginning of the piece we hear the sound of glasses being clashed together, developing into the movement of metal and plastic objects then shifting to ceramic objects before returning once more to the glass and metal materials. The distinct materials created contrasting soundscapes as various kinds of effects were applied to the sound objects. These different atmospheres gave the piece a fluid state.

By listening to the sound sources I could decide how the material would react to the simple action and reaction of sound objects being thrown together and moving apart. The materials in the piece always follow the simple process of colliding and decaying, either through receding iteration or dissolving textures. I also used a number of specific effects such as Doppler to create heightened tension, where the pitch of a sound modulates at a point during its trajectory along a spatial curve. Flanging was also used, to create the effect of colliding objects which then fall away from each other to ricochet like bullets into the distance. The piece is arranged into sections which explore different types of sound and spatial movement. There are also periods of quiescence within which the ears are allowed to rest, giving the mind a chance to re-assess what has taken place. The first section begins with two glasses clashing causing them to fragment through the use of granulation techniques and iteration. The sound objects bounce across the stereo field dissolving into new sonic forms; the destruction of one kind of sound generates new sonic possibilities. The most dramatic part of the piece is the development of a quasi-environment where sound objects resembling large vehicles crash in to each other and scatter into fragments evoking the idea of colliding trains (1:19).

The next section introduces a mimetic element with concrete materials manipulated to form sounds which resemble the characteristics of multiple oscillators. The sounds are made to move frenetically in the stereo field, evoking the idea of a wayward mechanical machine. There is some added material which appears to suggest a referential aspect with the use of such items as the two glasses, a comb and a plastic bowl but these materials are subverted by signal processes, morphing into abstract sounds. Finally there is the existence of continuous low frequency tonal material which forms a backdrop in which frenetic activity takes place with the movement of pitched sounds.

Further sections go on to explore the collision and movement of varying kinds of material, emphasising the spatial attributes of the different sound objects. There are immersive textures, and even mono sound files which move from one side of the stereo field to the other in order to define spatial boundaries (10:32). Within the final section, I created a repeated ticking sound, with variable transients, which is subjected to a variable multi-tap delay. This ticking sound is set against the development of huge chimes formed from the grouping of resonant material which is made to sound like the bells of a giant clock. The notion is of a chronometer in which prescribed movement becomes arbitrary, with resonant tonal shards spinning away from the centre of the chimes to form new material. The piece ends with a resounding drone in which there is both continuous sound as well as high frequency sound objects moving in the stereo field, thus depicting the action and characteristics of the trebuchet being laid to rest.

A further ingredient present in the music of *Trebuchet* is the use of vocal harmonics affecting some of the sonic materials in the piece. This is heard at the beginning of the piece with the suggestion of breathing as the glasses are clashed together and it occurs in further sections of the work. A further instance takes place when we hear the collision of ceramic materials in the form of clattering plates. The vocal effects are meant to give the piece an organic feel, as if it was a living entity (5:36).

In *Trebuchet* I had set out to explore the idea of how materials can be made to behave when colliding and fragmenting, as well as showing different kinds of spatial movement with sound objects travelling from left to right, as well as backwards and forwards, in the stereo field. Spatial and spectral movement defines this piece equally with the ceaseless colliding of sonic material, but above all is the requirement that the piece should form a continuous musical picture.

## CHAPTER 3

### PROLIFERATION AND EXPERIMENTATION

Between May and late December of 2007 I produced three pieces, two of which were multi-channel. They represent a period of experimentation in techniques involving spatial movement and sound manipulation, though not always with total success. The idea was to move away from the precepts that I had formed as an acousmatic composer and embrace ideas used by people who were involved in making Electronica. I had met designers of audio applications who were creating sounds and textures which often behaved in erratic ways. I had also worked with people who were involved in what is now called “circuit bending”. This involved the transformation of consumer products which contained sound making components turning them into noise-producing modules. The bespoke hardware and software could be made to create clicks, pops, and glitching within wave files, or by using oscillators. I wanted to create the kind of low-fi sonic textures that I had witnessed at various universities when trying to create music with sound artists. Unfortunately, I could not identify with the sonic material that I was generating. The result of exploring new ways of making sound brought about the composition of two works which tried to re-address my idea of acousmatic music.

## *NIGHT FLIGHT BY WHITE NOISE*

Composed May–July 2007

Stereo

10:00

This piece looks at signal processing techniques as an agency of spectral morphing upon two kinds of sound, contrasting the sonic characteristics of white noise with the shaping of recorded sound objects. I hoped in this piece to create a work which used glitches and clicks derived from badly edited wave files. In short, I was manipulating the detritus of found sounds, but I was not able to bear the sonic annulment of the senses that these sounds engendered. I therefore introduced some recorded material, such as an ironing board, drum beats derived from the pebatar and the glasses used in *Trebuchet*, along with a metal bowl. The technique of pitch transformation using a free FFT pitch plugin, called “Mad Shifta” by Tobybear Smartelectronix, was used to transform the ironing board, forming an evolving texture within the first section to create a sense of forward motion.

There are time domain stretching techniques used with the micro sounds such as the clicks and pops present within the piece. Together with the white noise, the clicks and pops are made to develop the idea of nocturnal activities. There is a great deal of formant and band pass filtering used on the white noise to produce the effect of breathing. This imparts an organic feel with the suggestion of the sound objects moving from the heat of day into the void of cooling night. Other elements which occur include the drum beats of some passing nocturnal and eternal dance, now



affected by the movement and the breathing of continuous sonic material, alluding to ambiguous shapes flowing through one another.

The piece has three distinct sections. The first contains some articulated material with the FFT pitch transformation of the ironing board. The second section is an allusion to radio noise, depicting the hum of long and medium wave bands suggestive of people listening to the emptiness between radio stations. Within this atmosphere there are gestures which emphasise the clicks and pops inserted to define the space in the piece. The third section employs continuous lines of textured sound, but towards the end of the piece we hear the sound of drum rhythms and objects being struck. The piece ends on two low tones, one preceding the other as if the low notes of a giant horn were heralding the close of night.

The piece is not a testament to the development of modern lap-top music, which is performed in many universities, but another standard acousmatic piece of music. I realised that I simply could not change my modus operandi, because of the principles that I found hard to reject within acousmatic composition, namely: clarity of sound coupled with articulated phrasing, and well-executed gestures. This piece is evocative, but it failed to capture the essence of improvised lap-top-based music, where selected applications are permitted to operate with a certain degree of autonomy, with the ultimate result that both structure and form maybe excluded from a produced work.

## *GESTURE AND VISTA*

Composed July–September 2007

Multi-channel and Stereo

18:49

*Gesture and Vista* explores the contrasting nature of continuous sounds and frenetic gestural sonic material. I began this piece whilst experimenting with new ideas and responding to new influences. These new musical ideas had already inspired me to compose *Night Flight by White Noise*. I had listened to electronica and I wanted to compose an acousmatic equivalent.

The materials used in this piece are all drawn from recorded sounds but they have been subjected to a variety of signal processes, transforming them radically. This was achieved in order to change the materials from being referential into a more abstract form. The result of this created rich electronic textures set against articulated sounds whose phrasing was derived from the original properties of the recorded materials.

The piece was composed for the standard ring of eight loudspeakers and it heralded a return to multi-channel spatialisation in my compositional development. I felt that it would be prudent to adopt very simple methods of spatial movement. For this reason I only used stereo files and I took great care when moving them around the ring of eight loudspeakers.

The first section begins with some articulated sound objects which are subsumed by evolving textures of continuous sounds. The nature of this continuous material appears to be always descending in pitch without any resolution.

The next section demonstrates the emergence of granular sounds which were formed to make gestures, developing the idea of an evolving relationship between texture and gestural sounds.

Further sections investigate the relationship of a contrived discourse between the continuous sounds and the gestural articulations. This is given impetus through applying different types of effects such as resonating filters and phasing effects, lending the piece an evolving aspect and forward motion.

The last section shows the undermining of the continuous textures as they become more and more jagged and quixotic in their movements. The piece closes with the mimetic harmonic movements of church bells which are brought to a sudden end by a large plosive sound along with a subterranean low tone cluster, sounding like the closing of a metal door.

The spatial treatment of the materials within the piece varied. The continuous textures were gradually moved around the speakers in a slow and majestic manner whereas the short articulated phrases tend to dart about the ring of speakers. Their spectral shapes were mirrored by creating similar spatial gestures, with the movement of one sonic event triggering another. This happens more towards the end of the piece where a struck sound will cause tonal sounds to occur (16:26).

Similarly, the movement of two sound objects coming together and fragmenting was explored with greater effect than in *Trebuchet* (13:44). The multi-channel array gave the sounds a greater space to express both spatial and sonic characteristics. I also tried to develop the technique of creating comprehensive sonic images within a multi-channel sound stage in which events can be perceived not as localised sound objects existing in one part of the array but as a complete sonic image. This was achieved by the simple layering of stereo files within the eight speaker array. I would go on to extend this idea of complete multi-channel images in a more sophisticated way in my later pieces. *Gesture and Vista* tries to create an acousmatic version of electronica but it fails to do so, simply because it does not use synthesisers to generate the vast number of sounds within the piece. The use of recorded sounds gave me a far greater palette of sonic possibilities than I felt I could attain with synthesisers. It is the use of recorded material in this work which decidedly makes it an acousmatic work, and not part of the genre of electronica.

## *INNER LOCATION*

Composed September–December 2007

Multi-channel and Stereo

16:35

This piece is the first of two environmental works. I wanted to move away from the complexity of my other pieces to a simpler approach to composition. Having purchased an inexpensive flash card recorder called the Zoom H2, I began to use it rather like a tourist taking snapshots with a pocket camera. These instances of different environments formed a curious postcard journey of fantasy and memories. The compositional processes were deliberately simplified, using only minor signal processing and granular techniques. These limited treatments were employed to give the piece a dream-like quality. I felt that the jagged articulated style previously used in other pieces would distract the listener from the prescribed course of environmental changes occurring in the piece. The technique of cross-fading was employed to create a sense of flowing memories, with material being juxtaposed only at certain times. This occurs at the beginning of the piece where the sound of sheep is heard in the wide right speaker, juxtaposed with the sounds of a pet shop, evoking memories. Startling coughs and utterances are also used to indicate sociological behaviour which often take place in concerts of classical music (1:42).

The nature of specific spatial movement is of singular importance in the piece, with many sounds being conveyed to the listener from the rear speakers (9:12). This is contrived in order to startle and draw the listener away from an established fixed

position. These attempts to offset the overall spatial image of the piece and disorientate the listener were contrived to question the listener's perceived control of the auditory space. The relationship between the audience and the projected material would be subject to constant flux every time the listener attempted to react to the sounds by a movement of the head. The offsetting of the material by removing it from the front speakers to the sides and behind proved to be effective, though some clarity was lost due to the nature of human physiognomy. The piece is structured simply to present sonic material in the form of remembered instances. A list of some of these events was: a pet shop, two different train stations, closely followed by the beginning of a concert, flowing into a camp site with the sound of a tent being buffeted by the wind. This is followed by thunder which is later repeated with some instances of transport, such as an aeroplane and the steady rush of cars on a road. There are several instances which are inserted in to the piece indicating a confusion of memories. All of these sounds lead us to an amusement arcade which climaxes into an imaginary soundscape where the seaside merges with the neighing of a horse. The piece ends with the sound of someone walking in the sea, in a purposeful manner. The final moment of the piece is the closing of a wooden door indicating the passing of events.

Hearing this piece again after a year, I feel that it conjures an atmosphere which is both exciting and sinister. However, some of the spatial movement is incongruous and does not always support the spectral characteristics of the material. This is a consequence of placing material around the sides and behind the listener. The piece could have been clearly presented with more interesting spatial techniques such as

the offsetting of one or more mono tracks within an eight channel file, which would have created different spatial perspectives. However, the technology at my disposal made it hard to develop complex spatial movement. It was not possible for me to move eight channel files within the eight channel array. I relied on the technique of moving stereo files around the ring of eight speakers with the left and right channels of a stereo file being offset, so that one channel might be in the front left speaker and the other channel could be in the back right speaker. By having multiple instances of a particular sound object I could distract the listener from perceiving stereo files moving around the array.

*Inner Location* was my first environmental piece which moved away from the articulated style of my other pieces. The low budget aspect of using an entry level flash card recorder greatly appealed. I believe the overall form of the piece is successful, with its depiction of memories and dreams. However, much more could have been achieved with better spatial techniques which I would later explore in my next two multi-channel pieces.

## CHAPTER 4

### TWO COMPLEMENTARY WORKS

#### *VOICING THE SUBSTANCE*

Composed March-May 2008

Stereo and Multi-channel

10:00

#### *ALTERED MATERIALS*

Composed June-August 2008

Stereo

10:00

During the three years of composition for this portfolio, I began to explore the idea of cadence and vocal harmonics existing within non-vocal sonic material. I felt that placing an emphasis upon the vocal aspects of a given sound could convey an emotive response with in the listener since vocal sound is the primary means of communication for human beings.

I decided to compose two works which would share the same sound sources and use the same signal processes, namely formant filters and frequency shifting using FFT effects. In *Altered Materials* the use of granulation was applied to the extended vocal techniques used by Serena Alexander, turning vocal utterances into fragments which



mimicked the stones and water drops which were present in the piece (2.05). Conversely granular techniques were also applied to create multiple instances of the vocal material, which were effective in creating choral effects used in both works.

The two pieces can be seen as complementing each other exploring the interaction between vocal utterance and other sound objects. In *Voicing the Substance* vocal sounds are predominant, acting as catalysts and causing events to take place, but in the second piece, *Altered Materials*, there is much more interaction between the vocal utterances and other recorded sounds, which creates ambiguity.

*Voicing the Substance* is divided in to five sections, with each part exploring the behaviour of different sound objects. There are sounds which tend to occur throughout the whole of the piece, such as the recordings of stones being dropped onto pieces of wood or in to water. The music progresses from one type of sound to another with the vocal material present throughout. The piece begins with a high vocal sound and ends with a similar utterance. This is meant to demonstrate the uneasy relationship existing between the individual and the material world. Perhaps I was subconsciously influenced by *La Fabbrica Illuminata* by Luigi Nono. There certainly exists in my piece a real tension between the vocal sounds and the other sound objects. It is a struggle which is brought to a close with a kind of frustrated utterance. Within *Voicing the Substance* sounds are triggered by vocal utterances which occur throughout the piece providing a means of progression moving the music forward towards a conclusion.

There is a cathartic moment in the piece when a chorus of treated vocal tones is heard (8:17). These tones are made to shimmer, giving them an unearthly quality. I felt that it was necessary to transcend the vast canvas of recorded sounds by having vocal tones in an attempt to convey a plaintive atmosphere. However the listener is not allowed to reside amongst the choral tones and ringing bowl sounds, and they prove to be ephemeral, eventually giving way after a period of sonic tumult of looped vocal phrases and clashing metallic objects to an uneasy quiescence and final resolution.

*Altered Materials* is structured in three sections. It was composed to complement *Voicing the Substance* by using the same source material. The first section conveys a subterranean aspect with low vocal tones and the use of gravel and stones moving to form aqueous textures. I used some FFT effects to shift the frequencies of various sound objects – a large piece of wood coupled with bricks and stones which are being moved about in some water. There is a brooding aspect to this section, punctuated by some gestural activity. The introduction of the articulated material creates interplay, forming a kind of loose counterpoint to the slow moving material. The next section begins with a pronounced metallic reverberation, evoking a Tibetan prayer bowl (3:03). This heralds the fusing of the vocal material with the other sources. The reconciliation between the contrasting sound sources is represented by the vocal material arranged to form a quasi-religious invocation. This tonal invocation is repeated in different ways with the next occurrence using some frequency shifting (5:30). This was done to change the listener's perception of the

vocal material as it morphs with metal sounding objects that are moving in the stereo field.

The last section conveys a sense that the overall space of the piece has been expanded. There is some gestural interplay generated by vocal utterances which are used as catalysts. This takes place between the vocal and non-vocal sounds, leading the listener to an uneasy quiescence. The enforced calm is underpinned by low transient sounds and continual textures that are redolent of radio noise. The vocal invocation heard in the previous section is heard once more, although in a receding state, implying a dominance of the human vocal material over all the other sources (8:40).

As a pair of works, one multi-channel and the other stereo, there is an obvious spatial difference. In order to compensate for not composing *Altered Materials* in a multi-channel format, I tried to create a sense of the material moving out of the stereo field towards the listener. This was achieved by using spectral panning and amplitude modulation. In *Voicing the Substance* a ring of eight speakers is used with sounds being placed in specific speakers in order to guide the listener towards a particular spatial gesture. This method was adopted when presenting the vocal sounds as catalysts, which would trigger the non-vocal sound objects.

I had made some progress in spatial movement by chaining different kinds of effects together. An example of this is the GRM Stereo Shuffle plugin which gave the impression that I was using eight channel files rather than stereo. By chaining

plugins together I could either generate immersive textures or I could have stereo files simultaneously sound out of the ring of speakers as startling gestures. I expanded upon this idea of multiple effects further in my next piece.

## CHAPTER 5

### *NATURE ROOM*

#### *NATURE ROOM*

Composed November 2008-January 2009

Multi-channel

11:00

*Nature Room* represents the sum total of my experience as a composer of multi channel acousmatic music thus far. There is a simple conceit at the centre of this work, that of expanding a stereo recording of a rural environment into eight channels. The stereo recording is filled with nature sounds and the spatial movement of birds. I tried to present this activity within a multi channel context. The simple flight of a bird moving from left to right in the stereo field could be developed to show the birds flying around the speakers or travelling in straight lines from one speaker to another. I also wanted to preserve the integral stereo image or at least to present it in a similar manner within the speaker array.

There is a humorous angle in this piece with the birds seeming to crash into the various bird boxes that were placed around the campsite, coupled with the hectic motion of the birds as they struggled with each other for food.

The sounds in *Nature Room* were all drawn from a recording I made at a campsite in early September 2008. I placed the microphone by a tree in which raindrops were falling through the leaves. The tree was situated about three feet from the microphone and the raindrops created hard transients as they struck the leaves and other objects such as bird boxes in and around the tree.

The piece is divided into six parts with each section defined by a radical sound transformation, indicating different spatial environments. Within the piece it is possible to witness the hard transients created by the rain falling in the tree (3:34-6:40). The intermittent tapping of the rain is meant to define the confines of each defined space.

In the penultimate section I created a number of tonal structures which move within the ring of speakers (7:50). The idea of these structures was to develop an imaginary aspect within the music, moving the listener into a dream-like state. It seemed necessary to project another sound world onto the environment of bird song and frenetic animal movement which had so far dominated the piece.

The last section slowly gives way to the sounds of pigeons and a variety of birdsong. The sound of the birds gradually fades into a larger reverberant space conveying the sense of one leaving the natural world, and moving towards an imaginary realm.

## CHAPTER 6

### *INSIDE OUT*

#### *INSIDE OUT*

Composed March-May 2009

Stereo

10:00

The idea of sound having intrinsic space, or the notion of sound within a determined space, has been at the core of my work, either through the movement of sound within an eight channel array or through composing for stereo where the governing of the intrinsic spatial image of the sound proved easier to control. I had experimented with microphone placement when making either environmental or studio recordings to reveal the spatial attributes of sound objects. It was by chance that I heard a pair of accelerometers and the characteristic narrow spread of frequencies and sharp transients which they generated. It was the sonic qualities produced by the contact microphones which led me to compose my last stereo piece.

*Inside Out* takes its name from the idea of sound having no intrinsic space; it is simply pure vibration. The sound in essence is captured by a contact microphone which is therefore responding to the vibrations of a specific physical object. The accelerometers have magnetic attachments which made it easiest to work only with metal objects. The sound sources that I used were varied, the principal items being

a gas oven, a metal boiler in the process of breaking down, and a bath tub with and without water. These objects, coupled with the characteristic attributes of the accelerometers, gave my sound sources a distinctive quality which I quickly realised must be engineered further to create spectrally rich sounds. To do this I had to employ a vast number of spectral and granular processes to change the timbre of the sounds, but more importantly to imbue the sonic material with spatial attributes. Much of the source material was tempered by the various metal objects that I employed to make the piece. The spatial aspects of each object varied considerably but each had a distinctive metallic, edgy quality and the sonic attributes of every object tended towards sharp transience and a narrow frequency range. Throughout the composition I was forced to layer many kinds of sounds to form a wider spread of frequencies. The sound objects seemed to impose their own spatial information which was limited to the structure of each particular item and it was necessary to create spatial fields for each type of sound; reverberation and other forms of processing which used delay lines were utilised to mitigate the abrasive aspects of the sounds. *Inside Out* is the most heavily processed piece of acousmatic music I have composed. Every aspect of the sound sources underwent some form of alteration. It was the nature of my response to such a distinctive group of sound objects that fashioned this piece.

*Inside Out* is formed in two distinctive material groups, and the dynamics of the piece are determined by the varying materials. The first section is made up of very dry staccato sounds with variable reverb juxtaposed with some metallic materials. The dry sounds perform a rhythmic dance, around which pitched sounds constantly move



giving the piece a frenetic aspect. The groups of sounds are divided by dynamic fluxes in order to rest the ears from the quixotic nature of the gestures and phrasing. The whole piece is characterised by modulated iteration and Doppler movement, the pitch modulations creating the idea of vehicular and mechanical activity and thus disguising the true nature of the material. Disguise is at the centre of this piece, and the sounds are deployed to create a state of conflict between the various sonic textures. There are many instances of material ascending and descending, with multi-phrased activity creating a restless state without seeming to find any resolution. The agitation within the piece is finally resolved in the last movement where a tonal structure is created with a decaying and receding turbulence. There is much of my second piece, *Trebuchet*, in this work, with a return to colliding and scattering sonic material preceded by blocks of rising and falling textured sounds. The scattering takes place far too often and is a flaw in the work but perhaps it is offset by the interplay of other harmonic material present in the piece. I used some comb and flanging effects to transform the material towards a more tonal and resonant sound world, creating a contrast with the harsh metallic sound objects which are prevalent in the music.

*Inside Out* is a real abstract acousmatic work in that it truly subverts all the recorded sound sources to form a piece in which all the material has been given added spatial attributes. However, there are some referential moments within the piece such as squeaky bath taps being turned and the sound of running water striking the metal bath tub (1:27 and 5:57) but it is possible that a listener might not notice the referential sounds because of the multi-layering of the sound sources.

This was the last of the nine pieces to be composed, and it was a pleasure to extend my ideas of phrasing and gestural interplay with the recorded sound sources. I was more interested in the spectral nature of the material since I was causing the original sound sources to morph into new forms of sound. I am glad to have finished with such an exciting and turbulent work and also happy that it contained some of the elements present in *Trebuchet*. However, *Inside Out* marks the finish and a turning point in my compositional development, hopefully directing me towards a more profound kind of music and away from my present rebarbative and precarious style of acousmatic composition.

## CONCLUSION

The five multi-channel and four stereo pieces composed during the last three years constitute a summary of my investigation into the spatial and spectral characteristics of sound as demonstrated through the processes of articulation, phrasing and gesture. I wished to present the pieces in this portfolio as a personal journey of composition. It is for this reason that I have not directly referred to any academic material which has only now become available to me and which relates to my methods of composition in acousmatic music.

The reasons for composing acousmatic music are many but I feel it is necessary to highlight one event which stimulated my awareness of sound and its importance within a spatial context.

I first realised the importance of the relationship between sound and space when a helicopter flew over my house casting reflected and deflected sound images which conveyed information of height and lateral movement. I perceived the helicopter, both as a single localised entity and as a moving field of sonic information whose polymorphic state generated both shadows and clear sonic images. I knew that I could never achieve this kind of spatial sophistication but it was one of the inspiring factors which led me to compose the music for this portfolio.

For many people everyday sound can be a mundane experience but for the acousmatic composer, sound is an inspiring phenomenon with which to create new sonic worlds. For me sound represents a way to express my imagination through acousmatic music, but in the world around me sound becomes a utilitarian force. I perceive ambient sound deflecting off objects conveying spatial and auditory information. In a typical street I hear the reverberant qualities of bus shelters, and the facades of buildings, lamp posts and constant sounds such as air conditioners and traffic. These sonic events have audible signatures which indicate my position in a given space.

I created my nine pieces with this utilitarian aspect of sound in mind. *Trebuchet* was an abstract work which used everyday sounds to create immersive environments in which sound objects moved and collided with each other. I chose material which would behave in very different ways, such as shattering glasses and resonating bowls.

The two works which featured predominant extended vocal sounds, *Altered Materials* and *Voicing the Substance*, differed vastly from *Trebuchet*. Both pieces examine the interplay of vocal utterance and its effect upon sonic objects within the world around us. I used bowls, wood, stones, water, and even a pair of leather shoes to create varying textures. In *Voicing the Substance*, vocal utterance is used to trigger and openly contend with the surrounding objects, but in *Altered Materials* the sounds taken from the non-vocal objects and vocal sounds mingle to form new kinds of abstract material. This new material was selected to alter the mood of each piece.

Low frequency sounds giving an aqueous and brooding quality, whilst the ringing tones and song-like vocals depicted a sense of light with a heightened state of emotion.

I was conscious of the danger that both pieces might sound exactly the same since they were both derived from the same source materials. Spatial concerns also dominated all of my compositions. I used immersive textures in all of my pieces which tended to be stationary or have a subtle spatial movement, juxtaposed with frenetic activity. I was always conscious that a sound's typology should greatly influence its spatial characteristics with high frequency sound moving rapidly and granular sounds spreading within the stereo field. Transient sounds were also used to define a spatial field such as the rain falling in *Nature Room*, and complex sounds, such as the evocative train sound in *Night Flight by White Noise*, was made to behave in an immersive manner.

The recorded source material can greatly influence how one should order a acousmatic piece. My music tends to be structured as modules, with each depicting a contrasting sonic state. These blocks of sonic turbulence are divided by periods of quiescence to avoid sonic overload. *Trebuchet* is an example of this structural form, but *Night Flight by White Noise* was shaped as a series of flowing movements.

Choosing sounds to fit a preconceived idea can be difficult. In *Nature Room*, I simply used the recording that I had made. For other pieces my sounds were selected and processed to alter the mood of a work from referential to abstract. It is interesting

that much of my music has an abstract feel although the sounds are derived from recorded material.

It is hard to show why I chose to make sounds behave in certain ways, often it was because the characteristics of a sound were pleasing. The spatial arranging of sonic material was often determined through instinctive or intuitive feelings as to where a sound should be placed within an eight channel array, or a stereo field. The form of many pieces emerged when I felt the overall concepts had been fully explored. *Trebuchet* finishes on a drone which for me indicated a move away from the ceaseless movement and collision of sound objects towards a point of stasis.

During the past three years there have been significant developments in my compositions for multi-channel arrays. At first I began by layering stereo files within the ring of eight loudspeakers, but in my later pieces it became possible to use eight channel files to create complex spatial images. Chaining plugins together enabled me to realise some of my ideas concerning the behaviour of sound objects in predefined spaces. In all of my acousmatic music I try to expose the morphology of the sound when it is detached from its origins and presented to the listener through loudspeakers, either in the form of a stereo or multi-channel composition.

My music attempts to highlight the spatial and spectral information contained in sonic material which can be perceived at all levels, from the emotive to the cerebral, focusing upon spatialisation as an integral part of a given sound.

There is always the problem of how to convey the overall intention of a work. I would like to think that some of my work conveyed some of my sonic and spatial ideas. Programme notes are important aids for the composer, but overall I simply wished the listener to be lifted out of the mundane listening experience into another world coupled with a real joy when witnessing a sonic display.

## APPENDIX 1

### *MATERIAL MOVEMENTS*

Composed 2005-6

19:00

Stereo

*Material Movements* was a culmination of experiments in sound manipulation. The most important objective was to create clear sonic material and transparent spatial imaging.

The music in this piece explores the notion of sound objects existing in two contrasting states. Referential sounds represent the natural world around us, but processed sounds indicate the atomic or molecular world. I wanted to realise through acousmatic music the interaction that exists between physical objects and people. I imagined the objects around me as existing in a solid state as well as in the form of energy in a state of constant agitation. The contrasting worlds were depicted in two distinctive ways. The first was sounds in the real world as shown by referential materials. The listener would hear the domestic sounds of cups and plates and even my outside rubbish bin. The second state was depicted by processed sounds and the use of resonant filters. The idea here was that the atomic world would be filled with light and immense spaces, whereas the natural world would be shown to be



predictable and mundane. I also introduce a wild card in the form of ice. This represented for me a bridge between the different worlds. I realised that the listener would not perceive the ice *per se* but at the least it could be made to create interesting timbres.

The piece is divided into two parts with the first section being dominated by the referential materials. There are constant incursions from the atomic world but the resonant materials never overwhelm the natural sounds.

In the second part I created the atomic realm by generating resonant material. The last part of the piece shows the interplay between the resonant sound objects ending with a large crescendo. This climax represents the turbulent nature of the atomic world.

The piece was artistically fanciful but it gave me the confidence to begin a PhD at Birmingham University. I felt that I had attained the objective of clear sonic imagery and a control over sound objects in a stereo field. However, I still felt unsure that I could develop my composing techniques further during my time with BEAST.

## APPENDIX 2

### SOUND SOURCES AND THE PROCESS OF COMPOSITION

The recorded material for most of my pieces was taken from domestic items. It was harder for me to go out and collect novel sounds because of mobility issues and the possible risk of assault. I did what I could with the sounds that existed around me. My first piece, *Reach*, was made up of ethnic instruments such as whistles, drums and various kinds of percussion. Other pieces such as *Trebuchet* and *Inside Out* use sounds which have been recorded in my house. Like most composers of electroacoustic music, I tend to retain my sound sources but destroy the processed material which means I can always return to the sounds in the future. If, in some cases, I needed to revise a specific piece, I would compose material afresh from the original sound sources using the ideas implicit within the existing piece.

Before composing a piece I examine the source material and reduce any extraneous noise that might be apparent. I then cut the material into phrases and small sounds in order to make gestural material or composite sounds. During this selection process I investigate each sound for its spatial and spectral properties by listening for particular traits and characteristics. A typical arrangement of folders before composition would be: 1) the source material; and 2) a group of folders called Long, Medium and Short phrases. The next stage involves processing of the phrases and new folders are created to contain the different kinds of processed sounds.

Examples of this are Continuous, Granular, FFT etc. The final stage before beginning a piece is the setting up of a folder which will contain files belonging to the piece, as well as files which are in a state of near preparation. I do not name files because I have the ability to preview them; they are therefore prefixed by a letter and number such as [a1] or [f1], [f] signifying File 1 – that being the first file of the piece.

I find that over the years an ordered system of folders, even if it appears eccentric, can make the compositional process much more efficient, and the allocation of different files to folders can speed up the accessing of sounds for the newly emerging piece.

## APPENDIX 3

### HARDWARE AND SOFTWARE

Sonar: This was the main audio/MIDI host for all my work and was used as a compiling agent. The tracks are not multi-channel but the busses can extend to eight channels. Sonar also contains a surround panner which is able to offset the two channels of a stereo file and can move a stereo file around a ring of speakers from 0 to 360 degrees. Unfortunately it is not designed for rapid movement and contains a bug which can create artefacts when used rapidly.

Sound Forge: This is one of the most intuitive wave file editors which is almost accessible to blind users and can be used to cut and process files very quickly. I am not able to use this program for real time signal processing because it is not accessible. However, Sound Forge is very good at editing files and has fine noise reduction facilities.

AudioMulch: This is a program which has been extremely important to me. Like Sonar and Sound Forge, AudioMulch can accommodate VST plugin technology but it is far more stable than Sonar. AudioMulch can also be used to chain many kinds of signal processors together. I liked using this application because it was very accessible, once some initial adjustments had been made.

In order to create complex arrangements of signal processes I required sighted assistance. I used a special macro which is called Hot Spot Clicker. This application was invented and developed by Jim Snowbarger. It can be used in software which contains a substantial number of bit-mapped images with which a screen reader is not able to interact to inform a blind user what is on the screen. Hot Spot Clicker is useful because it can allocate key commands to specified actions. A sighted person simply places the mouse on a particular button on the screen and the blind person can allocate an action or spoken label to the spot. It is extremely useful for all kinds of applications.

Granulab: This is a real time granular synthesis application which has twenty-eight parameters for shaping wave files. It can time stretch and it is possible to create both pitch and spatial effects. It has been the most important piece of software for composing my music. I have been able to create a multitude of timbres and sonic gestures which I would have found difficult with other types of software.

VST plugins: Virtual Studio Technology or VST plugins have become the most accessible way of shaping sounds for me at present. I can manipulate them in a number of ways which still gives me the ability to compose in a similar manner to my sighted counterparts.

Software technology is always changing and the ongoing development of a given application can lead to problems of accessibility. No single application is totally accessible for a visually impaired person which is why applications are cherry-picked

for their most accessible attributes. Over 90% of software is not accessible at this time, and no commercial music application is totally accessible. These findings are based upon an assessment carried out by an independent team of visually impaired people who were deemed to be proficient enough to investigate most of the commercial software that was made available to them. However, Sonar and Sound Forge still remain the two most stable applications being used by blind people to date.

## BIBLIOGRAPHY

EMMERSON, SIMON (ed.), *The Language of Electroacoustic Music* (London: Macmillan Press, 1986).

LACHENMANN, HELMUT, '*Concertini*', 2005, (UK premiere, Huddersfield Contemporary Music Festival, 2005)

SCIARRINO, SALVATRORE, '*Lohengrin*', 1982-4, first performed in 1983 in Milan, UK premiere of staged version 2001, Huddersfield Contemporary Music Festival.

SMALLEY, DENIS, '*Pentes*', 1974, (Canada: empreintes DIGITALes, 2000).

SMALLEY, DENIS, '*Empty Vessels*', 1997, (Canada: empreintes DIGITALes, 2000).

SMALLEY, DENIS, '*Wind Chimes*', 1987, (Canada: empreintes DIGITALes, 1992).

WISHART, TREVOR, '*Vox 5*', 1979-1986, (London: Virgin Classics, 1990).

WISHART, TREVOR, '*Tongues of Fire*', 1995, (New York: Electronic Music Foundation, 2000).

HARRISON, JONTY, '*Aria*', 1988, on *Article indéfinis* (Montreal: empreintes DIGITALes, 1996).