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Painting in a Sonic Environment
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Abstract

The thesis explores how painting is affected by its sonic environment. The research stems from an artistic response to noise in the environment and how this can be explored through artistic practice. The boundaries of art have and continue to be challenged as visual art has embraced an increasing range of approaches. This research explores the visual experience of viewing a painting alongside the all-encompassing time based nature of a sonic experience and readdresses the way painting operates within its own sound environment. It asks how these different elements can affect the reading of one another and in particular focuses on installations in extreme acoustic spaces, such as anechoic and reverberation chambers. It investigates how introducing sound to the painting arena can affect the reading and also transform the parameters of the painting.

The research is practice-based and takes the form of a series of exhibitions, latterly in the form of site-specific installations, which have been evaluated, interpreted and responded to. This has led to a fundamental investigation, both practical and theoretical, into the way that sound and vision work together and how they relate within the context of art. Through the research the format of the painting developed in tandem with the temporal and audio considerations, resulting in all-encompassing installations bringing together panoramic paintings and 3D soundscapes.
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Introduction

a Background

The research aims to investigate the all-encompassing, time-based nature of a sonic experience alongside the visual experience of viewing paintings. The core research has been conducted through a series of exhibitions, followed by critical and contextual reflection and analysis.

The work focuses on how the urban environment can be explored through both visual and sound art and how these different elements within an installation can affect the reading of one another. To do this a series of works with painting and sound were developed, latterly in the form of site-specific installations with panoramic paintings and 3D soundscapes within the same space. The installations aimed to achieve an immersive environment, both visually andaurally, by using paint and sound, while painting itself is explored through both the addition of sound as well as the panoramic format and scale. This led to an investigation of the interplay between sound and vision which considered the scientific fundamental relationships between them, such as how these elements are transmitted and received by humans, spectra, synthesis and their relationship to movement and space. The research also explored how sound and vision can work together within the context of art, specifically in representations of our environment.

The hypothesis is that the occurrence of sound within the visual art installations changes the way in which one experiences the paintings, and vice versa, and that the overall sensory environment significantly affects the way in which a ‘viewer’ interprets and responds to either the sound or the visual elements of the work. Please note that the term ‘viewer’ is defined in the Introduction Part d Methodology.

There is significant research into sound in connection with the moving image, through theory related to film and video or sound with other digital media such as computing and web based art, but there is little evidence of research into sound (as opposed to music) in connection with drawing or painting. The addition of sound to what is traditionally a visual arena brings not only a time-based element to the painting but also creates a different focus, opening the possibility of multiple channels of experience. The relationship between sound and painting affects the way we interpret and respond to the work but is often overlooked by galleries,
artists and theorists alike. In the context of painting, understanding that relationship between sound and vision can hold the potential for unlocking a wider, expanded interpretation of painting. It can allow one to explore connections between these stimuli and test how they might be used together to enhance the work and the overall artistic experience for the viewer.

Throughout the period of research artworks have been made continuously, through a process of gathering research material, developing this in the studio, installing the work and then appraising it. This has informed subsequent work, leading to further exploration, development, presentation of work and so on, in a generative, cyclical way. The artworks have consisted of paintings, latterly panoramic paintings, and sounds placed within the same environments, thus situating the practice within the traditions of the panorama, landscape painting and expanded painting, as well as those of audio-visual installation. The research has stemmed directly from an attempt to examine the reciprocal relationship of the two areas of sonic and visual. It focuses on the nature of each and allows them to have a symbiotic relationship where one gains and feeds from the other with the resultant meaning or effect being more than the sum of its parts.

This thesis represents a summary of the work starting with the practical research. It analyses the development of artwork and the practice-based research outcomes made throughout this research period. The second part of the thesis focuses on the contextual research and the ideas that led to the creation and development of the work.

b  Research Questions

The main research question is:

- **What are the relationships between my paintings and their sonic environment?**
  The sonic environment of painting and the use of audio alongside painting is an area that has not been fully explored and has much potential in the making of painting as well as its relationship with its installation. In the research the paintings have been situated in environments with incidental sound as well as diegetic soundscapes that have been consciously added. How does this sound affect the interpretation of the visual work?
Throughout this research a number of related sub-questions have also emerged:

- **How does the scientific relationship between sound and vision affect the way that they interact and are interpreted within a painting and sound art installation?**
  The close relationship between sound and vision including core scientific principles, such as spectra and synthesis, as well as perceptual and sensory relationships have been researched. What are these key aspects of sound and vision that relate to contemporary art? How can these be considered and used to develop art practice?

- **How do complementary soundscapes change the interpretation and meaning of the visual work?**
  When painting is considered in the context of sound the reading of the work and therefore the intention and meaning can be altered. How does the addition of purpose made soundscapes change the meaning, whether that is through the subject, process or physical interpretation? Does the introduction of soundscapes bring a different understanding to the visual work?

- **How have my paintings responded to the consideration of their specific sonic environment?**
  When sound is introduced and consciously considered within a painting context it can bring changes to the work such as temporal elements, movement or a different physical way to read the painting. How has the development of my painting been directly affected?

- **How does the format of a painting, in particular a panoramic installation, affect the way the work operates?**
  The work utilises panoramic formats alongside audio to explore possibilities within painting. This considers painting itself, in particular expanding traditional notions of landscape painting and elements of time or multisensory experience.

- **What affect do chambers with specific acoustic qualities, such as anechoic and reverberation chambers or purpose built chambers, have on the painting and sound installation?**
This explores the use of sound and vision in immersive or extreme sonic environments. It analyses how specific sonic environments can affect the reading of art installations and bring different elements to the installation.

### Development of Research

The background to the artwork came from an established painting practice which developed over a period of time into making paintings relating to noise in the environment. This led to the critical examination of scientific research in the area of sound and vision and examination of the direct relationship that painting has with its own sonic environment. The result is a body of work engaging both painting and sound. The outcomes are audio-visual installations comprising of paintings that relate to their sound environment through scale, format, subject matter and a conscious relationship with time and duration.

This research originally stemmed from collaborations with scientists at The University of Edinburgh who were engaged with research into environmental sound, noise and also sound measurement. The background to current sound concerns is discussed in Chapter 1.1.1. This gave rise to an interest in sound in the built environment, in particular urban landscapes, and the investigation of this through both a visual and sound practice.

The artwork reflects the surroundings we live in by taking snapshots of sound and visual elements and transposing them into the gallery setting. Primary research in a visual or audio form has been gathered from sites across Scotland, particularly in the Central Belt and, where appropriate, site-specific research for particular installations has also been gathered internationally (see Chapter 1.1.3 for details of research gathering sites and Chapter 1.1.5 for venue details). The sound and the visual research material were normally gathered from the same starting point, i.e. a chosen site, then taken through different processes via the sound studio and the visual art studio before finally being reinstalled together.

The research has culminated in fifteen different installations, each discussed in Part 1. During this period of research further work and trials have been carried out. However, to keep the thesis focussed and manageable only the key fifteen works have been analysed. Each of the installations has tested specific ways of working with either the sound, the visual material or the context itself. Each has built on previous works, with some material being reinterpreted using different modes of presentation. Importantly, each installation includes
new material made specifically for the installation, relating to either the context or the new ideas which have emerged through the research. Most of these installations have been public exhibitions, often in non-traditional art viewing spaces, allowing for on-going feedback from a range of artists and audiences. This enabled a responsive and agile approach to ideas and ways of making work, leading to an on-going, generative process of reassessing and remaking.

At the core of the research is an exploration of the use of sound with painting. The direct relationship that painting has with its own sonic environment is an area which has not been fully explored in other academic research. Despite the numerous artists that have at some stage worked with the relationship between painting and music (Wassily Kandinsky, Paul Klee or Piet Mondrian to name just a few) there is surprisingly little written about the sound environment of painting. Books such as *Sound and the Visual Arts* [Bosseur, 1993], *The Sound of Painting* [Maur, 1999] or *Visual Music* [Boughter et al, 2005] investigate the relationship between sound/music and visuals/painting. However, in the most part they analyse the overlap in terms of the senses or where one art form is trying to emulate the other. *Image, Music, Text* by Roland Barthes [Barthes, 1977], *On Some Relationships between Music and Painting* by Theodor Adorno [Adorno, 1995] or *Sensual Relations or Empire of the Senses* by David Howes [Howes 2003; 2005] reflect some of the philosophical overlaps and boundaries. The are numerous examples of painters who have attempted to paint musical notes (as above) or paintings that imply a musical sound or noise through implication, visual references or mental leaps such as *The Scream* by Edvard Munch, *The Evesdroppers* by Nicolaes Maes (explored in depth by David Toop in *Sinister Resonance* [Toop, 2010]) or *Answering the Horn* by Winslow Homer (discussed in an essay by Asma Naeem [Naeem, 2010]). There are also art exhibitions which have included both sound and painting, yet there is little evidence of this aspect of the work in documentation and they do not seem to have been fully captured through correlating text (see Chapter 2.3.1 for further discussion of painting in an expanded field). In contrast, sound and the moving image, in the context of the audio-visual, television or film, has been written about extensively through film theory and by those working in the areas of the audio-visual. Many texts relating to sound art and sound within our contemporary culture also explore this. Relevant examples include *The Wireless Imagination* or *Noise Water Meat* by Douglas Kahn [Kahn, 1994; 1999], *Ocean of Sound, Haunted Weather or Sinister Resonance* by David Toop [Toop, 2001; 2004; 2010], *Acoustic Territories* or *Background Noise* by Brandon LaBelle [LaBelle, 2006; 2010] or *Audio-Vision or Film: A Sound Art* by Michel Chion [Chion, 1994; 2009].
Although all of the texts above are relevant and in many places extremely insightful these do not fully address painting and its relationship with its own sonic environment.

The use of sound with painting has much potential in the making of artwork and its installation as well as fundamentally altering the intention or meaning of both the visual and sound aspects. It also adds to the debate around expanded practice, in particular painting in the expanded field, and what the presence of sound can bring. By focussing on the two most dominant senses and their stimuli, vision and sound, the research explores this potential both theoretically and practically. The context of the work is considered, taking into account the importance of the location in which painting is shown, specifically the physical and audio environment. The impact sound has on the paintings led to questions around the time-based element of painting and how this can be further explored through the format of the painting itself as well as how the audience experience the work. The later paintings (in sections 1.4 and 1.5) utilise a panoramic format alongside sound to explore time and motion within painting and possibilities this opens up for painting.

The outcome from the research has three primary elements. Firstly, how the sound environment affects, and potentially enhances, the reading of a painting. Secondly, how painting itself can be transformed through this central tenet, through the physicality of the work, the viewer experience or elements such as time narrative. The third is how the installation of these together results in something more than the sum of the parts and produces an immersive environment, which expands both the painting and the scope of the sound.

d Methodology

The research is iterative in nature and has been an on-going cyclical process. It begins with initial information gathering and assimilation through to developing ideas, themes and pieces of work. These are then installed or exhibited leading to reflection and evaluation, which finally feeds back into ideas and information gathering and development. These do not always follow a linear path and can be responsive findings or opportunities that have arisen. However, the key elements, the process of making and the understanding of the wider context are continuous. As an aid to planning the whole research programme and
communicating ideas to advisors, mindmaps showing the different elements of the research were constructed. An example is shown in Appendix 1.

In practical terms a number of research activities have taken place such as field trips, gathering source material, related reading and contextual information, developing work in the studio, exhibitions and installations, reflection and evaluation. The development of contextual work alongside the practical work has allowed for a rigorous and meaningful engagement with the research area and relates to current paradigms in this field. On-going exhibitions and public viewings of both finished work and work in progress have been instrumental in developing the research. These have been reflected upon and have informed the development of future work. As well as installations and exhibitions there have also been a number of outputs in the form of academic journal and conference papers, interviews, talks and events. Presenting the research to a wider audience has helped broaden the perspective of the work and has offered further opportunities to gain critical feedback on the work in progress.

Common to all aspects of this research is the fact that it has been carried out by me, an artist engaged in my own practice. This is critical to all thinking around this research as not only does it mean that the work is original in concept and creative in practice, but it also means that the reasons and interpretations of the research are very specific to my own artistic perspective. The work is my own creative endeavour. As a researcher and artist my primary motivation is to make a body of original art practice. The research is part of this rather than an end in itself. This is germane to art practice: artists do not make work because they are researchers but there is a research process inherent to some artwork. Therefore the research is based on the practice (as opposed to the practice being based on the research).

Another aspect that stems from the artistic practice is that there is an intuitive element to making all of the work and an area of experimentation and risk taking in the work is prominent. Rather than the work fulfilling a specific brief, it is allowed to create its own area of enquiry and reflect on contextual, cultural and environmental factors.

Note that throughout this thesis the word ‘viewer’ is used to refer to the audience, despite the fact that they are both viewing and listening. Viewer is a standard word to describe the audience/viewer/listener/participant in a fine art context. The relationship between viewing and listening is one of the key themes in the research and is discussed at length throughout
the text, particularly Part 2. The specific relationship between words used and the cultural dominance of one sense over the other is analysed in Chapter 2.5.3 Superiority of the Senses.

The methodology adopted in this research has two fundamental strands, which are inherent to all aspects of it. These are:

i  **Interdisciplinary**

By its nature all of the research is based on an interdisciplinary approach. The research straddles different disciplines from fine art painting to sound art, science collaboration to practice-based research and environmental issues through to historical background, therefore a range of methodological approaches have been necessary.

In much discussion about visual art practice the term interdisciplinary is used to describe work that uses a range of visual media. It could be considered that some of these might be more accurately described as transmedial, i.e. across media. In this research there is a genuine interdisciplinarity as not only does the work cross discrete visual and sound considerations, but also there has been work with scientists and acousticians. It arguably could be called extra-disciplinary as it is not making a hybrid between these areas but rather using their distinct qualities to make a new form of work or experience.

ii  **Practice-based**

The research is practice-based research, which has artistic practice and the making and analysis of artwork at its core. As discussed in Practice As Research [Barrett et al, 2010] the basic premise is that the research is studio or practice-based. There are various definitions of the difference between practice-based and practice-led research however the crux of the difference seems to be whether the creative artefact is the basis of a contribution to knowledge. Knowles and Coles’ concept of the framework of painting, which can similarly be used to support the sound element of the work, places this work as painting as idea i.e. research *with* painting [Knowles et al, 2008] where the practice is a vehicle for ideas. Preliminary research, written theoretical work, reflection and evaluation all feed into this, creating a symbiotic relationship with the artwork.

Because of the range of processes within both interdisciplinary and practice-based research a range of different methods have been required to support the development of this research
The methodological approach taken has therefore encompassed methods ranging from digital to analogue, practical to theoretical, artistic to scientific and visual to audio. For an artist and researcher who works across media, these are common ways of working and culminate in specific practice-based outcomes, namely audio-visual installations. Some of the methods utilised are more common to artistic practice than others, in particular a) field work and material gathering, b) development of practical research in studio, c) installations and exhibitions and d) public viewings of the work. These are well-established norms for most artists and practice-based researchers. The other two methods, e) evaluations and feedback and f) literature review and contextual research are frequently undertaken but often in a less systematic way than has occurred here therefore these have been formalised for the purposes of this research.

**iii Fieldwork and material gathering**

Throughout this period of research there has been on-going gathering of visual and audio material. The sites have been of particular importance as much of the work is site-specific. The methods of gathering have varied depending on the site and why it is of interest but have mainly consisted of drawing, photography, sound recordings as well as informal interviews (see Chapters 1.1.2 and 1.1.3).

**iv Development of practical research in studio**

Both the sound and visual art studios were essential to the development of the practice-based research and were where fundamental shifts in thinking took place. As discussed in Chapter 1.1.4 the sound and visual art studios were utilised in different ways as they had specific access and required distinctive approaches due to practical considerations of the medium. However, they have echoed one another in terms of ideology and fundamental reasons for particular processes.

**v Installations and exhibitions**

Having opportunities to install the sound and visual elements of the work within one space was a critical part of the continued development and analysis of the work. On a regular basis suitable spaces to install the work were found, which allowed various ideas and practices to be tried out in real life situations. The specifics of the venues also became integral to the work; in particular some of the unusual or extreme sonic spaces (see Chapter 1.1.5 and Part 2).
vi Public viewings of the work
Displaying the work in the public realm has allowed it to be seen by a wide general audience as well as a number of specialist audiences. Presenting work in the form of an exhibition enables feedback and encourages debate around the work, building critical understanding and helping to inform developments. The exhibitions also enabled the use of some specialist sites (such as scientific laboratories) that would otherwise have been difficult to access.

vii Evaluations and interviews
During this research period a variety of evaluative processes of the exhibitions and installations have been undertaken. These have taken a number of forms including questionnaires to visitors, own observations, recorded interviews and feedback. The research is multi-faceted by nature, therefore specific guidance was sought to evaluate certain elements [Chelimsky et al, 1997]. This included how to evaluate and use suitable language for people’s interpretation of sound [Davies, 2009] as well as how to evaluate cross-disciplinary research (specific advice on formats from EPSRC mentor Karen Bultitude).

viii Literature review and contextual research
Research in the form of the theoretical context and awareness of the current climate was key to developing the conceptual basis of the work as well as maintaining relevance and legitimacy to the practice-based research. This has taken a wide variety of forms including continuous secondary research into issues and debates related to my field of study, attending events and conferences, visiting exhibitions and keeping up to date with current trends in related fields. The references contain a wide variety of texts which range from fundamental background research, such as studies which present the scientific background, to texts which relate to specific elements of my work, such as detailed sources on panoramas, historical and theoretical texts on expanded painting, essays regarding time element in visual work, sound art and the propagation of sound within visual realm.

e Summary of Thesis
This thesis divides the research into two areas. Part 1 discusses the practice-based research and the artwork itself while Part 2 explores contextual information which has informed the practice-based research. Each of these parts has been further subdivided into sections and further divided into chapters, to clarify my research process and thinking. The sections,
Approach, Sound, Vision, Immersion and Installation, represent key elements of the research and these subdivided topics are mirrored in Parts 1 and 2.

i) Summary of introduction
The introduction presents the aims and the rationale for carrying out the research. It does this in five sections covering the background, the research questions, how the research developed, the methodology used and finally a summary of the sections of the thesis.

ii) Summary of Part 1 The Work
Part 1 describes and analyses the development of the practice-based research. The main thread through the research is a series of installations and public exhibitions, which are developed, reflected upon and evaluated. The installations are the key stimulant to discussing different themes addressed by the work and are used as case studies for exploring specific concepts.

Part 1 is roughly chronological, with the first sections showing earlier work. However, there are some exceptions to the order where the work has been responsive to situations or unexpected outcomes have occurred, therefore the order is based more directly on subject matter and research topic concerns. Also it should be noted that most of the installations could be discussed in more than one of these chapters, as they each have elements of sound, vision, immersion and are all a form of installation.

iii) Summary of 1.1 The Work: Approach
The chapter begins with explaining the processes that the research development took. It starts with a discussion about environmental considerations, presenting background information as to why this area has been researched. The chapter then describes the process of gathering visual and audio material and particularly considers the sites and why these have been chosen. It goes on to describe the studio process and the special considerations that arose relating to studio practice with both sound and visual work. Finally, it describes and discusses issues related to the venues and showing of work.

iv) Summary of 1.2 The Work: Sound
This chapter provides an overview of the development in the sound work with processes discussed in depth. It considers the recording of the sound and looks at how sounds were developed into soundscapes, with discussion around movement of sound, stereo or three-
dimensional sound, other spatial characteristics. How the sound is incorporated into the installations is considered, with examples of different ways the sound has been incorporated into installations. Finally, it considers examples of where these ideas have been tried out in real situations, through six different installations. These are early examples of working with sound alongside painting and test out different ways of installing or playing sound with painting.

v) Summary of 1.3 The Work: Visual
The chapter discusses the processes undertaken in making the visual work and how the paintings changed throughout the research period. This development is most evident when looked at in relation to sound and its impact on the painting. In particular it considers how the visual work developed into a panoramic form and presented a new expanded form of painting within a sonic environment. It discusses the background research for paintings, selection of imagery, techniques, materials and compositions as well as the development and installation of panoramas. The examples in this case are significant public exhibitions which allowed for experiments in painting to be presented and analysed.

vi) Summary of 1.4 The Work: Immersion
One of the major developments in the research was the increasing importance of the context and indeed the specifics of the sound environment. Experiments were carried out in various places, including sites of special interest and extreme sound environments. The use of these very specific spaces led towards all encompassing installations, the idea being that the viewer is immersed within the work. This chapter discusses this process, the choices and the characteristics of installations within these very different venues.

vi) Summary of 1.5 The Work: Installation
This last section of Part 1 presents the final installations, which are the major outputs of the body of research. Four bodies of work are presented which represent the culmination of the research. There is documentation of these works along with discussion about the final outcomes of the research and decisions that were made while developing these. This chapter does not initiate any new ideas. Rather it takes the sound, visual and immersive qualities and presents the final outcomes of the work.

vii) Summary of Part 2 The Context
Part 2 examines the fundamental physical properties as well as the artistic principles which
underpin how both the visual and sound images are perceived by an observer and the correlations between the two. This provides a framework for a critical examination of the paintings, the accompanying soundscapes and the installations (discussed in Part 1). Perceptual and sensory relationships and similarities and differences in the way we relate to these modes of communication, senses and disciplines are examined in some detail. It examines vision and sound from the point of view of the artist as well as offering a rationale for the subject as an appropriate field of artistic enquiry.

Part 2 explores the background and contextual material that informed the practice-based research and follows the same format and topic sections as Part 1, Approach, Sound, Vision, Immersion and Installation. Within each of these sections there are chapters, which discuss discrete areas of contextual research. All of these impacted on the practice-based research and cross-reference with other chapters as well as Part 1.

viii) Summary of 2.1 The Context: Approach
This is a short summary of how the contextual work was gathered and why particular aspects were approached.

ix) Summary of 2.2 The Context: Sound
This section analyses sound, investigating particular aspects and how it relates to vision. Fundamental relationships between sound and vision are considered such as wave phenomena, pitch and the spectrum. The rainbow phenomenon is then explored through further analysis of the spectrum including discussion of an experiment carried out with sound, colour and painting. The development of sound art is then considered and the section ends with a study of artists Dalziel and Scullion who repeatedly worked with issues around the environment and often used sound within their practice.

x) Summary of 2.3 The Context: Visual
In this section visual elements relating to the work are analysed. It begins by looking at painting in an expanded form and in particular painting as installation. It discusses what the introduction of sound might mean for painting. It then goes on to explore the panorama, looking at its historic precedent, for example of the Mesdag Panorama. Finally this section looks at the potential of the panorama as well as considering the work of contemporary artists who have worked with similar ideas.
xi) Summary of 2.4 The Context: Immersion
In this section the specifics of sound in a space are considered. It analyses spatial sound and vision, how humans hear and see in space. Depth including stereo and three-dimensional sound are discussed, directly linking back to much of the practical work, as shown in Part 1. It then goes on to explore movement and how these spatial aspects affect the viewer’s experience of the installations.

xii) Summary of 2.5 Context: Installation
The final section looks at sound and vision as a whole, examining them as linked senses and how these are perceived together within an art context. It starts with looking generally at sound and vision within an art context and then looks specifically at synaesthesia and transensoriality. It then goes on to discuss how vision and sound have been recognised (or not) and the idea of the superiority of senses is explored.

xiii) Summary of Conclusion
The conclusion encapsulates the key findings from the research. It provides an overview of the conclusions drawn and summarises the findings.

xiv) Summary of References
The references given are those cited in the thesis.

xv) Summary of Appendices
The appendices present a number of important documents that have been part of the research process. These include an example mindmap of the research, a list of exhibitions and published material, summaries of the formal evaluations of exhibitions, example timelines of soundscape edits, a DVD of example sound files and a separate book of digital prints of the paintings.
Part 1 The Work
1.1 The Work: Approach

1.1.1 Background

The debate concerning sound within our environment is on-going, with awareness of sounds in the environment increasing through projects such as sound mapping at the Sonic Arts Research Centre [SARC, 2013] or noise mapping at NPL [NPL, 2013]. Sounds are introduced to our environment through innumerable sources but recent research has particularly highlighted transport systems, with road vehicles being main contributors alongside aeroplanes and trains. Low-level noise pollution is also a factor with continuous noises such as computer fans or ventilation systems masking sounds in internal public and private spaces.

As Aubrey Manning discussed in his series The Sound of Life on BBC Radio 4 the way that different humans and other species have responded or adapted to changing sound environments is a growing topic of interest. Our exposure to natural sounds often creates a response quite different to the way we deal with anthropogenic (caused by humans) sound. Michel Chion discusses the meaning of the term noise as one of the following [Chion, 1994, p182]:

1) Unwanted sound
2) Unmusical sound
3) Any loud sound
4) Disturbance in any signal

Noise is most often associated with unwanted sound which is a subjective term, giving an element of judgement to the interpreter. In the 21st century we are immersed in sound and audio-visual stimuli. However, when anthropogenic sounds are introduced certain sounds are encouraged, such as music, and others considered unwanted, therefore noise. In certain types of public spaces, those defined as non-places [Augé, 2008], such as airports, train stations, car interiors etc., the mixture of background ambient sound and the inclusion of sound announcements or sounds to mask the background sounds are increasing. Note the interest in the sound environment of specific places by sound artists such as Brian Eno in his Ambient series such as Ambient 1: Music for Airports [Eno, 1978].
Noise also facilitates the masking of other natural sounds that have environmental implications for wildlife and our general wellbeing. Background levels of sound as well as light have increased steadily in urban areas over recent years. Birdsong, for example, which was once common in cities, may now be drowned out by the background noise of the passing traffic [Manning, 2004]. The star formations in the night sky may be quite invisible for people living in the city due to the back scattering of light from streetlights by tiny particles in the lower atmosphere. In extreme cases noise levels may be so high that they adversely affect our health for example by disturbing our sleep patterns [Nissenbaum, 2012; Gilligan, 2012]. It has implications for society, for the context we are working in as well as direct impact on the way in which we view art.

There has been considerable research directed towards the reduction of sound levels in the environment [Carme et al, 2000, p.2948], for example through the improved design of jet engines, fans, ventilation systems, buildings and industrial plants and also towards new techniques for measuring sound [Kang, 2006]. There has also been interest in the development of active noise control. Noise-cancelling technology is now available to the public, often in the form of headphones generating signals (anti-noise), which effectively cancel out the noise in the surrounding space [Carme et al, 2000]. Concurrently, there is a growing area of research about desirable sounds that are enhanced or created by urban planning, such as the sounds found in a town square or the ambience of a market.

The research topic stemmed from collaborations with scientists working in fields relating to sound, in particular acoustics and sound measuring techniques. The work is underpinned by an on-going interest in research in the field of sound in the environment and links have been established with a number of academics in this field, notably at the Department of Physics and Astronomy at The University of Edinburgh, Academy of Sciences, Belarus and National Physical Laboratory (NPL), London. These have been critical not only for their scientific input and inspiration but also for the specialist facilities they provided such as microphones and loudspeakers, sound mixing studio facilities and anechoic and reverberation spaces.

Sound in the environment is the background topic which led to this body of research however the research addresses sound specifically within an art context. To explore this the sonic environment of painting constitutes the main thrust of the research.

Throughout the process an understanding of the context has been essential. This has
developed through a mixture of reading, going to art and sound events, exhibitions and conferences, visiting relevant sound or environmental sites, making contact with individuals working in related fields and sound and visual experimentation. Because of the multi-disciplinary nature of the work, the contextual information gathered has been extremely broad ranging. It has been comprised of scientific research and environmental factors, as well as various areas of art history and theory, covering fields such as art and technology, sound art, historical panoramas and contemporary painting. The benefit of this has been that the work has naturally responded and developed to research gathered and there have been periods where the work has had different foci. For example, during the early stages the importance of the scientific background was dominant, and there was a broad sweep of background research taking into account environmental factors and a wide range of art practices (both sound and visual). As the research developed key elements emerged, namely the expansion of painting and idea of the panorama, specific or extreme sound environments and the immersive nature of the work.

1.1.2 Gathering Research

Primary research was gathered in the form of drawings, photographs and sound recordings during site visits, mainly in Scotland and some further afield. Collating this represented a personal archive or research bank that provided starting points from which to work. Both sonic and visual elements were considered integral to the work at all points, with the accumulation of material for both the visual and sound research developing in tandem to one another, often stemming from the same sites, being carried out at the same venues, on the same days.

The experience of recording material oneself on location was felt to be important. This has been the norm in visual art however not always in sound. There is a temptation to use second-hand sound recordings due to the difficulties in obtaining certain sounds and the ease with which they can be found through the vast collections of sound effect recordings or downloads freely available from online archival sources e.g. the BBC sound effects library. As Andra McCartney has noted:

‘Can you call a piece a soundscape if it is made from sound effect CDs? Does it make a difference? How well do soundscape composers know the place that they record?’ [McCartney, 2003, p.2].
This also points to a different expectation of sound where to copy or re-do is more accepted whereas in Western visual art the issue of originality has been seen as imperative to its reading since around the 18th century. The use of collage and appropriation within art and society at large in recent years has led to a re-questioning of this stance. The idea of the copy, or recognition that a work is in itself a version or amalgam, underpins much of our current cultural thinking, where the availability of imagery and reproduction is rife. However, a major benefit of first-hand fieldwork is the understanding gained of the site itself, the environmental context of the sound and visual aspects, underpinned by an inherent interest in the sites themselves. The physical process of walking through a site, looking and listening, gathering first-hand observation helped to build a deep working knowledge of the sites.

1.1.3 Sites

During the research process the site became increasingly central to the work. The site was always the place where research was gathered and was therefore the basis of the work, however in many cases the site related to both the initial research as well as the presentation. The work stemmed from an interest in the environment therefore sites were naturally selected that reflected my contemporary urban and/or industrial surroundings. Specific sites were chosen for a variety of reasons but each fell into one or more of the following categories: a) sites of specific interest in terms of the environmental issues, in particular noise pollution, b) sites selected because of a location relevant to the artist and c) sites that were related or connected to the installation venues.

a) Sites of specific interest in terms of noise in the environment

These included a variety of places including loud working environments, city centres, power stations, places related to noise complaints (such as wind farms), a variety of transport systems, motorways near houses and so on.

An interest in power stations alongside alternative sustainable sources of power in the environment became a key theme. This came from a history of making work relating to pollution and an on-going awareness of the environment and how we interact with our surroundings. Sites researched that relate to power were:

- **Drax Power Station**
  
  This is the second largest coal-fired power station in Europe and the UK’s largest emitter of carbon dioxide. It was particularly interesting to visit due to the visual
complexity of the machinery as well as the deafeningly loud noise created by the process.

- **Sellafield Nuclear Reprocessing**
  This site has gone through a number of phases in its history and is currently a reprocessing plant, supporting the decommissioning and clean up of nuclear power. Nuclear is a key issue in the debate around power, therefore it provided an example of different thinking and highlighted the complexities around these issues.

- **Wind turbine sites**
  A range of wind farms have been explored, as there are many throughout Scotland. The number of sites in Scotland has increased dramatically over the last ten years, supported by our drive towards sustainable, alternative energies. There is considerable debate about their visual impact on the landscape as well as increasing evidence about their effect on our quality of life issues associated with the sound they produce [Nissenbaum et al, 2012]. The sound of wind turbines is an on-going rhythmical swish however the volume can change dramatically depending on the wind direction.

Each of these power sources had dramatically different sound properties, Drax being incredibly noisy for staff due to the heavy nature of the work, Sellafield being neutral and wind turbines having generated continued debates because of the noise they produce.

Transport was another important subject to explore because of the dominance of the sound it produces as well as the environmental implications. The impact of transportation systems has also been the focus of much sound mapping and noise reduction research. There are many researchers working in this field such as Richard Barham at National Physical Laboratory, London and Bill Davies at Salford University, both of whom were collaborators on the sound events during Non-Bio Boom (see Chapter 2.5.3 and various publications including *Does This Sound OK?* by Davies [in Carlyle, 2007]).

The forms of transport included in the research were:

- **Trains**
  Various railways and subways have been investigated. Visual and sound research was gathered from different perspectives, including various types of train, while stationary as well as moving.

- **Aeroplanes**
Planes have been a subject of my drawings and paintings with visual research gathered from airports. Sound were recorded around the perimeter of airports so that take off and landing could be heard.

- **Road vehicles**
  Throughout this research many roads have been recorded and worked with, resulting in a mix of different vehicles and types and locations of roads being recorded.

**b) Sites selected because of a location relevant to the artist**
As the research developed the interest in sites frequented in my day-to-day life increased. Both Glasgow and Edinburgh feature prominently in the work as well as transportation links between these cities. Sites that were close to my hometown of Glasgow were of particular interest, such as:

- **M8 Motorway**
  The M8 motorway is a literal and symbolic link between Edinburgh, Glasgow and the West. It goes through the centre of the Glasgow and the building of this road resulted in parts of the city being physically and socially divided. I also pass the M8 daily, either by walking over or driving on it and therefore it is dominant in my life.

- **Cowcaddens**
  This is an area of Glasgow where I worked during this period and is where the M8 motorway meets the city.

- **Studio viewpoint**
  There was also a focus on noises in and around the visual art studio and other working environments. The surrounding environment of the visual art studio used during the period of research included a dual carriageway, a railway and a heavy metal galvanisers yard. Several paintings and sound recordings were created from this location. The studios are discussed further in Chapter 1.1.5.

**c) Sites that were related or connected to the installation venues**
As the work became more site-specific the venue, as a selected site to show the work, became of increasing interest and the work became more relevant to the venue in which it was shown. Some of the sites and venues were chosen because specific qualities of a geographical location or work was developed as a direct response to purpose of the space, such as:

- **Indian roads**
  The recording of road sounds in different countries, in particular India, was of great interest due to the unusual sounds and comparison with sounds from Scotland.
• **Underwater**
  One of the exhibitions was underneath an aquarium therefore underwater sounds were specifically recorded and developed for this venue.

• **Reverberation chambers and anechoic chambers**
  The use of extreme acoustic spaces demanded that specific work was made to suit the venue and also led to acoustics being a theme within the work itself. This work was enhanced by placing within these specific chambers.

### 1.1.4 Studio

Practical considerations meant that the sound and visual work were developed in two different environs and only brought together through their installation. The visual work was made in the context of an on-going studio-based painting practice, with the studio providing a focussed accessible environment from which to develop work. The studio was situated within a large studio warehouse complex, SWG3, which can accommodate large-scale painting and experimentation with materials. The sound studio was based in The University of Edinburgh and was a purpose made acoustic recording space with specialist sound editing programmes. Within this studio there was a 5.1 surround-sound speaker system set up to enable highly directional soundscapes to be heard and edited within the studio. The work itself was developed through on-going trials, testing different sounds and the way they overlay.

![Fig. 1 Sound studio, UoE](image)

There were a few stark differences between working in these two environments. Firstly, the sound-editing studio (see Fig. 1) was designed for individual use and did not lend itself to collaborative working because of the limitations of its physical space and the specialist nature of the equipment. The visual studio was an open-plan space encouraging collaborative modes
of working and an open exchange of ideas. However, in reality the activity of making work was so absorbing that this did not have a great effect and most feedback was sought through specific showings, meetings or feedback points. There was also a time element as the sound studio was booked for specific time slots, therefore the sound production was intense with the editing and mixing carried out in short focussed periods. As there were no time constraints the work made in the visual studio (see Figs. 2 and 3) continued over longer, less intense periods of time with more time to consider and critically reflect upon the work as it was being made. Finally, the two environments engaged with very different materials, from the computer software and hardware of the sound studio to the hands-on nature of making large-scale visual work.

The difference of working onscreen and working with physical materials was significant. However, despite these contrasting studios and processes the activities that took place were similar and had the same intentions. In each case source material was assimilated, mixed, edited and reflected upon to create multi-layered land/sound-scapes. Whether this is a personal approach, or simply the current digital context, the shift between digital and handmade comes naturally and is not anomalous. Working with a computer is so common in my day-to-day life, including in the making and development of work, that the shift between mouse and brush is not so distant. In reality much of the research development and some of the reflective process happened within the visual studio. As well as development in the research and painting, sounds could be listened to in this environment but only in low quality. Part of the benefit was that it was an established place to work, as well as having certain practical benefits such as computing/internet facilities, late night access, proximity to home etc.

Fig. 2 Visual art studio, SWG3

Fig. 3 Visual art studio, SWG3
The extent to which both the sound and visual work influenced specific decisions in individual works is difficult to assess accurately. At some points the visual work was made before the sound or vice versa however the aim was for an integrated approach to the sound and visual elements at all times. It should be noted that in the visual studio there was a constant level of background noise which could be heard throughout the space. As stated, it was located by a railway line and a dual carriageway, therefore there was continuous noise from passing vehicles. In addition there is a helipad (helicopter landing point) and galvaniser’s yard nearby, all of which have their own specific noises and characteristics. The relatively high volume of background noise in the visual studio provided a specific opportunity to work with sound whilst developing the painting. In addition, the M8 motorway, often referred to as a scar on the city of Glasgow, was encountered on a daily basis reflecting the enormous impact of transport and sound within urban areas.

The first point at which works were seen in their entirety was in the exhibition or installation therefore the staging or showing of work was critical to both its reading and its further development. This dependence on the installation as an opportunity to assess and evaluate the work altered the way in which all elements of the work could be developed. It demanded serious consideration of the physical environment, emphasising and altering the integration and potential meaning of spatial and environmental relationships in the work.

### 1.1.5 Venues

Critical to the work was the necessity to have suitable venues in which to carry out experimental installations. One hurdle was the time consuming nature of selecting, arranging and setting up a complete visual and sound installation. Choosing venues was particularly difficult as there were artistic considerations, such as the acoustics, aesthetics, lighting, shape, size as well as a number of more practical issues to bear in mind including public accessibility, related costs, location and availability. The physical attributes of a space, such as size and shape, greatly affected the development of the work, particularly the dimensions of a space. This affected the visual work, as a difference in the size or shape of a room dictated the form of the work, and the acoustics dictated how the work would be heard. A range of different venues allowed for experimentation with these and the ability to try out different combinations of ideas, however some exhibition spaces were used more than once to allow for more sustained analysis. The main attributes looked for in the venues were the following:
a) Venues with unusual acoustics

The acoustics of each space were a consideration as this directly affected the way specific sound pieces would work. The acoustics were considered at an early stage, which led to the development of work particularly aimed at that space, in turn influencing future work. It was through this process that the use of the reverberation and anechoic chambers became influential. The use of extreme sonic spaces to install the work shaped how both the visual and sound developed and how they were used in further installations. Particular to these were:

- **The University of Edinburgh**
  Both the reverberation and anechoic chambers were used at various points. This allowed for further experimentation within the same space and also the time outwith public showings to test a range of sound and visual works. Using this venue led to the development of the panorama and also gave a smaller scale test before setting up the *Dead or Alive* installations (see Chapter 1.5.2) and making the individual chamber for *Autorama* and *Panorama* (see Chapter 1.5.3).

- **National Physical Laboratory, London (NPL)**
  Here a reverberation and a hemi-anechoic chambers were used in my experimental research. These were large-scale extreme acoustic environments where a larger scale installation was developed and shown.

- **Waterfront, Belfast**
  The interest here was that the venue itself is known for its sound quality. This link came through site visits to the Sonic Arts Research Centre, Belfast.

- **The British High Commission, New Delhi**
  The venue itself was unusual due to the interior fittings and use of the room. The furnishings changed the acoustics of the room therefore I integrated the work into the structure of the room. Sound recordings were used that had been developed through previous work in India. Also in this venue the outside sounds could be heard inside the space, altering the sound experience.

b) Venues able to house particular installations

As well as the acoustics of a space the physical layout became increasingly important as the painting started to become horizontal in format. Making work designed to encompass the viewer meant that only particular rooms were suitable for installations. Round and enclosed
rooms were ideal but spaces of this type were difficult to find. Two venues that worked particularly well were:

- **Palace of the Republic, Minsk**
  This venue had a room in the shape of a hexagon (approximate) allowing for early experimentation with panoramas. There were also related research links.

- **Falkirk Wheel**
  Here the work took over the interior of a boat therefore the work encompassed the viewer upon entering the boat. The work was made on the boat and derived from the surrounding environment as well as the structure of the wheel therefore site-specificity was key.

Experimenting with these spaces led to the desire to make a freestanding structure to house the work developed. This was used in the following two venues:

- **Inspace, Edinburgh**
  In this venue the full stand-alone chamber was installed and two different showings of the work took place. It also allowed for experimental research work within a structured research thematic that I proposed.

- **The Briggait, Glasgow**
  The space allowed for the full installation of the separate chamber within a much larger space, which had its own interesting physical and acoustic characteristics.

c) **Venues in interesting locations**

Several of the installations were in unusual geographical locations. These were developed through a number of different opportunities as well as through various research links. The main ones were:

- **Nordsø Museet, Denmark**
  Here the installation was within (underneath) an aquarium and underwater recordings were made to relate to the venue. The museum was also in a harbour town, which was the focus of a number of sound and painting works.

- **Falkirk Wheel**
  The Falkirk Wheel is a key engineering structure in Scotland and represents the links between the east and west of Scotland. The installation reflected the surroundings and used the location as a starting point for the work.

- **Venkatappa, Bangalore**
The main interest here was the difference in soundscapes between India and UK therefore a number of sound works were developed in India. There were also existing research links with the Indian Institute of Science.

Public viewings in these venues contributed to my analysis of the work through evaluation and on-going reflection [Knowles et al, 2008]. Viewers of the work, and therefore those giving feedback, ranged from invitees from the gallery or my own mailing lists, from the general public to key individuals or experts in related fields. More details on the evaluations can be found in Appendix 4. Consideration of the range of installations built an overview and personal reflections helped me to gain insight into the development of the work, leading to shifts and changes throughout the research period. As these were public exhibitions considerable levels of planning, installation, publicity, related talks, documentation and formal and informal evaluation were involved as part of the process.
1.2 The Work: Sound

1.2.1 Recording Sound

The sound recordings were field recordings, recorded digitally on site using a high quality monophonic cardioid microphone. The sounds were mainly anthropogenic; ones often referred to as noise pollution and were taken from a range of environmental sources. The choice of the sounds relates directly to the choice of sites (see Chapter 1.1.3), however within each site there were choices of sounds that could be recorded. The selection was initially based on the interest of the sound itself, such as whether it had sound variations, movement or was a constant rhythm, as well as the implications of the subject in environmental terms. For example the sound of a wind turbine has both a constant rhythm and movement, due to the regularity of the blades turning through the air, and also has environmental implications to society. Cars on motorways have irregular sounds though we can clearly hear the Doppler effect whilst listening to these [Kinsler et al, 1950]. Cars in urban areas, on the other hand, have entirely different sound maps with the whirring of engines or clunks and clicks of stopping and starting etc. which become much more prominent, although both have obvious environmental implications.

The sounds recorded were all related to the visual imagery gathered but to varying degrees. They are diegetic with a range of incidental and specifically selected sounds. The visual work gives a static view of a scene, normally not incorporating people, therefore any sound created is implied by the visual setting. Although I recorded all of the sounds on-site, I was not evident or present within the recordings. As most of the sounds were recorded outside the impact of my physical presence within the recordings was negligible. In filmic terms most of the sounds are off-screen or acousmatic; the source of sound is invisible [Chion, 1994, p.74]. The same goes for certain visual subjects, such as people or cars, which are then heard and implied by the sound. There is also the sound of the ground or the field, which is more evident in the later works. Because of the scope of the visual panorama, the sounds of the field are multi-layered and all encompassing, covering a range of frequencies and aural layers.

There is also an intuitive element to the choices of sounds, with certain sounds seeming more appealing to the ear or encouraging certain specific connotations, such as the alarming nature of the sound of an ambulance or the rather nostalgic representation of bygone industries through the hammering of metal. It is worth noting that most of the sites where sounds were
gathered were visited especially for the purpose of gathering research however there was also an element of opportunism that happened. Some serendipitous recordings were gathered in unusual circumstances, such recordings of high volume of the birds in Minsk city centre or various unintentional recordings of sirens.

In the following examples in this chapter I will examine how the sounds developed alongside the visual work in the early installations. These works often focussed on some of the more extreme sounds, such as the engine of a motorbike or factory sounds. The sounds did not always refer to the images directly but were recorded within the same development period. Through the research period there was an incremental increase in the use of incidental sounds and more neutral background sounds (ground) as opposed to very specific single or more extreme sounds (figure). The background sounds tended to have a more neutral noise field, which could host more isolated sounds or help to create background ambience and rhythm. This overall ambience or atmosphere was echoed by changes to the visual work.

It should be remembered whilst discussing the addition of sound, in particular when using found sound, that sound is always present, even if the level to which it is audible may vary. This provides a key difference between the sound and the painting in my work. The painting is very clear where it begins and ends however there is always a level of sound, even if that is just in the viewer’s perception. Viewer perception is discussed further in Chapter 2.4.3.

There is also the question of the natural (or extraneous) sound environment of the work itself. The research has stemmed from two interests, an underlying interest in the environmental soundscape, which has resulted in making both sound and visual work directly about noise in the environment, and the effect a sound environment can have on a painting. Can sound be used to change or enhance the meaning or experience of the painting?

If we take the first point, an interest in our soundscapes, this has an inherent acceptance that we are constantly operating within a sound environment and that we are within a sound field at all times. It would therefore be futile to disregard the existing sound environment of the work. This has led to experimenting with incorporating (or embracing) the exterior sound environment within an installation. Although experimentation has taken place in this area there has only been one major exhibition where the background sounds have been fully operational. This was in the exhibition Panorama (see Chapter 1.4.3) where the extraneous sound was thought of as part of the intention of the work. In this exhibition the background sounds mixed with the created soundscape leading to confusion about the physical
boundaries of the work, and what was and was not within the installation. The benefit of this approach was that there was a fuller integration with the site. The challenge was that this was a unique space where this was possible, without amplification, and it was also uncontrollable. Part of the reason it worked so well was due to the location of the venue in a busy area in New Delhi where the traffic sounds were particularly distinct and that the two soundscapes overlapped well acoustically in the space.

The second point was how the sound environment can affect painting. For this to be pursued, which has become the crux of this research, a more controlled environment was sought so that the sound environment could be added. This meant that the sound environment was specifically created with the visual work in mind and vice versa. The existing sound environment ranged from quiet galleries to more noisy public, some with lively reverberation and some almost acoustically dead spaces. To take the addition and control of sound to an extreme, a range of different acoustic spaces were sought, which is where the use of anechoic and reverberation chambers appeared. See Chapter 1.4.2 for further discussion on extreme sound environments.

### 1.2.2 Development of Soundscapes

To enable the sounds to be manipulated and used within an art installation sound recordings were edited into one continuous soundtrack, either .wav or .mp3 files, both of which can be manipulated digitally. These sounds were downloaded onto a computer within the sound studio at The University of Edinburgh. The different sound files were mixed, edited and manipulated through the software.

During the early stages of research both stereophonic and 5.1 surround sound were experimented with. At this stage there was no access to sound moving software and simple procedures were utilised to create the idea of movement within the sound. The signal was divided between six different speakers and each sound pattern individually manipulated. In particular the volume division between the different loudspeakers allowed for a crude impression of movement in the directions from which the sounds were coming. Shortly after these initial experiments with movement in the sound, access to more sophisticated software was gained, allowing for more realistic movement of sound signals in the later phase of editing. The sounds were recorded digitally, then mixed and edited to create six surround sound files that were then played through the 5.1 surround sound speaker system. The ability
to move the direction of the sound opened up a number of avenues for the use of sound within an installation. Surround sound can not only give a realistic overall impression of sounds moving in a space but also allows for more distinct sounds to be placed or identified to relatively specific locations. The sounds were normally recorded from a fixed point (as discussed in Chapter 2.2.3) with the narrative of sound playing out through time rather than movement of the space. Because of the movement of the viewer through time and space they are able to create their own narrative.

In most of the early soundscapes the reproduction systems were either monophonic or stereophonic, which did not give a realistic representation of the more complex reality of differing acoustic environments nor the specific movements of certain individual sounds. Early recordings for soundscapes, e.g. the first recordings for the World Soundscape Project at Simon Fraser University, Canada [Truax, 2002], were stereophonic (or stereo), giving a limited degree of directionality in the reproduction space. In stereo reproduction sounds are panned between two loudspeakers in front of the viewer but there are no sounds from behind. Later works frequently use octophonic surround sound, giving a much greater degree of immersion in the sonic environment. For practical purposes it is possible to achieve very realistic spatial movement of sound in the horizontal plane by recording in mono and then intensity panning the resulting sound to the five channels in a 5.1 configuration in which five loudspeakers handle high and mid range frequencies and the sixth channel is used solely for the low frequencies or bass, known as Low Frequency Effect (LFE).

Strictly speaking, when using 5.1 the signals to each speaker should incorporate both intensity and phase differences, dependent on the location of the sound source, but as pointed out by Moore, ‘one of the most important perceptual cues for both the direction and distance of a sound source is its intensity’ [Moore, 1990, p.353]. So in practice the phase differences can be ignored with very little sacrifice in realism. This pattern of speakers enables relatively realistic surround sound from a very simple sound recording, if manipulated effectively. The sound can be configured and edited through the studio stage of production so that different sounds can individually move within a space giving a three-dimensional moving sound environment or soundscape (similar to landscape for sound). In effect it allows the artist to compose sound elements within a space the way that one may compose elements of a painting or install works in a gallery.
A key consideration for the sound work was to ensure it maximised the potential acoustic qualities of the space and that it related closely to the visual material. This became increasingly important as the research developed, finally becoming the key element to the work itself and to some degree becoming the subject of the work. At the beginning of the catalogue for Sonic Boom, the curator of the exhibition David Toop states that the selection of artists for the exhibition was due to their:

‘… commitment to working with sound (a medium with very particular and sometimes difficult characteristics) and their interest in using sound to articulate physical space’ [Toop, 2000, p.16].

Toop reiterates the importance of the relationship between sound and space, quoting David Lynch in saying that ‘architecture itself is a “recording instrument”’ [Toop, 2010, p.212]. In his book Haunted Weather he also stresses the significant research in this field and relates this to the reverberation qualities of the space, noting that:

‘The relationship of sound to space has become an immensely creative field of research. This may be the resonant space of rooms …’ [Toop, 2004, p.3].

The importance of the space when working with sound is clearly evident if one listens to the same sound in different acoustic environments. The understanding and articulation of the space is key to the reading and experience of the work.

To utilise the physical space in the research the sound was moved through the speakers as though it was moving through an actual space. The recordings and their subsequent installations aimed to give the viewer a feeling of a particular environment and indeed a sense of presence within that environment thus transporting them from the gallery setting. There is considerable discussion around the notion of presence particularly in virtual reality where the mediation of space through technology or the idea that people feel that the environment is real or that the viewer feels they are within are space is key. Distinctions can also be drawn between immersion and presence, where immersion would be seen as the physical act whereas presence would be seen as a human response. For further reading on presence see Slater, 2013 and the International Society for Presence Research website, http://ispr.info.

Spatially the most successful movement effects were produced when the sound source was recorded passing close to the microphone e.g. the train sounds were recorded on a station platform when trains approached from a distance, drew up alongside the platform and then drew away again. Similarly the aeroplane sounds were recorded close to an airport as the planes flew overhead. As with most natural environments, the overall sound was a
combination of specific discrete sounds with well-defined directional characteristics and more general background sounds coming from all directions. As the audio engineering expert Francis Rumsey has pointed out:

‘The spatial characteristics of natural sounds tend to split into ‘source’ and ‘environment’ categories, sources being relatively discrete, localised entries, and environments often consisting of more general ‘ambient’ sound that is not easily localised and has a diffuse character. Such ambient sound is often said to create a sense of envelopment or spaciousness that is not tied to any specific sound source, but is the result of reflections, particularly in indoor environments. The spaciousness previously referred to as “outdoorness” is much less related to reflections, probably being more strongly related to the blending of distant sound sources that have become quite diffuse’ [Rumsey, 2001, p.2].

Particularly in the later soundscapes (see Chapters, 1.5.1, 1.5.2 and 1.5.3) the sounds of the environment itself and the subtle acoustics add to the feeling of the space. Indeed the ‘outdoorness’ that Rumsey refers to became increasingly significant. When placed within an indoor arena such as a gallery or acoustic chamber this also became rather disarming as the space took on other qualities and added to the removed sense of place. The acoustic and spatial considerations are discussed at length in Part 2.

1.2.3 Incorporating Sound

The sound work shifted throughout the period of research and restricting the range of sounds made it more systematic and focused. Initially sounds collected were mainly from site visits that had been undertaken to a range of industrial and extreme sound environments. The paintings were also of these sites. However, the relationship between the sound and painting in the early installations was not always direct and at points were disconnected in terms of subject matter. As the research developed the nature of the sound recordings, and therefore the resulting soundscapes, became more site-specific and more closely linked with the images. This was in keeping with the visual work, which also became more streamlined and specific in terms of content and process. The visual work became more like an overall landscape, showing a scene or panorama. In the same sense the soundscapes became more sweeping and less disjointed, echoing the visual work. For example, in some of the later works the soundscapes focussed on a specific sound, such as traffic, which was altered and edited to create a regular overarching pattern for the whole framework. This was also the case in the visual work, such as in *Experiment 2*, *Dead or Alive*, *Autorama* or *Panorama* (see Chapters 1.5.1, 1.5.2 or 1.5.3).
Understanding and using the appropriate hard and software for both recording, editing and playing greatly affected the development and final work as well as the interpretation of the work [Rumsey, 2012; Miles et al, 2005]. A number of different ways of recording and presenting sound have been used such as:

- **Stereo speakers and recordings**
  Stereophonic sound reproduction, or stereo sound, uses two loudspeakers to produce the illusion of sound sources coming from different spatial positions. Generally the speakers are positioned on the same horizontal plane, on or close to the floor, so only changes in direction in this plane are reproduced, vertical positioning being ignored. They are placed at some distance apart, ideally angled towards the listener so that they subtend a total angle of about sixty degrees with the listener. If the monophonic signal obtained using a single recording microphone is played through the system then the apparent position of the source can be changed by panning the volume of the signal from one speaker to the other. If the entire signal is played into the right or left hand speaker the sound appears to come from that direction or if half the signal goes into each speaker then the sound appears to come from midway between. For more realistic stereo effects phase or time differences should be taken into account. To do this stereo recordings can be made with two separate microphones placed a short distance apart, each recording onto separate channels. For many purposes a single stereo-recording microphone is used which has two separate recording heads pointing in different directions but centred at the same point. This type of microphone only picks up volume changes but has the advantage that the resulting signals are equally acceptable for stereo or mono reproduction i.e. are mono-compatible.

- **Surround sound**
  The range of directions that stereo can reproduce is limited however there are innumerable other configurations of multiple loudspeakers. The most common configuration is known as 5.1 since it uses five mid-range/treble speakers and one bass speaker. The standardised configuration for placing these is three in front of the listener and two behind. The position of the bass speaker, known as the subwoofer (often-labelled LFE for low frequency effect) is not critical as bass speakers are not highly directional. The three front speakers are referred to as Front Left, Front Centre and Front Right and the rear ones as Left Surround and Right Surround. 5.1 recording heads, which contain six separate microphones that record each of the channels simultaneously, are available. Even 5.1 systems do not give fully realistic
three-dimensional reproduction although they give a near realistic sound experience. Wave Field Synthesis or WFS, on the other hand, uses whole banks of speakers to generate a complete virtual acoustic environment. The complexity of the hardware involved, however, means that it is only rarely used for exhibition installations.

- **Stereo headphones**
  Stereo headphones work on the same principle as stereo speakers with the left and right speaker placed on either ear. The type of headphones used can alter the perception of sound in particular in-ear and over-ear headphones have slightly different characteristics, which can affect the realism of the reproduction. In-ear headphones generally match the recording situation most closely but are not a realistic option for sound installations or exhibitions. One benefit of using headphones is that the sound quality is likely to be maintained, as there is less extraneous sound than with speakers. Headphones can also feel more personal due to the individual nature of wearing them and, because the loudspeakers are by the ears, the sound follows the wearer’s head movements.

- **Binaural recording and headphones**
  For binaural recordings miniature pressure microphones are placed in each ear and the two channels are recorded separately. When the sounds are played back through headphones the effect is one of uncanny realism as all of the time and intensity cues are automatically reproduced. This can allow a high degree of control of the sound and can allow the viewer experience to be very specifically shaped. The realism achieved is best if the listener is the same person who has made the recording since each person has his or her individual Head Related Transfer Function (see Chapter 2.4.1). This is often not the case but even when a number of different people listen to the same binaural recording they usually agree that the three-dimensional effect is vastly better than normal stereo or even 5.1. Dummy heads are available for binaural recording which are made to replicate the average characteristics of the adult head and have small recesses for inserting the microphones. The advantage of using a dummy head rather than an actual person is that it eliminates the possibility of head movements and extraneous human noises so the resulting sound is cleaner. Purpose-produced binaural recording systems are now available at affordable prices and binaural recordings are becoming increasingly common online. In February 2012 BBC Radio 4 broadcast the play *Private Peaceful* by Michael Morpurgo in binaural and there are indications that binaural broadcasts may soon become commonplace.
• **Spectrum analyser**

A spectrum analyser is a device for visualising sound wave frequencies and volume. It produces a time-dependent image of the spectrum on a display (normally on a screen) called a spectrogram. The varying sound intensities in the spectrogram show up as colours and the frequencies as vertical displacements giving an immediate time-based response. A microphone (or other input) feeds the signal into the spectrum analyser and an image is produced showing an immediate visual representation of the sounds that are being made at that moment. When used in an exhibition environment it allows the viewer to identify the range of sounds they produce and enables a direct link between the audio and the visual, in particular highlighting the spectrum of frequencies within the sounds.

• **Anechoic and reverberation chambers**

Anechoic and reverberation chambers are standard test spaces in acoustic laboratories. The anechoic chamber is a dead space, almost entirely free from reverberation and isolated from external noise. The reverberation chamber is the opposite having a very long reverberation time. When a sound is placed within the chamber it echoes around the room. The echoes persist in time and overlap one another, making it loud, with indistinguishable sounds. Chapter 1.4.2 discusses anechoic and reverberation chambers in more detail.

The specific application of the sound has been intrinsic to the viewing of the work as it affects how the viewer listens to the sound, how they encounter the visual work and how they experience the installations as a whole. These methods are discussed in the following chapters as they have been integrated into individual installations.

**1.2.4 Examples**

In the early installations shown in this section (see Chapter 1.2.4) groups of paintings were shown alongside sound recordings. The subjects of the work are easily identifiable as relating to the early site visits that were undertaken. The paintings were direct responses to some of the issues that had arisen on the visits themselves with sound recordings played through speakers alongside a group of paintings, testing out early ideas in relation to sound.

Figs. 4 to 6 show the installation of an exhibition in Dynamic Earth where six paintings were shown alongside a soundscape and a spectrum analyser. These were shown within the public
foyer of Dynamic Earth and behind the installed paintings there was a large glass panel wall through which viewers could see the parkland beyond. This provided an extremely appropriate backdrop and visually stimulating setting for the work. Although this was incidental upon selecting the venue, the decision to show the work against the glass wall accentuated the industrial images and reiterated their relationship with the natural elements behind.

The paintings themselves showed a range of subject matter, mainly of power stations and aeroplanes with the emphasis being on industrial structures, with a rather monumental feel. One of the key works in this installation, Fig. 4, shows a painting of Drax Power Station. The visit to the power station was one of the first visits that was undertaken and provided a number of interesting outlets for ideas such as that the site had some unexpected sound qualities. Within Drax the volume of the sound made by the machinery was so loud that ear protection has to be worn at all times. Despite taking considerable care in recording none of the recorded sounds were usable because the intense volume overloaded the apparatus. This site and the paintings developed from it were of particular interest to me, partly because of the environmental issues concerned with the site itself, such as the use of fossil fuels, as well as the extreme sound levels within the premises. However, ultimately the sound recordings taken from this site were not used in the final installation.

a Sound, Dynamic Earth, Edinburgh

Fig. 4 Installation, Sound Dynamic Earth 2006

Fig. 5 Spectrum Analyser, Sound DE 2006
In this exhibition there was a further element to the presentation, which was the inclusion of a spectrum analyser. Here and in some of the other early experiments (see Sound at Glasgow Science Centre and London Metropolitan University later in this chapter) a microphone was used to pick up the sounds of passers-by which have been fed directly into a spectrum analyser. This was used in several early exhibitions and the public interacted well with the hands-on involvement and evaluators at the exhibitions have noted the audience’s interest in the interactive (see Appendix 4). However it was deemed to be very separate from the painting and sound work and eventually it was seen as a separate work. In fact it was shown in a later exhibition Dead or Alive (see Chapter 1.5.2) however not as part of the main exhibition but as additional information relating to the art installation. This seemed to be a more successful way of integrating the analytical process and equipment.

**b Sound, Glasgow Science Centre**

![Fig. 6 Installation, Sound Dynamic Earth 2006](image1)

![Fig. 7 Spectrum Analyser, Sound DE 2006](image2)

![Fig. 8 Installation, Sound GSC 2006](image3)

![Fig. 9 Speaker, Sound GSC 2006](image4)
The *Sound* exhibition in Glasgow Science Centre was a further iteration of the work from the Dynamic Earth with some additional paintings and a new soundscape arrangement. The painting of the M8 motorway was a central piece within the exhibition and was visually the centrepiece of the installation. The sound installation and relationship between the sound and image were also more successful. This was mainly possible through practical qualities of the space, which was more open and flexible giving the possibility of a more appropriate speaker arrangement, using the central pillar to embed the three-dimensional quality of the sound. This was one of the early installations where the sound was played three-dimensionally, meaning that it tested the integration of the visual images and the sound. These early experiments began to push ideas around the contextualisation of what is primarily a two-dimensional painting exhibition with sound.

c **Sound, London Metropolitan University**
This installation in London Metropolitan University included a number of paintings alongside a related soundscape that was played through headphones. In this exhibition space it was not possible to play sounds aloud, since it was close to a library where the sound level had to be kept to a minimum. The idea that a gallery does not accommodate sound is not unusual, either for the reason that the sound potentially contaminates or disturbs adjoining spaces, or because the space itself is traditionally considered to be a quiet ‘contemplative’ space or through other sounds being so intrusive that a sound piece would not be heard clearly. This led to experimentation with alternative ways of presenting the sound, namely sounds played through headphones, which were placed on a plinth near to the paintings (around two metres away). This meant people viewing the exhibition could choose to wear headsets, select at what point to put on the headphones and where to look once they were wearing them.

Headphones are used extensively by many artists working with sound and can enable the sounds to be heard in an intimate way, as the individual wearing them is the only one to receive those particular sounds. Because of the ear protection provided, the sound is often more clear as there is minimal risk of superfluous sounds interfering with the intended sounds. It also creates a situation where although the sound may be directional, in this case through stereo headsets, the direction moves with the viewer’s movement. In this installation the sound was led by the viewer wearing the headphones and to some degree draws on analogies between visual work and the concept of the gaze, as considered when viewing individual visual works (for further reading on the gaze see for example *The Look* by Jean Paul Sartre or *Discipline and Punish* by Michel Foucault [in Sartre, 1956; Foucault, 1988]). A major disadvantage of using headphones was that the sounds stayed the same regardless of individual viewing of the installation and as such was fixed despite their physical presence and viewpoint moving between different works.
As explained in Section 2.4 the space and direction of sound is very important for the placement and identification of spaces and sounds. The findings from this exhibition showed that the headphones and paintings seemed rather separate. From speaking to viewers and through my own observations it was unclear whether the sound and visuals were the same works and should be viewed together or whether they were discrete pieces. Although there is potential in the realistic sound environment headphones can offer, in particular binaural recordings/transmissions, they seem to work against the principles of the visual and sound environment, actively separating the two. This spurred an on-going interest in methods of incorporating sound including how headphones might be more effective and a continued interest in the use of sound within galleries and exhibition spaces.

d **Kyst, Nordsø Museet, Hirtshals**

Fig. 17 Underwater installation, Kyst NM 2006  
Fig. 18 Underwater installation, Kyst NM 2006

This exhibition was held underneath a large aquarium within the Nordsø Museet, Hirtshals, Denmark. This was an unusual, rather dramatic space to show work within, with extreme lighting, sloping walls of water and live aquatic life within a large enclosed space. The paintings were installed with a soundscape within the central area of the space, interpreting the underwater environment from visual and sonic perspectives. Showing within this unusual space, allowed for (and to some degree demanded) the consideration of the site, both in terms of geographical location (beside a harbour) and the use of the space (as an aquarium). This exhibition used a stereo system to integrate the soundscape, the key reason in this
instance being the high level of reverberation in the space. Due to the large areas of hard plastered walls and the glass sides of the aquarium as well as the uneven geometrics of the room the difference between using stereo and 5.1 was felt to be quite small.

Although not all the work in this installation was directly site-specific to the aquarium it related to the theme and was installed to complement the subject matter. This exhibition opportunity encouraged a number of ideas relating to underwater sound environments, resulting from trials which took place prior to the exhibition. These experiments were addressing sound within water, using a hydrophone, an underwater recording device. The early attempts to make a soundscape from underwater sounds made use of fish sounds recorded by scientists at an aquarium in Aberdeen but these proved problematic mainly due to the poor quality of the sounds and predominance of background noise. Instead recordings were taken using a hydrophone of air bubbles being released in a tank of water. Bubbles are one of the most common sources of underwater sound. These sounded like clicks or high pitched taps which went off at repetitive but random intervals, similar to the types of sound intervals you might hear from a Geiger counter. In the final soundscapes these worked as a short clipped sound, being relatively distinct in comparison to the other sounds used.

**Kyst, København’s Akvarium, Copenhagen**

![Fig. 19 Painting with sound, Kyst KA 2007](image1)

![Fig. 20 Installation, Kyst KA 2007](image2)

This exhibition was the second in a series in Denmark and utilised existing paintings and soundscapes to allow for further early experimentations with visual and sound pieces. In Fig. 19 you can see a stereo sound piece alongside paintings with the speakers placed strategically within the space to maximize the sound capacity and to relate to the accompanying images. Although this was not a key exhibition in terms of experimenting
with new work it allowed for testing of sounds within a space and the combination of speaker arrangements with visual material.

**Louder Now, Waterfront, Belfast**

Fig. 21 Sound Installation, Louder Now 2007

Fig. 22 Installation, Louder Now 2007

Fig. 23 Painting installation, Louder Now 2007

Fig. 24 Painting detail, Louder Now 2007

Fig. 25 Painting detail, Louder Now 2007

Fig. 26 Installation, Louder Now 2007
The final exhibition presented in this chapter is *Louder Now*, Waterfront, Belfast (2007). It was presented outside the main auditorium of the Waterfront Concert Hall, a venue renowned for its state-of-the-art sound system and acoustics. The exhibition consisted of a series of paintings set within a multi-speaker sound installation and was developed through visits to SARC (Sonic Arts Research Centre, Belfast) and their links with The University of Edinburgh. The installation was situated within an arc shaped space and the new three-dimensional soundscape was played through a multi-media speaker system. The six speakers were placed along the inner wall of the space, facing a long curving wall where the paintings were hung. As with all of the installations the work had to adapt and change to the space. In this case, although the sounds came from one side of the space, because of the reverberations inherent in the building structure and the reflective curving wall the sounds effectively sounded three-dimensional creating an inclusive environment.
1.3 The Work: Visual

1.3.1 Development of Visual Work

As discussed in the previous section, the early research explored sound through individual paintings of sound-related subjects, with work progressing to incorporate sound, firstly in stereo and then beginning to work with surround sound. Through physically making installations, and as outcomes emerged, a direct visual response grew out of the research with fundamental shifts in the visual work. How the paintings could integrate more fully with sound, as subject matter and art medium, was constantly probed and rethought with an increasing focus on the way they would be read by the viewer and the scale and dimensions of the paintings. Panoramic-style paintings began to emerge, leading to a rethinking of the format, composition, focus, materials, mediums and critically a renewed interaction with the site/venue and the sounds themselves. Through the process of the research, and the desire to combine both the sound and the painting in an integrated way, the visual work developed from paintings on canvas (between thirty centimetres and two metres in dimension) to large panoramic paintings, which scan the perimeter of a given space (typically ten metres or more in length). The long and surrounding images encourage the movement of the eye and the viewer within the work, suggesting an element of time and space. This section discusses the progression of the visual work in further detail alongside specific examples.

As described in Section 1.1 research began with field trips and on-going observations of surroundings, with visual material being gathered in the form of photography, drawing and painting. Images were then assimilated in the studio, and analysed to identify links or points of interest. As seen in the examples in Chapter 1.2.4 the early paintings were mostly of specific concrete subject matter, often responding to one subject. As the paintings developed and embraced different formats other considerations emerged and the aim became to create a visual landscape or environment. This demanded a shift in the painting which led to a new strand within the work, that of creating a scene or vista, with multiple focal points and potentially multiple subjects within it. These new works were created in the studio and from the primary research gathered, images were selected and edited. This often took the form of a visual collage or ‘mashup’, where different images were put together, contrasted and combined to create a reflection or impression of something, in this case an environment. The images were not copied landscapes but edited versions, giving the impression of a particular space. The later panoramas were not realistic observations of a scene but rather amalgams or composite landscapes. For example in Experiment 2 a number of different photographs and
drawings of Glasgow, in particular where the M8 joins the city and particular views from that particular road and the surrounding buildings, were amalgamated (see Chapter 1.5.1). The perspective changes throughout the panorama according to different viewpoints and areas of focus, similar to changing focus or attention while moving through a space. Throughout the final panoramas (see Experiment 2, Dead or Alive, Anechoic and Panechoic, in Chapters 1.5.1, 1.5.2 and 1.5.3) photographic and drawn images from the original primary research were translated into final paintings through a series of alterations including reducing or enlarging sections, picking out vertical or horizontal structures, particular aspects of focus or precision becoming evident. The colours changed through the process, leading to areas being tonally altered or washed out, there were areas of specific mark making, layering and overlapping. They used methods of painting to represent and also to obscure and create a range of focuses within the work.

### 1.3.2 Making the Panoramas

The change from rectangular paintings to large-scale panoramic works was a gradual shift, which took place after testing out a number of early experiments with sound. There was an increasing move towards immersive painting environments, where the panoramas encompassed the viewer and, within a painting context, took on board the temporal nature of the sound. Visual art, and painting, have the potential to treat the image as temporal through the act of inviting the viewer to engage with the work in this way. Through the act of looking the viewer can scan over the work with no fixed viewpoint, supporting the idea of the experiential work. This treats the painting or image as an installation where the space itself and the environment are integral to the artwork, thus moving towards all encompassing painting.

In physical terms the visual work developed from paintings on board or canvas, to large panoramic paintings normally executed on paper. Preliminary drawings and mock-ups were often drawn out very small scale, sometimes around 50:1 to help build up compositional aspects (in particular the flow through the image and to position key structural features). Often several initial drawings and various iterations would be pursued and altered to aid the development of the composition. It was critical to be clear at this stage about the overall composition due to the large scale of the work that was being developed and the practical implications. Because of physical limitations within the studio the larger panoramas were completed in sections (between two and five parts) therefore they could not be seen as a
whole until they were installed, demanding a planned approach. In addition they were painted on a flat wall therefore the three-dimensional circular nature of the works was only realised in an installation situation. See Figs. 86 and 87 which show the development of Panechoic on the studio wall before it is installed within a circular chamber (Chapter 1.5.3). The exceptions to these were Milieu (Chapter 1.4.2) and Experiment 2 (Chapter 1.5.1) both of which were painted in situ. Working in situ was beneficial to the development and the overall composition however it is often not practical in exhibition situations.

The panoramic images that developed were made on paper and painted in acrylic and gesso with drawing intervening and overlapping in pencil, chalk, ink and paint. Using paper as a surface to work on allowed the paintings to be rolled up for transportation and storage. It also had a lower cost implication and the paper was easier to prepare for painting, resulting in it being more suitable for experimentation. There were a number of different papers which I experimented with but most of the panoramas were made on paper reinforced with glass fibre. This helped to maintain the longevity of the work, particularly in transportation and installation. This kind of paper has a rather porous, rough looking finish and is absorbent of the paint, therefore creating a slightly hazy edge when very wet paint has been applied. This contrasted effectively with some of the more linear areas of drawing or the thicker impasto paint. Installing the panoramas was rather cumbersome because of the desire to maintain the full length, i.e. one continuous piece of paper for each length of wall in the exhibition, without folding, damaging edges or ripping in the de-installation. All of the panoramas, with the exception of those in the reverberation chamber in The University of Edinburgh, also had a structure supporting them on the back. This had various benefits including, keeping the panorama flat or circular and making it possible to install the panorama in a wide variety of venues.

The very long extended format of the images encouraged the notion of multiple perspectives. It was necessary for the eye to move throughout the composition aiding the intensity of rhythm and movement, echoing the related soundscape. Changes in the pitch and vibrancy of the visual work, such as intensity of colour/tone, mark-making and composition alludes to the complexities within our environment and the alienation and confusion that modern industrial spaces can evoke. The images have key lines or structures within the compositions that aim to hold the eye within the narrow band surrounding the room thus helping to focus, maintain intensity and flow through the visual work. Most of the images either have the line of a horizon or the focal points are relatively high, hung roughly at eye level, to create an
approximation of a horizon. The panoramas are an amalgam of images with different compositional elements running through them such as a general horizon, a series of sweeping lines providing a framework, block areas of buildings or a series of focal points such as drawn areas of lorry, aeroplanes or specific buildings.

1.3.3 Examples

a Sonitus, Venkatappa Gallery, Bangalore

Fig. 27 Installation, Sonitus 2008

Fig. 28 Installation, Sonitus 2008

Fig. 29 Painting and sound, Sonitus 2008

Fig. 30 Painting detail, Sonitus 2008
This was the first exhibition that explored a larger, longer format painting alongside sound. Although there were other visual works in the exhibition, including several individual paintings, the long painting was the key new work developed for this exhibition. The panorama was made for the one end wall of a large rectangular room (i.e. not around the whole perimeter of the space, as with later panoramas) and became the visual centrepiece of the exhibition.

The composition here was not representative in terms of perspective or colour [Gage, 1999]. It was created by editing together a range of drawings and photographs to create a loose amalgamation of industrial structures. The painting was relatively minimal with a mixture of drawing in pencil, chalks and acrylic and gouache paint. Many of the considerations during the making of this painting were centred on the practical implications of the increase in scale and overall compositional elements. This included the differing qualities of working with materials at that scale as materials are increased. This work was on paper due to the practicalities of stretching canvas or transporting boards therefore other painting materials were used. Working on paper (as opposed to canvas or board) at this scale can seem very dry due to the large quantities of paint required on a brush. This demanded a rethink of materials and ways of approaching painting and mark-making which contributed to further developments in the panoramic painting. In subsequent panoramas a number of painting experiments were tried, such as washes of colour, applied with very large brushes to build up tonal values, such as the Experiment 2 or Autorama (Chapters 1.5.1 or 1.5.3). In the final work Panechoic (see Chapter 1.5.3) the paper was first painted with a thin acrylic paint to seal the surface and give a darker ground to work on. This allowed the paint to stay on the surface creating more defined and controlled areas of painting.
There was a soundscape made for the exhibition and played through the 5.1 speaker system. During the period in India additional recordings and further sound works were developed that responded directly to the local environment and fed into later exhibitions. This exhibition was within a traditional art gallery in the heart of one of India’s busiest cities and the environment was of interest for further works. Connections were made with the Indian Institute of Science who had a great interest in the environmental theme of the exhibition and also an early connection with Karnataka Chitrakala Parishath, the city art university, where research links were made and a lecture was given on this research (2012). This also led to further exhibitions in India including an exhibition directly developed from this research, *Panorama* at the British High Commission, New Delhi 2010 (discussed in Chapter 1.4.3), as well as work included in a group exhibition on colour in Abadi Art Gallery, New Delhi (2011).

**b  Zvuk, Palace of the Republic, Minsk**

![Panorama and sound installation, Zvuk 2008](image1)

*Fig. 33 Panorama and sound installation, Zvuk 2008*

![Panorama and sound, Zvuk 2008](image2)

*Fig. 34 Panorama and sound, Zvuk 2008*

![Panorama detail, Zvuk 2008](image3)

*Fig. 35 Panorama detail, Zvuk 2008*
Zvuk was held in the gallery of the Palace of the Republic: a large cultural centre in the main square of Minsk, Belarus consisting of three adjoining spaces. The varying room structure was used strategically to enhance the different uses and the discrete nature of the work, with the work in one room, a hexagonal room, effectively surrounding the viewer in a circular way [Blesser and Salter, 2007], allowing for experimentation with a panorama. Because of the layout of the room the panorama fell into two different halves with two one metre high paintings, approximately twenty metres in circumference. One half of the panorama had been shown before in Sonitus (see Figs. 23 and 24) and the adjoining other half was made for the space. A three-dimensional soundscape was also installed with the 5.1 surround sound speakers being placed in appropriate corners around the gallery. Within the other rooms a number of paintings were hung.

The panoramic painting showed a mix of industrial structures and transport systems. The colours within the panorama were from a limited palette ranging from viridian green through to ochres and greys, mainly within the earth range of colours. This simplification of palette and narrow colour range within the panorama contrasted significantly with the other paintings in the exhibition. This again separated the impression given by the hexagonal room and created a distinct environment within this space. The decision to use a limited palette seems to have enhanced not only the slightly unnerving atmosphere within this room but it also allowed the image structures and sounds to take precedence rather than the colour. There were however differing scales, materials and concentrations of paint with some areas painted very loosely, with rather muted colour and tonal values, and other areas painted more decisively. There was also a considerable amount of drawing in pen, pencil or fine brush, which made surface differences in texture and intensity. Some areas, such as the lorry (Fig. 35) were drawn in pencil whereas other aspects, such as roads, were depicted through loose
lines in paint. There was also considerable space and quiet within the image to allow the eye to rest and to represent the contrasting sporadic structures and beguiling nature of our landscapes.

The soundscape was installed in the central gallery space with the objective of combining the visual and sound elements to create an immersive environment for the viewer. Six core sounds were used to produce the Zvuk soundscape (i) motorway 1 (ii) motorway 2 (iii) a train (iv) a plane and (v) a pneumatic drill in the street and (vi) a hissing factory noise. There were effectively three characteristic time scales on which the different sound fragments occurred; a second for the industrial noises, ten seconds for the passing trains and aircraft and in excess of a minute for the background motorway. The sounds related to the images making up the panoramas, such as the aeroplane sound, but also evoked subconscious links with the paintings in the other spaces within the exhibition such as the train sound and the motorway.

Because of the multi-directional nature of sound within a reverberant setting there is a potential problem of noise pollution in the surrounding areas. In Zvuk there were adjoining rooms with doorways that were open and wide, with no sound barriers therefore sound from the panoramic room extended outwards and percolated into the other rooms. The fact that there was sound throughout the entire gallery meant that the sound environment upon entering the panoramic room was less alien to the viewer. Because of well known diffraction effects [Campbell et al, 2004, p.43] the sounds that carry throughout a large complex space are the ones with more bass so in the adjoining rooms the sounds were relatively distorted and non-directional with the louder sounds and low frequency sounds carrying through and the subtle noises attenuated. In practice this resulted in certain sounds such as the plane and train being heard throughout the gallery space and others, such as the factory, being almost indistinguishable outside the room which housed the panorama. The possibility of encompassing these findings into future exhibitions was considered either through separating the sound and creating different acoustical spaces or alternatively by embracing this filtering effect and enhancing it through further deformations similar to the way in which the reverberation chamber was used as an extreme reverberant setting.
Marking the Terrain was a group exhibition of drawing at Glasgow School of Art. Although a complete installation could not be developed in this setting, as there was neither the opportunity to install sound nor the larger all-encompassing installation possibilities, it was an excellent opportunity to push and test some of the visual work through a smaller installation. The six-metre panorama was installed so that it followed the wall around a ninety-degree corner of the gallery, allowing for other ways of working with panoramic images.

Experimentation took place with the drawing and painting and the use of different techniques on paper. In particular the palette for the work was monochromatic leading to an interpreted and distanced impression of the subject matter. The subject of the work was Sellafield Nuclear Processing Plant and the work sought to expose the conflicts within the subject matter. The use of pencil drawing with minimal painting emphasised the specific nature of
the visual work through the careful application of the paint. Layers of drawing contrasted
tonal areas and visual devices such as verticals within sweeping curved horizontals helped to
build a panoramic visual language within an overall composition.
1.4 The Work: Immersion

1.4.1 All Encompassing Installations

Approaches to installations have taken a number of forms but the main elements have stayed the same, namely, an opportunity to develop and test relationships of sound and visual work (mainly panoramas), in site-specific environments. Different venues have been utilised and the specific characteristics, such as acoustic or visual qualities, of the space used to enhance aspects of the work. In particular I was interested in the consideration of space/place [Augé, M, 2008] within both the starting point (the site) and the end point (the venue) as well as the importance of geographical location and to what degree it is synonymous with the work.

Through creating an artwork as a multimedia installation, there is an increased ability to direct the environment. However, this does not necessarily give control over the experience due to the dominance of the viewer's role within the work, as well as additional environmental issues. The audio-visual can have a diminishing effect on the artist's reign over the interpretation, although it allows greater scope for experience. Sound artist and researcher, Owen Green, suggested:

‘The environment is not something we control, but interact with, and it exerts reciprocal effects on us; technology is not a means to exercise control, but again something we interact with that affects the course of our actions’ [Green, 2006].

Sound work has a particularly significant chance of extraneous interference due to the high level of noise in our environment and this has to be considered within the making and/or showing of the work. Beyond this there are also the noises that the audience or viewer makes, Green goes on to describe:

‘The authority of the performer-composer over the audience in having sole control over what sounds are made is weakened also, as any listener could, in principle, make sounds that would affect the emerging sonority’ [Green, 2006].

It is known from previous psychoacoustic tests [Shams et al, 2004; Greated, 2009] that the sonic environment in a space affects the way in which visual images are viewed therefore combining the two should affect both the reading of the visual and the sonic. Because the panorama encircled the viewer, a surround-sound installation was particularly appropriate so the two elements worked in tandem to create an atmosphere of complete immersion in the environment as well as to introduce a temporal element into the work. As stated by Calvert, Spence and Stein, ‘a recent study has revealed that vision can be radically altered by sound in a non temporal task, even when there is no ambiguity in the visual stimulus’ [Calvert et al,
2004, p.32]. Therefore this research has tested a variety of aspects of art practice, mainly how we experience work and how differing sensory experiences affect each other.

When one listens to a sound from one source in an enclosed space a combination of the direct sound coming from the source together with the sound that is reflected off of all the surfaces in the room i.e. floor, ceiling and walls, as well as any objects is heard. The direct sound is heard first as it has the shortest path to travel, shortly afterwards the first reflection from the nearest surface is heard, then the second reflection and so on. These reflections make up the reverberant sound field. If the sound from the sources is continuous the reflections add together until the reverberant field reaches a pedestal level, normally after one or two seconds. If the sound is switched off the reverse happens i.e. the direct sound is lost first, then the first reflection, second reflection etc. until the sound level has dropped effectively to zero. The time that the sound takes to die away is referred to as the reverberation time and is arguably the most important acoustical characteristic of a space.

The reverberation time is dependent on the volume of the room and the total sound absorption of the wall, floor and ceiling surfaces. Soft materials like foam have very high absorption rates, whilst hard materials like marble have very low. Accurate measurements of reverberation time can be made by making an impulsive sound, such as clapping two pieces of wood together or bursting a balloon. The sound can be recorded and a graph plotted to show the variation of sound levels with time. The slope of the graph gives the decibel rate of decay from which the time to drop by sixty decibels and the reverberation time can be deduced. Reverberation times were recorded in a number of the research exhibition spaces in order to get a quantitative measure of the ambience. For example measurements taken inside and outside the semi-anechoic space set up for the installation in the Briggait (see Chapter 1.5.3) showed that there was a very significant change in acoustic environment experienced on entering the chamber.

### 1.4.2 Extreme Sonic Environments

The most influential aspect on the developments of the work has come through the use of anechoic and reverberation chambers as sites for experiments and exhibitions. Anechoic and reverberation chambers are standard test spaces in large acoustics laboratories. When measuring acoustical characteristics or performing acoustic experiments it is important that reflections do not contaminate the measurements. In an anechoic chamber the walls ceiling
and floor are all lined with foam wedges, which produce virtually no reflections hence, the name an-echoic. The reason for using wedges of foam, rather than flat sheets, is so that the sound waves are stopped gradually which is essential if reflections are to be inhibited. Reverberation times in high specification anechoic chambers are generally too small to be measured and on entering such a chamber one is struck by the feeling of extreme silence and deadness. John Cage draws attention to this extreme experience of going into an anechoic chamber:

‘I entered one at Harvard University several years ago and heard two sounds, one high and one low. When I described them to the engineer in charge, he informed me that the high one was my nervous system in operation, the low one my blood in circulation. Until I die there will be sounds. And they will continue following my death’ [Cage, 1961, p.8].

Although these chambers are not sounds in their own right they are acoustic environments that impose a set of conditions. When one enters an anechoic chamber an awareness of oneself and ones physical presence and surroundings is encouraged. See here the artwork *The National Apavilion of Then and Now* (2011) by Haroon Mirza, where he uses sound and light within an anechoic chamber (see Chapter 2.5.1) and his distinct interest in the physical aspects in his work exemplify this approach.

In NPL there are several specialist acoustical testing rooms. In addition to anechoic and reverberation chambers there is a hemi-anechoic (a half anechoic chamber, with a solid floor), one for recording underwater sounds and another designed as a standard living room, which in effect allows for relatively accurate measurements to be taken from inside an average domestic room. This is because within a typical home there are both hard reflective surfaces, such as walls and cupboards, as well as absorbing materials, such as soft furnishings, thus creating a complex acoustical situation. Also the presence of humans within these rooms causes additional absorption and has to be taken into account, not just in domestic spaces, but also in larger public arenas, such as in concert halls or shopping centres.

Since the floor in an anechoic chamber is lined with foam wedges a grid is necessary to walk on and mount apparatus. This is inconvenient for large experiments and indeed for exhibition displays, hence the idea of the hemi-anechoic chamber in which the floor is flat and only the walls and ceiling are lined with foam wedges. The characteristics of a hemi-anechoic chamber are not as good as a full anechoic chamber but are usually more than adequate for most practical purposes. The anechoic chamber at The University of Edinburgh is a full
chamber however the main chamber at NPL is hemi-anechoic. The introduction of hard surfaces through the installation of paintings and speakers did make a small difference to the acoustics but it was so minor that the overall effect was not changed.

The diametrically opposite extreme enclosure is the reverberation room in which all the surfaces are highly reflective. The walls and ceiling are also sloped so that there are no parallel surfaces which would cause resonant standing waves, which would in turn produce patterns of high and low intensity sound. Reverberation times are extremely long in reverberation rooms, typically eight or nine seconds. The reverberation chamber encourages homogeneity of sound level within the space as the reverberation time is extended. Reverberation rooms are used for tests relating to the overall characteristics of a source, such as the overall frequency response characteristics of a loudspeaker or musical instrument, or for measuring the absorption of different materials, such as wall coverings.

It should be noted that adding sound to either space brings with it very different considerations. In the anechoic chamber the sound can be isolated because of the dead acoustics of the space. There is very little reverberation therefore you hear virtually pure sounds. In this environment the sound can be very carefully controlled and directed within the space. The reverberation chamber is the opposite as sound is uncontrollable within it. The sound waves continue to reflect off the hard surface walls until they eventually fade. This means that the spatialisation within the sound does not come into play because of the natural reverberation of the room. The direction of the sound is almost lost and an array of signals coming from different directions is heard. The architecture of the space dictates the sound quality and how it is perceived.

1.4.3 Examples

a Experiment 1 Anechoic/Reverberation, The University of Edinburgh

Within The University of Edinburgh School of Physics and Astronomy there are two experimental sound chambers, a reverberation chamber and an anechoic chamber, which provide extreme sound environments for academic research. During the period of this research there was full access to these, which was extremely useful in terms of testing ideas. They were used for experimentation with a number of works such as the early panoramas and for trying different installation methods of sound alongside visuals in a space as well as for
experimental exhibitions and public events. The first experiments took place over two periods - July 2007 and October 2008.

Experiment 1 Anechoic/Reverberation was installed in these rooms. There were two parts to this experiment with both the reverberation chamber and the anechoic chamber being used. A single long panoramic painting that followed the perimeter of the room completely formed the work in the reverberation room. The concept stemmed from anthropogenic noise and the painting depicted a contemporary urban landscape dominated by roads and buildings. The perspective is slightly confusing and there is an overlaying and disjointed nature to the structures within the painting, representing the hubbub of current cityscapes. It was a deliberate decision to omit cars from the visual imagery as the cars, trucks and other vehicles are depicted in the soundscape. The sound piece was made up from sounds of traffic recorded in situ in the field and then edited together using Protools software.

Fig. 42 Experiment 1 reverberation, UoE 2008  
Fig. 43 Experiment 1 reverberation, UoE 2008  
Fig. 44 Experiment 1 detail, UoE 2008  
Fig. 45 Experiment 1 detail, UoE 2008
On entering the reverberation room the viewer was surrounded visually by images from the built environment. The room was relatively bright due to the light painted walls and the surrounding visuals that enveloped the viewer. Concurrently sounds arrived from all directions bringing the viewer into a cacophony of sounds and visuals. Although there were only two loudspeakers in the room, the reflections were so great that a completely diffused sound field was set up. Since the sound absorption of the walls was very low the overall sound level in the room was correspondingly high.

The second part of the work was in the anechoic chamber and visitors to the exhibition walked directly from one chamber to the other. The reverberation room literally reverberated with traffic noise whereas, in stark contrast, the anechoic room was almost completely silent with the walls, ceiling and floor made from foam wedges absorbing the sound. In this respect it formed a sound analogy to the temporal variation in visual experience mentioned earlier. In addition the foam was dark in colour so the overall light level was very low, even given the
artificial lighting. The paintings in the anechoic chamber followed the same theme as in the reverberation chamber but were much smaller and placed at specific isolated points around the walls. The soundscape was made up of discrete traffic sounds, which occurred suddenly and were dispersed between significant gaps of silence. The speaker system was arranged so that the sounds appeared to come from different directions thus creating a spatial analogy between sound and vision.

b  **Milieu, Floating Gallery, Falkirk Wheel**

![Fig. 50 Drawing & sound installation, Milieu 2007](image1)

![Fig. 51 Speaker detail, Milieu 2007](image2)

![Fig. 52 Drawing & sound installation, Milieu 2007](image3)

![Fig. 53 Drawing detail, Milieu 2007](image4)

The exhibition *Milieu* was a site-specific installation on a boat moored at the Falkirk Wheel. The work was developed through visits to a range of engineering sites in Scotland and focussed on the structure and workings of the wheel itself. The work was made in situ. This was possible because of the scale and timeframe of the exhibition. Also the physical
limitations of the boat encouraged this use of the space. Exhibiting on a boat was a challenging setting with visual complexities as well as the physicality of the space to contend with. For example, installing of a bespoke surround sound speaker system would have been almost impossible due to the nature of the power supply available and also the tight health and safely restrictions on board. Instead the internal sound system on the boat was used. In actuality this worked well as the sound became integral to the physicality of the space and context. Making the visual work was rather cumbersome and after much experimentation paper panels were installed in small sections around the perimeter of the boat. However, as the boat was a barge and therefore diminutive in height, it allowed the painting to dominate the space visually. The findings from this experimental exhibition were instrumental in the shift towards more context focussed work.

c Panorama, British High Commission, New Delhi

Fig. 54 Painting & sound installation, Panorama 2010

Fig. 55 Sound detail, Panorama 2010

Fig. 56 Painting & sound installation, Panorama 2010

Fig. 57 Sound detail, Panorama 2010
Panorama was an exhibition within the British High Commission in New Delhi. This was a particularly unusual site to work in as the exhibition space is situated within an historical setting and is fully furnished with ornate furniture, wall and floor coverings, providing a strong character and loaded visual associations. The room itself has both the remnants of a domestic space and is a space used for public functions. The work was placed within the architecture of the wall in three sections and in addition there were four smaller paintings hung alongside the normal furnishings. Within this exhibition there was particular emphasis on the venue as the installation site, focussing on how the work integrated with the characteristics of the room.

A variety of sounds were used, some of which were from India, which were transposed in the studio to make site-specific sound works. There was a loud background noise level coming from the traffic outside, which added to the soundscape that was developed. The installation experimented with how to install sounds into such a specific and traditional space, with the speakers discretely hidden within the furniture. This encouraged the relationship with the exterior sound, with viewers not entirely clear which were real sounds and which had been introduced. The integration of the rather minimal, monochromatic paintings worked well with the visually crowded interior. This, alongside the rather unusual sound presence, opened up further possibilities in terms of the sound and visual work being combined into one integrated piece and was valuable in opening up these possibilities.

1.5 The Work: Installation

1.5.1 Experiment 2 Anechoic/Reverberation, The University of Edinburgh
Because there was on-going access to The University of Edinburgh reverberation and anechoic chambers there was the opportunity to revisit, test and explore ideas further within the same space, which led to developments from previous experiments regarding scale, site and context and an increased awareness of place and site specificity. Previous findings led to not only a renewed interest in site and context but also in the way one experienced the work, with the importance of the scale and amount by which the viewer is surrounded being critical. In this experiment the panorama was painted directly onto the perimeter of the walls, allowing for the panorama to be larger and also for it to be painted in situ. To do this required that initially the walls were papered so as not to damage the surfaces permanently, therefore the walls were lightly papered with lining paper, which was steamed off at a later date. The painting was then built up through ink and gesso washes and layers of acrylic and gesso paint.

The painting was over fifteen metres long, completely surrounding the walls of the chamber. The paint itself was rather difficult to control as the wallpaper paste had somewhat changed the nature of the absorption so that this was less controllable. The outcome of this was that you were able to get some beautiful ‘water’ marks or incidental runs and drips that otherwise may not have been possible.
Once the painting was complete several different ways of introducing the sound to the space were experimented with. This was to test out different combinations of sounds and viewers were invited to experience the work both with headphones and with a loudspeaker system. A formal evaluation was also carried out (see Appendix 4). The sound experiments were as follows:

1. Image with no sound
2. Image with sound played through speakers
3. Image with binaural recording headphones.

A point to note is that when stereo speakers are used in a reverberation chamber they are effectively working as surround sound as the reflections from the walls create a natural three-dimensional sound effect, such as in the earlier exhibition in Nordsø Museet (see Chapter 1.2.4). This does not happen in most rooms or acoustic environments.

The clear outcome of these experiments was that the sound made a large difference to the experience of viewing the work. The binaural recordings played through headphones were very effective in creating realistic sound however the viewers had mixed opinions of the benefit of this in comparison with the speakers. Through experiments with binaural headphones the use of binaural recordings were tested. Although they create a convincing sound experience, that sound is fixed to the viewer’s direction and therefore changes as they turn their head or physically walk through the work. The sound environment tracks the viewer, keeping the reality of any movement from the original recording, but not of the viewer’s interaction with the space itself. This was felt to be too directed and not reflective of the visual work, which the viewer has to move into and through. The issue still remains that in terms of the integration of sound and image the work is more cohesive when both the
sound and the visual elements are in tandem with the synthesis of these elements creating an overall environment for the viewer. The use of binaural recordings and headphones have much potential and have continued to be experimented with in the research but potentially as a sound piece in their own right. There may also be possibilities of taking this directed sound into the visual work in other ways.

1.5.2 *Dead or Alive, National Physical Laboratory, London*

NPL is the UK’s national standards laboratory for metrology and is one of the world’s leading measurement institutes. For airborne sound NPL provides the primary and secondary standards vital for the accurate use of noise measuring equipment. The laboratory also conducts innovative research to investigate new measurement techniques for sound and noise, utilising existing and emerging technologies and working in collaboration with educational establishments such as The University of Edinburgh. There are a number of specialist sound chamber facilities in NPL and they allowed access to their two main spaces, the reverberation chamber and the hemi-anechoic chamber for the *Dead or Alive* public exhibition. This built on the previous work in the anechoic and reverberation chambers at The University of Edinburgh but allowed the work to move up in scale and be installed in a more extreme environment as well as to have the opportunity for a wider public viewing.
The exhibition took the form of installations consisting of paintings and soundscapes set up in two spaces, an anechoic chamber (dead) and a reverberation chamber (alive). For the exhibition a new body of work was made including a twenty-seven-metre panoramic painting, fourteen paintings (thirty-by-thirty-centimetres) and two surround soundscapes. The
exhibition spanned these two rooms, the first one being a five-sided reverberation room, with a decay time of over ten seconds, the second room being a six-metre cube hemi-anechoic room with background sound levels being close to zero decibels. Entering the first space the viewer was encircled with a large panorama accompanied by a relentless montage of environmental noise. In the second space there was a much greater temporal separation of the sounds and the images were in the form of small paintings placed sporadically around the wedge-lined walls.

Although similar core material was used to create the sound and visual imagery for the two rooms the experience in each was dramatically different. The soundscapes were made up from field recordings, mainly of traffic noise, edited to produce surround sound in 5.1 configurations. The raw sounds were mostly recorded in Glasgow, where the motorway passes directly through the centre, and the visual imagery related to the same traffic, motorways and urban city sprays. The reverberation chamber was extremely oppressive in reality due to the continual din of the sounds reverberating. This was very powerful but could not be maintained for long. Indeed during the installation of the work it was a very difficult space to be in for prolonged periods of time. The hemi-anechoic chamber was also stifling but seemingly because of the clarity of the silence.

There was great value in working with NPL as it enabled a dialogue around sound as well as direct input and discussion with leading specialists in sound such as Mike Goldsmith and Richard Barham. This pinpointed the huge implications of sound within the environment and raised my awareness of current thinking in this area. In terms of the development of the works certain elements became extremely clear in these installations. The first was the absolute importance of the work surrounding the viewer. Until this point in the research the panoramas were still relatively experimental and a number of smaller works with a horizontal format had been tried out. The exhibition at NPL was a turning point in terms of creating all encompassing installations. Another rather unexpected element occurred where the oppressive nature of the spaces themselves became key to the work, which resulted in varying implications for the future works. On one hand the work surrounding the viewer was key however, there was a risk of the space itself becoming so dominant that it might lead the artwork. It was also the first point at which the idea of creating an independent chamber for the work was considered, which later became part of the work itself.
1.5.3  *Autorama* and *Panechoic*, Inspace, Edinburgh and Briggait, Glasgow

The research led to art installations that were all encompassing in nature with elements of painting and sound fused within the same installation. This use of panoramic works within specific sound environments progressed to work being pursued in unusual acoustic spaces and the dominance of the space becoming central to the form and intention of the work. The desire to control or shape the environment itself, to allow the work to be viewed by a wider public and also for the environment to become a key aspect of the work sparked ideas around making a structured environment in which to show the work. Ideas emerged around creating a freestanding chamber in which to house the work that could then be shown in different venues or spaces. The main aim of the chamber was to provide a circular space in which to bring together the sound and visual works, which also encompassed the research with anechoic and reverberation chambers. In addition the installation of work inside the chamber could be controlled through knowledge of the scale, lighting conditions and sound environment. A number of different forms for the chamber were considered with varying combinations of shape, material and scale. Options and designs for the structure were explored and for the final phase of research a hemi-anechoic chamber was constructed which could be housed within a larger gallery context.

This was a purpose-built space created specifically to install the circular panorama and speakers with soundscape. The chamber itself was made from an eleven-metre circumference circle made from plastic panelling with foam on the inside to act as a sound absorber. In terms of building the chamber, there were a number of technical issues, the obvious one being the practical difficulties in making such a specific acoustic environment, which also had to be portable as there was no permanent setting. Therefore a semi-anechoic chamber was made that had the key features of an anechoic chamber whilst still being suitable to install within a space and to place sound and visual works within it. The construction methods and choice of materials were also limited by financial constraints.
Fig. 72 Foam wall for making the chamber
Fig. 73 Designing and making the chamber

Autorama, Non-bio Boom, Inspace, Edinburgh, Jan '11

Fig. 74 Arches painting, Non-Bio Boom 2011
Fig. 75 Installation, Non-Bio Boom 2011

Fig. 76 Autorama installation 2011
Fig. 77 Autorama installation 2011
The first iteration of the installation in the chamber was as part of *Non-Bio Boom*, which took place from January to March 2011 at Inspace, Edinburgh. This was a three-month research thematic which I proposed to Inspace, based on anthropogenic sound. During the research thematic the gallery (and research) space undertook a number of different activities, many of which were related to the research such as public exhibitions, screening talks, workshops and a number of different artists working in the space. As well as the installation of the chamber there was experimentation with two different works in the chamber (see Figs. 76 to 81 *Autorama* and Figs. 88 to 93 *Panechoic*). There was also another painting within the gallery (see Fig. 74 *Arches*). The key events that related to the exhibition included a sound and music evening, where the research was presented alongside soundscapes and discussion by sound artists and academics (Figs. 72 to 74). There was also an event about sound in the environment including a soundwalk, which was undertaken in collaboration with researchers and individuals working with sound from other institutions (see evaluation of the soundwalk in Appendix 4). Inspace is a key research space within Edinburgh specialising in cross-disciplinary working. The space is a public gallery with research links throughout The
University of Edinburgh and beyond and actively encourages a range of disciplines to engage with the space. It is linked to the Informatics Department which has its own specialist sound chamber similar to the anechoic chamber in the School of Physics and Astronomy but much smaller and with lower specification.

During *Non-Bio Boom* the semi-anechoic chamber that had been developed was situated within Inspace. Two different installations took place in two phases, each consisting of newly created panoramas and soundscapes which were installed in the purpose-built chamber. The two phases allowed for developments and tests to be done including sound installation experiments as well as visual developments. There were clear advantages in creating a self-contained space as it was not fixed to one location and elements of the installation could be tightly controlled. The space was an ideal size and shape from which to show the visual and sound works as it enabled the ideas to be addressed but was also large enough to work as an interior space and was manageable in terms of creating the work. It was circular, which enabled the full panorama to be viewed, surrounding the viewer.
completely and sound and lighting was directed accordingly. Having the chamber also meant there was a specific space in which the viewer entered, physically walking inside similar to the panoramas of the 19th century (see Chapter 2.3.2) or more current installation art environments such as the work of Olaf Eliasson (as discussed in Chapter 2.2.2) or Hans Op de Beeck (in Chapter 2.3.3).

The foam used for lining the walls and ceiling of the chamber did not have such good absorption characteristics as the foam wedges used in the anechoic chambers. Also there was some loss of absorption due to the introduction of the panoramic image, which was made on paper and painted with mixed media, which inevitably reflected some sound. Thus the room was not entirely dead like the anechoic chambers in NPL and at The University of Edinburgh. There was an option to increase the level of absorption by adding more foam to the perimeter and further covering of the floor and ceiling. After some consideration this option was not taken up as the sound environment worked well with the panoramic image and the soundscape. In reality the total absorption of the chamber itself and complete lack of reflections was not critical to the impact of the work. Rather, the key elements of the chamber were the exclusion of the exterior space, the low background sound level, the controlled lighting, entering the physical chamber and the all-encompassing nature of the work.

The painting in Autorama was in keeping with the previous iterations of panoramas which had been developed. There was a limited palette, rather unnatural in appearance with warm pinks and reds over pencil and ink drawn elements. The painting gave an impression of a particular environment through its loose sweeping marks overlaid with detailed drawing and gestural marks indicative of buildings or urban structures. The overall scene of the landscape was present but the details became loose and abstracted. There was a rhythm throughout the painting including curves and staccato marks echoing the soundscape. The sound again was more sweeping in nature with on-going undertones of motorways buzzing and circling the viewer. Constant background noise was evident with other more defined traffic sounds coming over from time to time.
b  

*Panechoic*, Non-bio Boom, Inspace, Edinburgh, Mar '11

Fig. 86 Development of panorama, SWG3 2011  
Fig. 87 Development of panorama, SWG3 2011

Fig. 88 Panechoic installation 2011  
Fig. 89 Panechoic detail 2011

Fig. 90 Panechoic installation 2011  
Fig. 91 Panechoic installation 2011
The second installation was *Panechoic* which included a different painting, this time slightly denser in tone and texture and a new soundscape. One of the differences in the making of this work was that initially the paper was painted dark grey, leading to a different surface on which to paint and also the colour blended into the dark grey of the foam padding. This made a difference to how the painting functioned within the chamber and encouraged a more integrated visual effect. In terms of the composition, the main difference was that larger sweeping elements echoed the lines and curves of a motorway or transport system. Also, the scale at which the image was seen was closer in so much as you could identify relatively close structures and definable aspects to the visual image. Within the image are a number of key features, mainly based around the M8 motorway in Glasgow and the various buildings and bridges as the road enters the city.

The final showing of *Panechoic* took place in the Briggait Glasgow. This was the second time the work was shown and was a developed version of the first showing in Inspace. A new soundscape was developed which took into account the effectiveness of the original sound and altered it accordingly.

 Panechoic, Non-bio Boom, Briggait, Glasgow, October ‘11
There were another two additions to this exhibition, which were that a soundscape being played on binaural headphones was placed to one side (see Fig. 84) and an informative video about sound was placed by the other. These were additional elements to the exhibition.
Attention was drawn to the chamber itself through placing it in the centre of a large atrium type space. The chamber was more dominant in this venue as it became like an object or sculpture within the space. It also meant the viewer had to select to enter the space and take that journey into the chamber. The main implication of this was that the viewer was very conscious that they were entering a specific space, as they chose to do so. In Inspace the chamber was also entered however it was less conspicuous and therefore it seemed as though the entrance to the chamber was just part of the structure of the space or another room. In real terms the installation inside the space was often unexpected as there was little hint from the exterior appearance. This had a curious effect in that the viewers were intrigued and absorbed by the space but also rather surprised.

Part 1 provides an overview of the development of the practice-based research, with key concerns identified and discussed. Each chapter has focussed upon a specific concern and the work has been analysed through the lens of one of these headings. Each installation or exhibition has been described and issues that have emerged through the making or installation discussed. The chapters in Part 2 will echo these concerns, with each theme dissected in relation to contextual research. The effect of the research on the development of practical work and vice versa will also be discussed and relate closely to the work of Part 1.
Part 2 The Context

2.1 The Context: Approach

In Part 2 the background and continued contextual research that have informed the work are discussed. Specific aspects of sound and vision are explored, ranging from fundamental scientific aspects of sound and vision, to the effects of their combined use and how these have been incorporated into other artists’ work. This section begins by looking at sound, then goes on to explore painting as well as its relation to panoramas, how sound and vision work in relation to one another and finally how these are brought together within installations. Throughout this section there are references to the research in Part 1, exploring ideas and exposing the rationale behind decisions within the practice-based research.
2.2 The Context: Sound

2.2.1 Fundamental Relationships Between Sound and Vision

If we take as a basic premise that the practice-based research is focussed on sound and vision then the fundamental physical properties of these are central to how they can be incorporated in the artwork. The way in which sound and vision relate to one another informs how they might be used as well as their effect on the interpretation and reading of the installations.

One fundamental aspect when considering sound and vision is that both sound and light (the basis of vision) are wave-like phenomena, which identifies many of their characteristics such as the spectrum, synthesis and masking. Pythagoras was aware of the concept of harmonics in musical sounds [Helmholtz, 1875] and conceived the monochord to demonstrate that dividing a string into two parts raises the pitch by an octave and that further subdivisions created increasingly higher harmonics. Both Pythagoras and Aristotle postulated that there must be correlations between the musical scale and the rainbow spectrum, in the 6th and 4th century BC respectively, but it was not until Hermann von Helmholtz in the 19th century that a comprehensive theory of sound was developed thus recognising the full spectral distribution of sound waves [Helmholtz, 1875].

Early understanding of light dates back to Isaac Newton who in 1666 used a glass prism to demonstrate that sunlight could be split into component colours. He realised that the spectrum was due to the fact that the colours at the blue end of the spectrum bent more than those at the red end as they passed through the prism. In Opticks he wrote:

‘Nothing is more requisite for producing all the variety of Colours, and degrees of Refrangibility than that the Rays of Light be Bodies of different Sizes, the least of which may take violet the weakest and darkest of the Colours, and be more easily diverted by refracting Surfaces from the right Course; and the rest as they are bigger and bigger, may make the stronger and more lucid colours, blue, green, yellow, and red, and be more and more difficultly diverted’ [Newton, 1704].

Newton also discussed the relationship between colour and musical pitch. His ‘colour music wheel’ is in essence a circle divided into coloured segments where the edges of the segments correspond to different notes in the diatonic musical scale. Moving round the circle, the leading edge of the red segment, for example, corresponds to the note D, whereas the leading edge of the green segment corresponded to the note G, thus Newton associated rising pitch with rising optical frequency. The analogy is not complete however, since the wheel only includes colours in the visible spectrum so moving once round the wheel corresponds to a
musical octave (i.e. a frequency ratio of two) but the optical frequency ratio is much smaller.

Although both sound and light can be considered as wave phenomena, their wave frequencies occupy very different bandwidths. Audible sound frequencies lie approximately in the range 20 Hz to 20 kHz, a bandwidth of almost ten octaves, whereas visible light waves only cover a range of around $4 \times 10^{14}$ Hz, a bandwidth of less than one octave. The bandwidth of light could be said to match that of the sound spectrum if both infrared and ultraviolet waves were included however this is not really relevant in this context as they are not visible to the naked eye. A question from the audience at a Café Scientifique presentation given in Stockton May 2006 was ‘what would happen if the visible spectrum was equally as wide as the sound spectrum; would we then generate visible harmonics’? Upper harmonics can be generated in nonlinear optics just as upper harmonics may be excited when a piano string is energized at its fundamental frequency. An example is in the case of solid-state lasers, which are used for a number of medical and industrial purposes and for research into acoustics.

### 2.2.2 The Rainbow Effect

The spectrum is key to the fundamental properties of both sound and light. Let us look further at this through considering the rainbow, which is a clear example of the visible colour spectrum. It was the French philosopher René Descartes who is accepted as giving the first good scientific explanation of the rainbow in 1637, however artists explored the visual effect of the rainbow much earlier. Stemming from prehistoric cave painting such as the Neolithic Indalo Man carrying the rainbow over his head, or its importance in native American rock art [Sassen, 1991] its connection to culture was cemented through its symbolic resonance in the Christian Bible as a sign of God’s covenant to man. A wide range of artists have used its symbolic presence, such as Casper David Freidrich in his sublime landscapes or Peter Paul Rubens for whom the rainbow held religious significance in his painting, *The Rainbow Landscape* (1636). Wassily Kandinsky or Georges Seurat utilised its colour and the sense of natural wonder it encompassed.

Olafur Eliasson has worked with the spectrum in a number of ways, from his early work *Beauty* (1993) where he created a rainbow within a gallery, to explorations with the colour spectrum by reflecting or projecting white light through coloured glass, such as *Domestic Notion* (2005) or *Who is Afraid* (2006). He has made a number of works referring to
afterimage, such as in *Tell Me about a Miraculous Invention* (1996), where green and pink lights are shone onto a reflective disc, thus making green and pink ‘shadows’. In his works on the afterimage the viewer sees the colour that is only really present in their own perception due to the colour change, works reminiscent of Josef Albers’s colour experiments [Albers, 1963]. These installations show the wonder of light, however they also explore the fundamental properties of light and the spectrum. His approach to the work is investigative, testing light and colour through a series of experiments, which he has described as ‘experimental setups’ [Eliasson, 2010, p.56].

Some of Eliasson’s structural works are more fixed in terms of colour perception and focus further on the viewer interaction. *Your Rainbow Panorama*, finished in 2011, installed on top of the ARoS Art Gallery, Denmark [Eliasson, 2012, pp.470-473] is a walkway that has been built with transparent coloured walls so that the viewer sees the colour spectrum through the walls. The reference to the panorama in the title comes from the viewer seeing a real panoramic view of the city as they walk through the work. As well as the physical and perceptual qualities of light the physicality of the viewer and their relationship with the work is key. The viewer experiences the work through entering it and walking through it, each having their own perception of light and colour. Eliasson states that:

‘At any moment, the panorama will appear almost monochromatic through the glass panes, but the appearance of the surroundings changes according to the movement of the visitors. Thus, movement becomes the vehicle of the visitors’ color perception’ [Eliasson, 2012, p.471].

This fixation on the human interaction with the work is evident throughout Eliasson’s practice. Although his work explored light, colour and the spectrum, the interface with the audience is always present (see Chapter 2.4.3 for further discussion on movement). His monumental installation *The Weather Project* in the Turbine Hall at the Tate Modern pays homage to the importance of light and indeed his related solar powered *Little Sun* project developed with engineer Frederik Ottesen has taken this into the level of community and environmental action in Africa. This again stresses the artist’s interest in the scientific properties of light as well the usefulness of art within a wider context, as he explains in the interview on the website (www.littlesun.com).

David Batchelor has written extensively about colour, the spectrum and light in his books *Chromophobia* and *Colour* [Batchelor, 2008; 2010]. He directly challenges traditional notions of colour within culture and art. In particular he discussed the lack of
acknowledgement and sometimes rejection of colour within Western culture since the Enlightenment and in many ways seeks to rehabilitate colour’s place within culture and art.

The use of the rainbow in these contexts exposes and challenges the fundamentals of vision through drawing attention to the spectrum and the breakdown of light. Although the word is used primarily within a visual context, the rainbow comes from the spectrum, which is both a visual and sonic phenomena. The term ‘rainbow of sound’ conjures up a picture of the spectral relationship between sound and colour and has been used as an analogy for explaining the spectral characteristics of sound e.g. in the EPSRC’s public engagement exhibition *Rainbows of Sound* [Newsline, 2004]. When a prism is used to split light into its component colours it can be thought of as an optical spectrum analyser, albeit a nonlinear one, the angle of each emerging coloured element corresponding to the wavelength or frequency. In an acoustic spectrum analyser the signal is decomposed into different frequency bands by filters or a Fourier Transform computer program and the changing frequencies or wavelengths show up as different displacements on the horizontal or vertical axes of a screen. This method of representing sound in a visual form through a spectrum analyser has been used in some preliminary research and exhibitions (Chapter 1.2.3).

Artificially projected light holds many of the same properties as natural sunlight and can be useful in the analysis of colour. The changing colours of the light from a projector can be thought of from a visual point of view as varying ratios between the three primary colours of red, green and blue, each of which occupies a finite bandwidth. When added together in different ratios they produce a gamut of colours across the spectrum. This process of colour addition can be compared to additive synthesis in sound production whereby spectral components are added together in different ratios in order to produce a single complex tone of a prescribed timbre. It has already been mentioned that the three primary coloured components each occupy a finite bandwidth. Sonically you can obtain different colours of sound by passing white noise through filters with different spectral characteristics. This allows you to divide specific bands of sound frequencies to create colours of sound from the initial signal (sometimes referred to as band-pass filtered white noise). The names used for coloured noise give an indication of the optical frequencies, for example red noise has more energy at the low frequencies, corresponding to the long wavelengths of red light. Purple (sometimes called violet) noise, on the other hand, has a predominance of high frequencies corresponding to the short wavelengths in the colour spectrum.
The analogy even follows through to colours in the mid frequency range; for example yellow noise is band-pass limited around about 3,000 Hz. White noise has an essentially flat spectrum of frequency components in linear space, corresponding to the concept of white light and black noise is in essence silence. John Cage’s seminal piece 4’33” (1952) can be considered a performance about black noise (silence) and the lack of it, rather than connecting it to the white of Rauschenberg’s White Paintings (1951) (for further discussion on related issues see Silence: Lectures and Writing [Cage, 1971]). Indeed Rauschenberg’s paintings are about black or colour, the shadow and the interference with the white [Guggenheim, 2013], just as Cage’s performance drew attention to the background noise. 4’33” made people listen to the sounds in their surroundings, alerting them to their unique sound environment [Radio Lab, 2003]. There are a few anomalies of course, which have an historic background. For example brown noise derives its name from the botanist Robert Brown who discovered Brownian motion, rather than to the colour brown; it is usually now just called red noise.

As well as directly visualising sound by displaying its frequencies using a spectrum analyser, the direct relationship between the colour and sound spectra have also been explored through a number of colour and sound experiments. These ideas were trialled at Colour and Design, a conference at the Institute of Mechanical Engineering in London, November 2007, and later in The University of Edinburgh, July 2008. These took the form of practical experiments in which my paintings were shown with a range of changing light and sound frequencies. Two portraits (see Figs. 102 and 103) had coloured light projected onto the surface. Audio recordings of the human voice were played as the coloured light changed. The sound corresponded to the light frequency, correlating directly through the harmonics bands. Both were distorted, the portraits through the use of paint and looseness of the brush strokes and the sound through editing and subverting the sounds so that although they could be heard as human voices the words could not be understood.

Figs. 102 & 103 Sound and light experiments, UoE 2008

During the experiments observations were made and an evaluation was carried out to
establish the effect of the changing colour and pitch on the work (see Appendix 4). The evaluations were inconclusive in terms of perceived relationships between the colour pitches and sounds and they varied according to the individual respondent, indicating either that a larger sample was needed or possibly that more specific questions should be sought. However, useful observations were gleaned, mainly relating to the viewer’s feelings towards the work due to changes in both colour and sound. In summary, certain colours and/or sounds seemed to be more uplifting or happy and others seemingly more sinister, giving different interpretations of the work. These observations confirmed ideas put forward by various studies of the psychological impact of colours with psychologists such as Karl Jung relating specific colours to moods or responses [Riley, 1995]. For further reading see the discussion of the relationship between colour and sensation in Paul Smith’s book *Impressionism: Beneath the Surface* (1995). In the feedback there were also comments about the correlation of lighter colours with higher sounds and darker colours with lower sounds. This analysis of the colour/pitch relationship affected the later use of colour in the work, encouraging different colour palettes to focus the work. Overall the experiments led to more limited colour palettes or the use of closer ranges of colours. Hans Op de Beeck, whose panoramas are discussed in Chapter 2.3.3 states, ‘by reducing colour and textures, you get to see an image that concentrates more on overall mood rather than specific objects or props’ [in Samman, 2011, p.102].

It often seems that a colour looks brighter or stands out more against neutral colours rather than against a multitude of different vibrant colours due to neutrals containing hints of the complementary hue. There are experiments based on afterimage, kinetics of colour etc. that can illustrate this [Feisner, 2000; Albers 1963]. There are indications that our interpretation of both sound and colour is more acute depending on the level of frequency. Brightness in colour is generally associated with the wave frequency, red being considered more vibrant than blue although the idea that this is due to the fact that red reaches the eye before blue is a misconception. Certainly reds stand out from blues when painted alongside each other but this can be explained by ideas of refraction dating back to Newton. As already mentioned, he found that the shorter wavelength blue light is bent, or refracted, more than the red. Thus red and blue objects are brought to a focus in different planes by the cornea lens, which is the principle of chromatic aberration. This can be used as a technique to push areas into the distance or bring them into the foreground and is particularly common in landscape painting.

In *Audio-Vision*, the composer and theorist Michel Chion discusses the equivalent idea with
sound, claiming that high frequency rich sounds demand more acute perception, therefore heightening our awareness of that particular sound. High frequency sounds may therefore be used to engage with the audience more directly or immediately. Note that in low frequency sounds pitch and rhythm merge. For example, a sound wave of 30Hz is detected as a constant low-pitched sound, whereas if we drop the frequency below the audio range, e.g. down to 5Hz, the sound takes on the form of a series of rhythmic pulses. The fact that different frequencies in sound are heard as various pitches and different light frequencies are associated with a variety of colours is not the whole story. The dependencies are to some extent subjective since we rely on human experience to describe subtleties of both pitch and colour. Different listeners may hear two sounds of the same frequency as different pitches, dependent on the volumes and complexity of the spectral compositions. Likewise, observers have no way of specifying a colour precisely. We might all agree on what constitutes red but when it comes to identifying subtle shades of red, this is a different matter. Colours can also change with motion. Persistence of vision varies with colour giving rise to the Fechner colours observed on Benham’s spinning top [Von Campenhausen et al, 1995].

2.2.3 Sound Art

The use of sound within the context of fine art draws directly on sound art and its history. Sound art (art which emits sound) was pioneered by the Futurists with artists such as Luigi Russolo raising the status of sound through experiments that pushed the boundaries of sound and indeed art, as well as through the manifesto The Art of Noise in 1913 [Russolo, 1967]. He developed unusual constructions as new forms of instruments, sound vibrations and ‘noise’. His Intonarumori, or noise intoners, challenged traditional notions of instruments and introduced sound into concerts and art contexts [Radio 3, 2009]. Marcel Duchamp’s experiments were also pivotal to the development of sound art and he tried various processes to work with sound and noise, such as the sculpture With Hidden Noise in 1916 (Philadelphia Museum of Art, 2013), which had an object hidden inside a ball of string constricted between two brass plates.

These early experiments paved the way for a number of significant developments within sound art in the 1950s particularly through the Musique Concrète movement developed in Paris, by its founder Pierre Schaeffer and composers such as Pierre Henry. Schaeffer, in his 1952 book In Search of a Concrete Music, explains what he means by this term:
‘I have coined the term *Musique Concrète* for this commitment to compose with materials taken from “given” experimental sound in order to emphasize our dependence, no longer on preconceived sound abstractions, but on sound fragments that exist in reality and that are considered as discrete and complete sound objects, even if and above all when they do not fit in with the elementary definitions of music theory’ [Schaeffer, 2013, p.14].

He went on to describe the sounds used as noise, ‘concrete music was made with noises and plastic signs’ [Schaeffer, 2013, p.120]. Thus the electronic music compositions were made up from recorded or ‘found’ sounds from everyday life as opposed to sounds that had been generated by electronic synthesis. These were pieced together and manipulated to create complete compositions, as composer and writer Curtis Roads points out:

‘Composers of *Musique Concrète* work directly with sound, with everyday sounds being added and manipulated to create a complete musical composition’ [Roads, 1996, p.117].

*Musique Concrète* pioneers created soundscapes through various means by using analogue devices or tape recorders to piece together sound fragments, cutting and splicing the tape by hand and using devices such as filters and tape loops [Holmes, 2008, p.125].

In the 1970s a movement of acoustic ecologists, including R. Murray Schafer, Barry Truax and Hildegard Westerkamp, emerged in Canada, dedicated to the recording and preservation of environmental sounds. Founded by Schafer, they developed the *World Soundscape Project*, which ultimately led to a genre of soundscape composition, which is now accepted as a musical form in its own right. McCartney says:

‘All of the processes involved in soundscape composition, from listening to recording, composition and reception, are deeply enmeshed in issues of time, memory and place [McCartney, 2003].’

In discussing the composition *Cricket Voice* by Hildegard Westerkamp, McCartney noted,

‘Westerkamp asserts that soundscape composition begins with conscious listening and awareness of our role as soundmakers. This is awareness of sound in context – unlike with the sound object of *Musique Concrète*, sound is not isolated but forms part of an environment that shapes it’ [McCartney, 2003].

The word soundscape was coined in the 1960s by the composer R Murray Schafer and suggests the sonic equivalent to the word landscape. In simple terms it refers to the aural environment or sound picture that is created by a collection of sounds, however it can have different connotations, dependent on its context. It is now used to describe a variety of ideas, such as a scientist may interpret a soundscape to be the sound environment in a
particular location within an urban soundscape or complex noise maps may be constructed prior to the approval of a building development to ensure that ambient sound levels are of an acceptable level. An artist or musician, on the other hand, may create a soundscape by combining different sounds in order to evoke concepts or sensations associated with a particular environment or indeed create an imaginary environment through a soundscape just as the early pioneers of sound art. In his book, *The Soundscape: our sonic environment and the tuning of the world* [1977], Schafer describes the soundscape as the sonic environment we live in rather than a specific sound piece. (This is opposed to a soundscape and similar to the landscape referring to landscape generally and a landscape being a representation or version). He asserts:

‘Regard the soundscape of the world as a huge musical composition unfolding around us ceaselessly. We are simultaneously its audience, its performer and its composers’ [Schafer, 1977, p.205].

This description takes the idea of sound as a continuum and a constant, recognising the proliferation of sound as well as the rare (or impossible) qualities of silence. The use of digital technology and the extent to which sound is able to be recorded, manipulated and played as well as the emergence of the home studio has led to a proliferation of sound within our society. For Paul Virilio, in *Art and Fear* (2003), this proliferation of sound and indeed the audio-visual equates to a profound loss of silence. His mourning for this extends back to when sound was introduced to the cinema. In the second section of the text, *Silence on Trial* technological progress, noise pollution and sound being brought into visual art are implicated as the dark side of contemporary culture and society. However, this access and availability arguably allows for a democratisation of sound and the power it possesses.

The democratisation of sound has not been fully explored through the thesis because it is not the focus of this research however it is worth noting that this is potentially far reaching. For example, in the catalogue for Her Noise (2005), an exhibition of female sound artists, the philosopher and arts and music theorist Christoph Cox discusses the role of women and indeed of technology in sound art:

‘Electronics opened up a new and unchartered world. Beyond the ordered, stratified domain of music … no longer merely pitches, scales and meters embroiled in formal systems of meaning and communication, but all the noises of the world in all their messy heterogeneity laid out on a single plane’ [Cox in Dzuverovic, 2005, p.13].
Despite the lack of visibility of female examples of sound artists women have been some of the pioneers of sound, such as Daphne Oram or Delia Derbyshire. There is much potential for a sound to be accessible to a range of makers and challenge cultural norms, partly due to the hierarchies evident in Western music that the use of sound questions and challenges. There are inherent characteristics in Western music such as tonal and pitch hierarchies [Hallam et al, 2008] which are seen as inherent to our understanding of music, as well as more practical hierarchies such as access to equipment, reading of music, the relative valuing of specific instruments and so on. The possibilities of the creation of sound, via both the home studio and the financial and non-hierarchical structures it allows for changes the way sound in all its many forms is being created in Western cultures and across the world. The possibilities of this democratisation is highlighted by Toop while describing a Japanese musician:

‘New and interesting sound isn’t coming from concert halls, it’s coming from the small apartments of young women like Pirami, and the possibilities are endless’ [Toop, 2004, p.113].

The vast resources available through digital technology and the possibilities this creates changes the role of sound and its accessibility to a range of users.

There are a number of common approaches to working with sound that contemporary artists use, either as background sounds to create ambience, as sound pieces or performance, within the context of film or integrated with technology. The practice-based research within this thesis borrows many aspects of early sound art, in particular the ideas related to Musique Concrète in terms of using existing sounds through field recordings or found sounds. The awareness that soundscapes inhabit spaces and therefore sound forms a relationship with its immediate surroundings is also important to the work. In terms of processes used in the research, sounds were recorded in the field (so to speak) and then manipulated in the studio to create a form of soundscape, a process that was echoed through the visual work. The editing, slicing and mixing in Musique Concrète was done by hand, with tape being physically cut and joined. In this research similar processes took place but utilising existing technology, therefore digital methods were used to gather and edit both the sound and visual material.

In structural terms, as pointed out by Truax [2002], a soundscape may be based on a fixed, moving or variable spatial perspective. From the fixed perspective the point of recording or emission is static and the movement of the sound around that central point creates the temporal element. In the moving perspective the listener goes on a journey through a series
of acoustic spaces e.g. entering a harbour on a boat or moving from one room to the next. Variable perspectives are more abstract – they edge away from the creation of a single coherent landscape image and do not necessarily have clear analogues in the real world. Within these structures there may be a myriad of sonic transformations e.g. changing speed, reversing or reverberating, and the soundscape may trigger memory recollections, rather than reconstructing a real situation.

The soundscapes in this research are made with variable spatial perspectives although not always in a linear form. The collaged nature of the soundscapes and the montage of sounds resulted in works with multiple spatial perspectives (such as on city roads, on motorway flyovers or within dense built environments). This was felt to benefit the three-dimensionality of the work as it allowed for a number of different sound perspectives to be utilised. The field of sound became more important than the form within the work, similar to the change away from figure/ground, which gradually came through the painting (see early works in Chapter 1.2.4 in comparison to those in Chapters 1.5.1, 1.5.2 or 1.5.3). Schafer describes his interpretation of figure and ground, terms often used in painting, within a sound context:

‘The figure corresponds to the signal or the soundmark, the ground to the ambient sounds around it-which may often be keynote sounds-and the field to the place where all the sounds occur, the soundscape’ [Schafer, 1994, p.152].

He then goes on to say that the field is where the interpretation takes place. The sound field can be used in a rather general way, often used to describe the surrounding, ambient or ongoing sound although strictly speaking it is the area where sound waves are propagating.

**2.2.4 Dalziel and Scullion Case Study**

In this section the work of Dalziel and Scullion is explored. They have been selected because of the diverse ways they use sound as both subject and medium within their work; as installations, sound sculptures or placed alongside large two-dimensional still or moving photographic images. In addition their work addresses environmental concerns and its placement, often in public spaces, is critical to its understanding.

Dalziel and Scullion have focused on some of the ‘non-places’ that Marc Augé discusses in his book of the same name [Augé, 2008], often focusing on places and environments that are transient spaces or passing places. They have made work concerning airports, aeroplanes,
wind turbines and the M8 motorway that runs between Edinburgh and Glasgow, airports, aeroplanes and wind turbines, all of which are subjects that have been addressed through this research. The sound within the work is used in combination with other media, most notably public sculptures and video pieces. Their work with sound seems to fall into two different categories; those works for which sound is the subject for example *The Horn* (1997) which is based on a mental, visual and aural symbol of sound, and those where sound is used as a medium, such as *Migrator* (1997), or *Once* (2001), where sound is integrated into an installation.

*The Horn* is a public sculpture at the side of the M8, in the form of a twenty-four-metre high horn. The sculpture has been referred to as a sentinel to passers-by and projects sound snippets of familiar cultural references, ranging from environmental noises to music and famous speeches, such as extracts of speeches and songs by Martin Luther King, Elvis, Methodist hymns or an unknown news commentator. The sound is designed to be updated continually in its twenty-five year lifespan and represents a backing track to our time, evoking distant memories alongside clips of contemporary culture [Dalziel et al, 2001]. *The Horn* whispers above the noise pollution heard only from a couple of metres away, commanding an intimate interaction with the physicality of the piece itself although this was not the original intention of the artists [Finlay, 1996]. The idea was for the horn to speak to the cars in a more universal and grand way, so that one might hear it if they had a puncture. Dalziel and Scullion stated that the purpose of the work was to deal directly with the surroundings, allowing the viewer another insight and connection, and as quoted in BBC Scotland’s *Artworks* Radio programme they wanted it to, ‘enable you to see something for the first time. Let the landscape speak for itself’ [Dalziel et al, 2001]. As with many public art pieces there was a reaction from the local community to its initial erection [Monaghan, 2001] and the sound had its volume turned down due to local objection. It is rather ironic that a piece of sound art alongside the M8 motorway, one of the biggest noise polluters in Scotland, had its volume turned down [Dalziel et al, 2001].

The introduction of sound works in any public arena can be problematic as they may be considered wanted sound or unwanted noise depending on one’s point of view. In this case the piece draws attention to sound therefore it invites a questioning of these issues. The reality of noise pollution has directly altered the work itself giving it a very real integration with the issues it aims to address. Despite this it is surprising that this debate was not pursued further as more homes have been built alongside the motorway, with sound barriers
and long wooden fences constructed, perhaps reflecting the complexities of the relationship to sound in our environment.

We are so used to background sounds that often they are only heard when taken out of context. *The Horn* represents two forms of background sounds as it utilises the background sounds of our society whilst simultaneously making us more aware of the actual background sounds of its location. As previously discussed, *Musique Concrète* saw the development of environmental field recordings and soundscapes using found sounds, however in *Musique Concrète* the background sounds were generally not thought of as part of the work itself but considered as separate. In the progression of *Musique Concrète* background sounds were often disregarded and it has been stated that these were not supposed to be part of the recording [Schrader, 1982, pp.2-15]. On the other hand the background sounds in John Cage’s ‘4’33’’ were critical to the piece. It was exactly this sound milieu that Cage was drawing attention to. By asking the viewer to listen he drew attention to the existing sound; the soundscape the audience already were within, including the specific sound qualities of that room and location. Toop emphasised the importance of this when he wrote:

‘[The] timed activation of activity, or silence, heightens a listener’s sense of being in one place for a specific duration and intensifies his or her perception of that locus’ [in Ross, 2001, p.108].

Although the piece ‘4’33’’ can be repeated the sounds and experience for the viewer will never be the same twice. Dalziel and Scullion have not discussed background noise as part of the piece, however to fully accept all interpretations of the work the sound of the motorway must be considered and embraced. The background noise and the active sound issues raised by the work galvanise it and make it part of the wider debate.

In contrast to *The Horn*, Dalziel and Scullion’s exhibition *Once* (2006), in collaboration with musician Craig Armstrong who created the sound element of the work, was shown in Glasgow’s Kelvingrove Museum and Art Gallery. In the exhibition Dalziel and Scullion projected portraits of over three hundred inhabitants of Glasgow with familiar local scenes as backdrops, which slowly moved across three large screens surrounding the gallery space in an all-encompassing (or panoramic) way. There was reference to the city, through the backdrops behind, however this did not inform as to the inhabitants or intention of the work. Rather than feeling like they belonged, there seemed to be a level of what Lucy Lippard refers to as placelessness [Lippard, 1997, p.9], with the faces projected onto the space rather than being within. An incidental observation made in the process of my research was that while in the exhibition viewers tended to follow the portraits between the screens, moving
around in a circular way, following the panorama rather than the sound. This observation raised important issues in the development of the research, with consideration of the very act of viewing a panoramic work or listening to sound within a chamber. The work induces the act of moving through the space, encouraging a different more active form of viewing experience.

The final work to be discussed is *Migrator*, a piece made for a waiting area in Heathrow Airport. Although created for this ubiquitous site, a place that suggests progression and transience, the work bridged the gap between local and universal. *Migrator* consists of a video of the sea with the birdcalls of migratory birds being played across the atrium [Dalziel et al, 2001, p.36]. The sound implies the physical bird, instilling it within the minds of the viewer. This audio-visual piece connects the site with Dalziel and Scullion’s own environment and concerns, taking the sound of Scottish wild birds’ migratory flight out of context and into another migratory manmade environment [Lafuente, 2002, p.43]. The obvious analogy between bird and aeroplane as well as the contrast of the sea with migratory flight helps to position the work between site and subject. Using sound and vision, it transcends the boundaries between subject and place, relying on the viewers’ imagination to create the idea and presence of a physical object.

Showing in public spaces, such as an airport, has many challenges. Not only is the audience not specifically a conventional or typical art viewing audience but their encounter with the work is unintentional and the spaces themselves are both physically and conceptually loaded. Dalziel and Scullion’s choice of sites is key, often using transitory and public spaces. Their work shifts between universal, non-definable sites, such as in *The Horn*, and extremely intimate pieces using local inhabitants and sites such as *Once*, where the community is at the core of the work. As Miwon Kwon discusses in *One Place After Another* [Kwon, 2004] the very idea of site specificity is both desired and near impossible for many international artists, therefore a different relationship with place and site must emerge. The complexities of our relationship with landscape are discussed at length in Lucy Lippard’s *Lure of the Local* [Lippard, 1997], where she examines the idea of placelessness, the questioning of where people belong in relation to both landscape as well as culture. Any attempt to make the work universal resonates with its familiarity as well as detracts from the specific nature of the place itself. Scullion says that they are,

‘Trying to put our subject into the context of the world as a whole is a kind of signature in our work’ [Scullion in Scotsman, 2006].
Dalziel and Scullion’s work has many links to the main body of research such as the use of sound with visual imagery and the interaction with the environment. However their work raises an array of issues around the reality of sound in an environment, such as the noise pollution in *The Horn*, a questioning of the role of the use of sound in *Once* and the integration to the visual in *Migrator*. This last piece made use of the differences between sound and vision. The bird did not fly across the space visually nor sonically, there was no copying or mimicking, but a play between the visual and sound elements. It approaches the same idea through both sound and vision, enhancing each other through their combined use. This approach, working between the senses and modes of interpretation is carried into the research with similar techniques being utilised through the moving sounds against stationary painted backdrops. Observations and experiments with sound and image suggest they should enhance or show a different perspective, rather than emulate.

The research in this thesis stems from similar concerns to those of Dalziel and Scullion in certain respects. In particular it originates from an interest in the environment and of place as well as the common use of visual elements alongside sound to strengthen or complement each other. However what clearly differentiates this body of research from the work of Dalziel and Scullion is that I am specifically concerned with the practice of painting as the primary visual element in my work. Rather than use a wide range of media my work focuses on painting, its traditions as well as its current status, to expand and embrace the use of sound. I will discuss this further in the next section.
2.3 The Context: Visual

2.3.1 Painting in an Expanded Field

The development of painting has been imperative to the research project as a whole. The consideration of current and related historical paradigms has opened up new ways of thinking about painting, which has in turn expanded all areas of the research. With the endless possibilities of postmodernism and ‘plural’ modes of practice, a painting can be understood in different ways. Pluralism evident in current thinking around visual art means that there is no one dominant style, rather that there are numerous options. The rejection of many of the assumptions of medium specificity (such as the illusion, the canvas, flatness) after Modernism led to a position where painting had to redefine its position (see for further discussion see essays such as Douglas Crimp’s *The End of Painting* [1981], Thomas Lawson’s *Last Exit Painting* [1981] or Yve-Alain Bois’s *Painting: The Task of Mourning* [in Bois, 1993, pp.229-244]). This has resulted in an opening up of the possibilities of interdisciplinarity for artists and artworks. Lev Manovich, the new media theorist and artist, considers the survival of traditional aesthetic categories as meaningless in the light of modern technological developments:

‘The assumption that artistic practice can be neatly organised into a small set of distinct mediums has continued to structure the organisation of museums, art schools, funding agencies and other cultural institutions – even though this assumption no longer reflected the actual functioning of culture’ [in Hansen, 2006].

However, the awareness of interdisciplinarity has in many areas increased the desire for medium specificity with specific interpretations of what painting might be. Painting has had to reassert itself, a redefining that has led to a more considered and expanded form. In *Painting in Context*, Anne Ring Petersen highlights that:

‘Generally speaking, the expansion of painting can be described as a hybridization … However, with respect to the visual arts it still makes sense to consider some of the new hybrids as a continuation of the traditions of painting as long as you keep in mind that they are not only related to painting’ [Petersen et al, 2010, p.125].

Thus the expansion of painting should not be seen as a break from the traditions, rather an opening up. As Gustavo Fares points out in his essay *Painting in the Expanded Field* [Fares, 2004] the argument is that ‘expanded field’ is not that anything goes, but quite the opposite, it allows room for movement and transformation within a medium. It opens up the medium to various possibilities, thus strengthening it.
The idea that painting no longer aspires to flatness is crucial to the potential of what a painting can be. During the 1960s there were critical developments in thinking about the form of the work, in particular through theories around Minimalism, where the combination of the object and the space around it took on a greater significance:

‘Actual space is intrinsically more powerful and specific than paint on a flat surface’ [Judd, 1964].

Here Donald Judd was embracing the strength of the physical presence of a flat image as opposed to its illusion. He thought of works not as painting or sculpture but as occupying an ‘intermediate’ position. This led to thinking around artwork as form and also the activation of the space around the artwork. Painting came off the canvas and began to work in three-dimensions. The image shape was more critical than the figure/ground. In Minimalist Art: The Critical Perspective, art critic and theorist Frances Colpitt discusses the change in the form of painting, to it going beyond the canvas. He refers to the historian and critic Michael Fried’s notion of ‘acknowledgement’ of the framework in painting (in reference to Noland’s colour field paintings), and later claimed:

‘No single issue has been as continuously fundamental to the development of modernist painting as the need to acknowledge the literal character of the picture support’ [Colpitt, 1993, p.51].

Significant shifts occurred in expanded notions of painting with the emergence of Minimalism and the transition from High Modern to Postmodern ways of working, though there are of course earlier examples of painting which contested disciplinary boundaries. That painting takes on and is considered within three-dimensions means that the idea of painting’s frontality [Payne, 2008, p.43] is no longer essential, thus painting has to be considered in a wider set of parameters. As the relationship of art to the space it occupied shifted, so did the relevance of its context and its interaction with the viewer.

The term expanded painting has been used to refer to a wide range of practices which are fully grounded in painting but consider aspects beyond the conventional boundaries of a canvas. The term ‘expanded’ is not new and is associated with the expanded field of sculpture, as coined by Rosalind Krauss in her seminal essay Sculpture in the Expanded Field [Krauss, 1979], where she discusses where sculpture has ‘expanded’ beyond its object-orientated status under Modernism. Although less commonly used in relation to painting, we can consider it in the same terms as Krauss referred to sculpture. The idea of ‘expanded practice’ is now well established and is in fact the norm for much artistic practice today (see for example texts on expanded cinema or photography [Rees et al, 2011; Baker, 2005]). In his Art Monthly essay artist and writer Mark Titmarsh talks about painting having two sides,
its ‘thingliness’ and its ‘discursiveness’:

‘The riddles of expanded painting show us that painting is not one thing but two, always separated from itself by the division between its ‘thingliness’ and its discursiveness. Questions of the status of painting as an object have dominated many discussions around painting however questions of context and exhibition within painting allow it to deal with its context. How can painting address the post conceptual concern for context?’ [Titmarsh, 2006].

Central to Titmarsh’s writing is his concern for context. An image can no longer refer just to itself; it must consider its surroundings, as John Latham from the influential Artist Placement Group succinctly put it in the 1970s, ‘the context is half the work’ [Crickmay, 2003] (for further reading on the importance of the context of a work of art see The Contingent Object of Contemporary Art by Martha Buskirk [Buskirk, 2005] or The Artworld by Arthur Danto [Danto, 1964]). The term expanded painting means that not only is the art object considered but also that it is considered within its context and surroundings - the physical and architectural space, other stimuli or happenings and also within a historical, geographical, political and environmental set of circumstances. Postmodernism’s preoccupation with context has encompassed painting:

‘Here painting is not limited to being wall bound, questions of surface and support lead to questions of volume and its status as an object. This strategy formally involves an idea of painting being in excess of itself, which in turn depends upon the categorical regime of medium specificity. In short, the possibility that painting can be somehow said to be ‘itself’. Other high modernist debating points such as shape and pictoriality are arguably as important here as they were in the nineteen sixties. However the cogent aspect here is more to do with juxtaposing painting with questions of exhibition and presentation, questions that bring painting into line with a ‘post conceptual’ concern for context’ [Finch, 2005].

An image in space no longer refers only to the image itself but to an object within a specific surrounding and context. In taking on board the contextual concerns of painting, the viewer is also immediately implicated. By definition where you have a context you imply a viewer. The experience of the viewer is key to the work itself, to making the work and to presenting it. In his book Painting as an Interdisciplinary Form (2008), artist and theorist Alistair Payne asserts:

‘Painting is not to be considered as a bounded space given through the combination of existing elements but rather as a part of a system that has a very different ‘spatial’ context. Importantly this shifts from a ‘grounded’ formal organised or pre-formed space of painting – where painting is held apart from the architectural context in which it is displaced. Rather it moves toward a recontextualised or fluid interactive space … Rather than look at space in terms of it possessing an individual or sedentary position (ready-made) an alternative method must be investigated for looking at space. One in which time, duration and our physical presence or experience determines how it can be perceived. This will have a great impact on how practice (artwork) can be dealt with in terms of space, how it exists within
Consider the work of Victoria Morton. In her painting exhibition *Plus and Minus* (2002), mainly consisting of paintings on canvas, she also painted a room bright yellow and recorder music was played. The room worked as a sound installation adjacent to the main gallery that housed the paintings. Although the two were not obviously interlinked the physical link directed the interpretation of the painting to that of sound, with colour and rhythm reminiscent of music [Morton, 2003]. Morton has repeatedly used sound as an inspiration, a reference or as an inherent aspect within her work. In *Sun By Ear* (2007), a large collaborative show with Katy Dove, there was a mix of animation, sound, paintings, drawings and collages which filled the space. The exhibition showed the many overlaps between their work, such as the playfulness yet sophisticated use of colour and an expanded experimental form of painting. During interviews their interest in music and its influence on their work has been discussed, reiterated by the fact they are both in the band Muscles of Joy with several other fellow artists, and both of their individual practices continue to reference music. Dove, who also works with paint, has animated her paintings to make large-scale projections, such as those in her show in Talbot Rice Gallery, Edinburgh (2006). These take on both sound and movement, whilst maintaining their relationship to paint through the visceral qualities of marks and colours within the paint. Although digitally manipulated the essence of painting is clearly evident. More recent work also includes *Audio Visual Musical Forms* influenced by Six Audiovisual Musical Forms by Norman McLaren [Dove et al, 2010, p.56].

Morton takes another approach, expanding the painting through objects and space. In *Her Guitars* at Modern Institute, Glasgow in 2011 [Modern Institute, 2011] there are numerous musical instruments placed amongst the paintings, a pair of cymbals were hanging from one, a drum was used as a prop for one painting and a small speaker was hanging from a metal stand along with a piece of clothing-like fabric. One piece, *Kimono*, had actual sound playing. It was a rusted metal box with nails and a speaker hidden inside the work, with sounds that seemed to be from metal or from bells. Although Morton’s paintings are bright, with colours described as acid yellow and with references to punk, her sounds are quiet and rather ambiguous. Not all of her work has actual sound within it however and in an interview she commented on this relationship with sound ‘it’s not the subject matter anymore … it has become completely absorbed’ [in Dove et al, 2010, p.59]. Many of her works are said to
represent sound or action through their marks however the sound is not always an end in itself but part of a wider approach to making work. In her show in Inverleith House, Edinburgh (2010), the work spills over the canvas, onto objects and bedsteads. The paintings do not stop at the edges of the canvas but traverse beyond, always based in painting but taking on the expanse of the space. In an interview in *Artforum*, Morton states:

‘This time, my continued interest in the space of painting-and how it operates psychologically on the viewer – has again led me to move around the normal conventions of the practice’ [in Sholis, 2008].

The importance of the objectness of painting and its viewing of it becomes more evident in her later work. The large-scale object paintings cannot be seen at once, sometimes hinged and placed at an angle they must be viewed from different positions, forcing the viewer to move within the space. According to Charlesworth her work is about the viewer:

‘It signals a disinterest in painting as a critique of itself and, consequently, a greater interest in the affirmative quality of a painting’s effect on the spectator’ [Charlesworth, 2004, p.8].

This relates to the paintings of Jutta Koether, who repeatedly performs alongside or with her paintings and adds music, text or physical dimensions to her work. She calls herself a ‘painter, performer, participant’ but stresses that she is grounded in painting, in fact painting is the very subject of much of her work, ‘I was from the very outset interested in possible ways of expanding this medium’ [in Müller-Westermann, 2011, p.33]. Curator and art historian Iris Müller-Westermann emphasises this aspect of Koether’s work by claiming:

‘Her pictures, rather, are a forum for discussion, a place where questions about painting as well as issues extrinsic to painting are negotiated within the picture’ [Müller-Westermann, 2011, p.13].

Koether draws attention to the painting yet extends it beyond the confines of the medium, sometimes showing the backs of canvases or ‘shows work in the round’ [Müller-Westermann, 2011, p.23].

This desire for contemporary painters to engage not only the viewer and the space through whatever medium works for them (sound, performance, object) but to be rooted and work within the realms of painting means the possibilities are endless. Koether does describe herself as a painter (as opposed to an artist) but also a performer or participant. Rather than the convergence or merging of disciplines that Theodore Adorno questions in his writing about music and painting [Adorno, 1995] the work embraces the use of other media, embracing where they may come together, but not reducing or spreading the specifics of each.
It is important to note here that when painting was initially considered beyond the confines of the canvas there was an assumption that this by definition meant that illusion was disregarded. The only form of illusion could be in the actual space itself and the objectness of the painting. This disregarded one of the specific characteristics of painting, that of creating tone, form, distance, image, subject, through the marks on a surface. Because the format of the painting became more crucial (or arguably, the flatness was less prioritised) the lack of illusion seemed unavoidable. As Postmodernism opened up the realms of painting, the necessity for lack of illusion or image, became redundant. Barry Schwabsky acknowledges this when discussing painters that emerged after Modernism and Neo-Expressionism and their interest in the image, ‘or many others whose fascination with images was clearly central to their work’ [Schwabsky, 2005, p.8]. Painting can work in an expanded field and have image, illusion, pictorial references beyond its physicality.

To embrace the experience of viewing a painting does not deny its status as a painting, rather it allows for a more in-depth or poignant way of working. The fact that the whole work is not wholly manifest at one time enables this. The question partly becomes, how do we categorise painting? If it does not pertain to its traditional boundaries, how do we identify it? In this context we read it through the painting itself, through the act of painting and through the showing of painting. Painting has come full circle, from the cave to church to canvas to object and arguably now to the experience.

As theorist and art historian Stephen Melville points out in his essay Counting/As/Painting, it becomes increasingly difficult to tell what counts as painting and what does not [in Armstrong et al, 2001, p.2; Schwabsky, 2002, p.10] and it is exactly this, what counts as painting, which is critical. Yve-Alain Bois, in his essay, Painting as Model, argues that it is indeed the different roles or models of painting [Bois, 1993, p.247] which make it durable and relevant. It is this fact that painting can take on different models, which Bois categorises as the perceptive, the technical and the symbolic model, with the strategic model (accounting for its historicity) [Bois, 1993, p.257] that make it relevant. This work is not bound by architectural constraints, or necessarily by illusion or flatness, it may have different conceptual and formal qualities, be grounded in different ideologies of art, however it all has a common ground, that it is based in paint and that it has moved beyond the confines of the canvas to an expanded, liberated painting.
2.3.2 Panorama

The panoramic format developed gradually within the practice-based research, stimulated by the desire for the paintings to be encompassing for the viewer and also for the sound and vision to echo one another. The circular image emulates the surrounding nature of the sound and follows the desire for painting to be non-bounded. If we look at the principles and emergence of traditional formal panoramas they have a specific entry point and function within the history of landscape painting [Oettermann, 1997]. When the first panoramas emerged, over two hundred years ago, they were made for the function of surrounding the viewer thus giving a feeling of being immersed within the image or view. The idea was deemed a standalone invention, and was patented in 1787 by Robert Barker [Oettermann, 1997, p.5].

Although only semi-circular in form, Barker’s early work Panorama of Edinburgh (1788) showing the city of Edinburgh from Calton Hill is the first known panorama. The viewpoint from which these images were made was critical in creating representations of the landscape, albeit a rather subjective interpretation, in this case showing the grandeur of Edinburgh and its architecture. Barker’s industrial viewpoint of London, Roof of the Albion Mills (1792), some years later shows smoke and ships in view, highlighting Britain’s industrial and colonial supremacy.

In the original patent Barker called the images a la nature coup d’oeil (to look at nature). The word itself, panorama, with the Greek origins of *pan* (all) and *horama* (view), was first used in 1791 to describe a deceptive 360-degree illusion of a view, as discussed by Ton Rombout [2006, p.5]. In ArtVision the museum magazine for Mesdag Panorama, Ernst Storm describes it as, ‘an unlimited view in all directions’, ‘a constantly changing scene’, and ‘a clear view of a specific subject’ [in Seeliger, 2003, p.9]. If we look at the foundation of the word landscape it derives from the German word *landschaft*, a shaped land, a cluster of temporary dwellings and more permanent houses. It then later develops through the Dutch 17th century *landschap* or *landskip* [Lippard, 1997; Dean et al, 2005, p.13] as a painting of such a place perceived as a scope or expanse. This idea of seeing is very similar to the later definition of panorama.

Panoramas are sometimes described as imitating nature however they were originally more like a ‘pictorial expression or ‘symbolic expression’ of a specifically modern, bourgeois view of nature’ [Oettermann, 1997]. They were designed to be so realistic that it could be
confusing to the eye to determine what was real and what was the painted image. Panoramas were even said to make some individuals giddy or faint because of the overwhelming experience, particularly that of an extreme view of nature presented to unfamiliar viewers. The panorama relates closely to the sublime through its representation of the environment, both showing dark, unknown elements as well as overwhelming excitement in the landscape. The idea that landscape could be controlled yet also uncontrollable was part of its lure.

When panoramas were first introduced they were spectacles, aimed at the general population and often seen as a form of entertainment. They were optical simulators, allowing the public to see the world in new ways, changing the way people looked at nature, ‘panoramic paintings became a pattern for organising visual experience’ [Oettermann, 1997, p.22]. The idea that the panorama was primarily an experience, aimed at the public, is key to its position within the history of art and to a degree its lack of prominence in the canon. It was clear that Barker saw his invention as an improvement on painting, ‘which relieves that sublime Art from a Restraint it has ever laboured under’ [Andrews, 1999, p.140]. Supporters of the new panoramic paintings, such as Sir Joshua Reynolds commented, ‘nature can be represented so much better there than in a painting restricted by the normal format’ [Comment, 2003, p.23].

Henri Valenciennes, in his Elements de perspective pratique a l’usage des artistes said ‘this new fashion for painting a sweeping view has been missing from art’ [Comment, 2003, p.87] and saw the development of the panorama as a development of knowledge. However, despite early panoramas being considered key visual and artistic developments by some, the fact they were aimed at the general public and associated with entertainment deemed them separate to the high art of the gallery. This positioned the panorama in a different field and emphasised the need for it to be shown beyond the art-going public. The panorama expert Oettermann estimated that at least 100 million people had seen a panorama [in Seeliger, 2003, p.15], making it an early form of mass media and bringing art to an audience who would otherwise not engage with it. In relation to the research, the desire to show and engage the general public has always been a strong consideration and many of the exhibitions of work have taken place in non-traditional galleries, opening up the audience to the work and allowing for a broader interpretation of the work. In this case the work has been viewed by a wide ranging audience through exhibiting in non art related spaces (such as the Falkirk Wheel, museums or science centres) or being housed within non art going communities (such as within a scientific community) opening new possibilities for the reading of the work.
In The Hague, Netherlands there is an excellent example of a complete panorama known as the *Mesdag Panorama* (1881), named after the artist who painted it, Hendrik Willem Mesdag. It is one of the few complete panoramas still in existence in Europe and the oldest one in its original location. Traditional panoramas came in the form of specific installations where a circular painting was housed within a purpose made structure with a central viewing platform often resembling a physical space such as the deck of a ship or hilltop. The *Mesdag Panorama* is housed in such a pavilion with natural lighting coming from the ceiling, a central viewing platform some distance from the painting and is almost one-hundred-and-twenty metres long by fourteen metres high. Mesdag’s desire was to create a naturalistic image within his painting. Inspiration for him came from his art tutor Willem Roelofs who stated that he would ‘try to discard all mannerisms and in a word try to imitate nature through feeling’ [in Seeliger, 2003, p.25]. Due to the pavilion-style gallery there is an enforced distance between the viewer and the painting itself therefore brush strokes or technical attributes of the painting are more or less invisible to the naked eye. The colours are rather muted, presenting a relatively lifelike image of standing looking out over the view on a hazy day. Jan Wolkers describes the sense of awe elicited by encountering the work:

‘You slip in to be overwhelmed by improbably distant views from the top of the dunes, to be made giddy with the heaving swell of the vast sea, to breathe the air of the scale-encrusted nets, blending with the tarry smell of freshly-caulked fishing boats on the beach, and the stench of rotting cockles among the washed-up jellyfish and the glistening sea lettuce along the high-water mark …’ [in Seeliger, 2003, p.58].

The *Mesdag Panorama* also has additional physical elements in its installation. Between the viewing platform and the painting there is a so-called ‘faux terrain’ [Lopez, 2011] made up of actual sand and debris, such as driftwood, concealing the lower edge and cementing the painting as early form of installation. The optical illusion of standing in a central viewing point is enhanced as it becomes difficult to tell where the real sand finishes and the image begins, being a form of *trompe d’oeil*. It takes on the physical presence of the space, adding to the idea that this is an early environmental installation. However, the physical and experiential qualities of the panorama further removed it from painting at a time in which painting was defined by being based on a flat canvas confined by its frame. This method of display is still used extensively in museum natural history displays of animals and birds as well as in botanical gardens such as the cactus house at Kew Gardens.

The *Mesdag Panorama* has had sound added by the museum in more recent years. It is a non-diegetic soundscape in the form of an aural description of the work and its history, with some additional background music. Unfortunately it gave a very specific interpretation or
reading of the work and overrode the visual image as it attempted to explain the subject matter or scene, detracting from the viewing of the work. This technique of playing voiceovers or music with painting can often be seen on television, where visual art is shown with suggestive music or commentary. As asserted throughout this text the addition of sound to a visual image changes the reading significantly therefore how the sound interacts with, interprets, adds to or detracts from the visual work is critical to the interpretation of both.

2.3.3 The Panoramic Effect

A panorama gives a wide unbound view whilst simultaneously enclosing the viewer and limiting what they can see through the viewing arena. The viewer is placed within the work and surrounded by it, with their field of vision more closely controlled than with a standard format painting. Oettermann calls the panorama ‘a prison for the eye’ [Seeliger, 2003, p.15], which in many ways it is in that it manages what the viewer can see. This presents a challenge for how to create space for reflection or ambiguity within the work. Space within a panoramic installation is either given through cognitive association with a specific subject matter beyond the scope of the painting or through the illusion of space within the image. That illusion can either be imagined or implied space or it can be the visual space created within the picture plane, through the painting marks, tone, colour or composition. Within this research the aim is to create an all-encompassing experience but not to confine the possibilities within the work, creating an impression or starting point for the viewer but not attempting to define or ‘lead’ all aspects of interpretation.

Although a panorama can be used to carefully control the viewing experience it could also be considered less restrictive than a traditional rectangular format (i.e. the canvas or frame) as it does not have a fixed focus and there are multiple physical ways to view the work. If one takes the comparison of the diorama, which is sometimes mentioned in the same context, there are distinct disparities in terms of the viewer/object relationship. In the diorama a theatre-like framing device is set up through which three-dimensional images can be formed. See for example Op de Beeck’s early dioramic works, Location (2), Location (3) or Location (4) [Samman, 2011] where the viewer is outwith the installation, as if looking in through a window to a recreated scene. This recognises the idea of looking at works through a frame therefore highlighting physicality of both the viewer and work in three-dimensions [Titmarsh, 2006]. However, whilst making the viewer aware of the space, it specifically
positions the viewer outside the work, as a spectator or voyeur. Contrary to this, the panorama encourages absorption rather than looking in.

One of the criticisms of the original panoramas was their limited scope, as they tended to become literal representations of specific viewpoints, with even the patent itself claiming that the artist must stick closely to the landscape they were representing. Their denigrators accused them of being soulless or mere mechanical representation [Comment, 2003, p.86]. Reflecting on these comments now it is noticeable how similar they were to views at the time about other visual representations such as the camera obscura or photography, attitudes which have now been superseded through various art movements and theories. In our current cultural climate these claims of heightened or alternative realities have much potential. Where panoramas are made acutely accurate, of a real or imagined scene, they can enable a transition beyond the real, such as in the work of contemporary Belgian artist Hans Op de Beeck. In his installations the viewer is transposed into a different sensory environment. They are similar to real landscapes yet give a feeling of otherworldly qualities, often through lighting, colour and stillness. Both Location (6) and Location (7) [Op de Beeck, 2008; Venice, 2011; Samman, 2013] give full-scale environments that the viewer enters, both with specific viewing platforms. Location (6) works with the principles of traditional panoramas, encircling the viewer in a purpose made chamber with a central viewing area. On his website (www.hansopdebeeck.com) Op de Beeck describes the similarities and differences to the traditional panoramas, namely that his is sculptural rather than painted:

‘Location (6) is a monumental sculptural installation based on the historic panoramas created, particularly in Europe since the 1800s, to suggest an endless landscape that completely surrounds the viewer. Traditional panoramas combine a three-dimensional foreground with a painted background. Location (6), however, is made up entirely of a sculpted landscape with artificial fog and light. The basic architecture of the work consists of a large cylindrical construction that contains a trompe-l’oeil landscape with an exaggerated perspective that heightens the perception of depth’ [Op de Beeck, 2008].

This work has also been created in pure white, making it reminiscent of a dreamlike state. It is effective in its all-encompassing nature though this takes the idea of the panorama to the extreme in terms of creating an illusion. The work is in many ways more real than the original panoramas of the 18th and 19th centuries through the extended use of sculpture and actual objects. His alternative narratives take on a reality that is beyond the real or even the hyperrealist. In the catalogue for this work it states,

‘The immersive features of the work are not designed to persuade the viewer of the landscape’s realism, instead they render convincingly a separate world made with an entirely different purpose’ [in Op De Beeck et al, 2008, p.44].
The question of the realism and believability of the image is not the purpose of the panorama rather it is this idea of transcendence or immersion.

Sanford Wurmfeld proposes a different interpretation of a panorama with his large colour field interpretations [Wurmfeld, 2009]. In his exhibition E-Cyclorama (2008) the colour spectrum is displayed around the perimeter of an elliptical viewing chamber, which is similar in structure to Op de Beeck’s chamber in Location (6). Like traditional panoramas the viewer steps into the work and by entering the space they have become part of it and are enveloped by the work. According to the exhibition information the main aim of E-Cyclorama is to affect ‘human mood and visual perception’ as well as explore ‘the psychological effects of colour’ [Wurmfeld, 2011]. The crux of the piece is about the immersive experience, carried out by being surrounded by colour. In many ways this work could relate to the colour fields of Mark Rothko paintings, taken to a more extreme level and closely relate to the colour spectrum works such as the panoramic walkway of Eliasson (Chapter 2.2.2).

The once patented term ‘panorama’ refers to a lifelike representation of a place in a particular format, however the term itself is now used more broadly. The word is often also used to describe an overall view of a landscape or sometimes used to describe an image that could not be seen or interpreted in one glance, needing multiple perspectives for the eye to scan across the horizontal plane. The work of Jeff Wall [Galassi, 2007] often uses digital photomontages to give large-scale panoramic perspectives of scenes [Costello, 2008, p.275]. Fried, in discussing Wall’s light box transparencies and Thomas Ruff’s large portrait photos, says they are able:

‘To address more than a single beholder at the same time. Intimately related to the increase of size was the display of those photographs on gallery and museum walls or, rather, the fact that photographs like Wall’s and Ruff’s were made in order to be displayed’ [Fried, 2005].

The point here is that Wall is conscious of the viewer’s observation and physical interaction with the work. In Restoration 1993 (1993) taken in the Bourbaki Panorama in Lucerne (1870), Wall creates a cinematic view depicting restorers working on the panorama. The work keeps part of the scene out of sight, playing with the idea of the panoramic view and the viewer. Wall uses these references to historical painting, from panoramas to complex landscape or figure compositions to address not only photography’s relationship to paintings but to question the concept of painting itself [Benjamin, 2004, p.104].
Gustav Klimt’s Beethoven Frieze (1902) or even works such as Michelangelo’s paintings in the Sistine Chapel (1518-12) are historical examples of panorama-like works, which take on the architecture of the space, activating and embedding the image within the structures and purpose of a room. The overwhelming vastness of Claude Monet’s Water Lilies (1920-26) in the oval gallery of Musee de l’Orangerie, or the colour fields of Abstract Expressionists such as Mark Rothko or Kenneth Noland are again key examples of paintings that extend the viewing to one which envelops the viewer. Rothko is said to have requested that viewers stand very close up to his works, demanding that it filled their field of vision, achieving his desire for the viewer to be ‘in’ the work both physically and spiritually. He stated:

‘I realize that historically the function of painting large pictures is painting something very grandiose and pompous. The reason I paint them, however . . . is precisely because I want to be very intimate and human. To paint a small picture is to place yourself outside your experience, to look upon an experience as a stereopticon view or with a reducing glass. However you paint the larger picture, you are in it’ [Baal-Teshuva, 2003, p.46].

In terms of landscapes the paintings by John Martin, ‘the king of the vast’ [Christie, 2011], also have that element of the physicality of the work inherent, purely because of the scale of the work. The works are read as whole scenes that absorb the viewer however they demand time and a scanning over the surface to absorb the work. In the exhibition of Martin’s work Apocalypse, Tate Britain (2012) his enormous awe-inspiring paintings continued to hold the viewers’ attention. Although fashionable with the masses in their time they were not recognised as significant by the art establishment:

‘Hugely popular in his time, Martin was derided by the Victorian Art establishment as a ‘people’s painter’, for although he excited mass audiences with his astounding scenes of judgement and damnation, to critics it was distasteful. In a sense ahead of this time, his paintings – full of rugged landscapes and grandiose theatrical spectacle – have an enduring influence on today’s cinematic and digital fantasy landscapes’ [Tate, 2011].

In recent years Martin’s works have been re-evaluated and their huge encompassing scale can be interpreted in light of the expanded notion of contemporary painting. Colpitt noted, when talking about the emergence of Minimalism, scale is only relevant to its relation to the viewer [Colpitt, 1993, p.77] making the relationship between viewer and artwork particularly evident.

In The Panorama Phenomenon [2006] Ton Rombout, an expert on the Mesdag Panorama, devotes a section to new interpretations where he investigates contemporary (particularly digital) photographic versions. There have been significant technical developments in
panoramic forms of photography, virtual environments or digital manipulation. Spherical photographic panoramas, or virtual worlds are increasingly common and can transport the viewer through a screen to a three-dimensional world (see Google Street View at https://maps.google.co.uk/ or online panoramas such as those at http://www.airpano.com or http://www.worldwidepanorama.org). Similar processes are also used within industry and daily life such as on estate agents' websites which enable prospective clients to see a 360-degree view of a property.

The idea that an image encircles the viewer can be traced back much further and even relates to some early cave art such as the Jebel Acacus in Libya or the caves in Lascaux, France [Clottes, 2010], where the drawings use the natural architecture of the rocks. The panorama also relates closely to some of the ancient work on scrolls, where the reading of the work has an inherently horizontal reading and therefore a physical and time-based element within it. Zhang Zeduan’s Along the River During the Qingming Festival (12th century) takes a snapshot of an event and the viewer then takes time to experience that moment. In the case of the Bayeux Tapestry (1077AD) or Trajan’s Column (113AD) the reading is in relation to narrative and the passage of time, a specific story playing out.

There are also a number of contemporary works that use moving image within a panoramic format, taking on some of the concerns of the panorama. The Russian group AES+F (www.aesf-group.org) have worked with a number of multi-screen videos, presented in a circular arena, similar to the three-dimensional setting of a panorama. Their piece Feast of Trimalchion (2009) could be called three-dimensional cinema as the screens were set out in a large circle, effectively making a panoramic film that enabled the viewer to engage with different sections depending on their physical point of view. The work took the viewer into a virtual fantasy world. In this case the all-encompassing nature of the installation almost became the vision beyond the horizon.
2.4 The Context: Immersion

2.4.1 Spatial Sound and Vision

Central to the concept of combining sound and vision in an art installation is the complex way in which these help us to perceive the three-dimensional world around us. Humans have evolved to live predominantly on a horizontal terrain, with both their eyes and ears positioned horizontally. This is not the case for all living creatures, for example the barn owl has a highly developed sense of hearing with its ears placed at different levels. The relative placing of the ears and eyes on humans means that we can gather visual information only in front of us whereas sounds can be heard from all around us. This is particularly relevant for painting and the introduction of sound to painting. The frontality of painting and the relationship with the embedded notion of the gaze has been challenged through its expansion. How we relate to the expansion into three-dimensions brings a questioning of the forward looking gaze as well as changes the role of the viewer from an observer to one that experiences or enters the work.

In building up a visual image we utilise the sensory information from both eyes together and likewise for reconstructing the sonic environment we use the sensory signals from both of our ears. The way in which our brain uses these sensory signals is very similar for sound and vision. The catalogue of examples that evidence cross-modal influences between the visual and auditory senses is vast [Calvert et al, 2004] although the manner in which they affect our overall experience from an artistic point of view is still open to question.

Early research into three-dimensional perception put much more emphasis on the visual than the sonic, echoing the cultural dominance of vision (see Chapter 2.5.3). Helmholtz, for example, reserves a very prominent part to binocular vision in his momentous Treatise on Physiological Optics [Helmholtz, 1910], whereas in his classic book on the sensations of tone [Helmholtz, 1875] binaural hearing is scarcely addressed. He makes comparisons between the eye and the ear but always in relation to single organs. Auditory localisation studies first appear in the early experiments by Venturi (1802) in which a blindfolded subject listened to sounds from a flute in different locations with either both ears or with one ear blocked by their finger. He established that the perceived direction of sound was related to the difference in signals being picked up by the two ears. It was seventy years later that Lord Rayleigh developed a convincing theory for the way in which the positions of sounds are localised; now known as the Rayleigh Duplex Theory. Charles Wheatstone, on the other
hand explained binocular depth perception (stereopsis) convincingly in 1838 and went on to invent the stereoscope, which became popular for viewing photographs in three-dimensions up until the 1930s. Stereo sound was only conceived in the early 1900s and was put into use in early cinema some years later. By the 1950s stereo tape recorders for domestic use had come on the market and both stereo sound and stereo photography were common.

In humans the sound and visual perception sensors are similar in some respect, notably that we have two eyes and two ears spaced relatively close together and at the same level. If we consider looking at a two-dimensional image, it is effectively projected on the retina, albeit upside down, by our eye’s lens, similar to a camera. Clues given to the brain from each of our ears are slightly different. Imagine there are loudspeakers placed to the left of a head, then sound would reach the left ear slightly before it reaches the right one. There is a time delay or phase lag between the two signals. Another clue is that the sound to the left ear will be louder. The brain combines these two messages to predict that the sound is coming from the left, which is the principle of stereo sound.

There is an added complication that the head diffracts (bends) long waves more easily than short waves so the effect of the change in intensity between the ears is considerable at high frequencies but small at low frequencies. Therefore the dominant clue at high frequencies is the intensity difference whereas at low frequencies it is the time lag. There is a third clue, which can be significant for sounds that contain a wide range of frequencies, referred to as the Head Related Transfer Function (HRTF). The head, torso and outer ears perform a filtering of sounds before they reach the inner ear, depending on their precise shape. These changes in the spectral distribution help the brain to resolve ambiguities in the intensity and time-lapse clues. There are some interesting anatomical aspects to this such as the pinna shape of the ears which filter the incoming sound signal in such a way that it preferentially selects sounds in the frequency range of human speech [Rigden, 1977, p.38].

In relation to the physical response to the panorama, we naturally interpret information on the horizontal. Viewing along this horizontal plane allows a scanning or overview of a scene and encourages that reading. The horizontal is particularly inherent to the interpretation of sound where there is both a philosophical understanding of the use of sound (as opposed to traditional musical hierarchies and structures) as well as the notion of the horizontal reading within the layering of the sound field. Considering the horizontal has affected the way in
which the format of both my painted and sound images have developed, through the use of
directional sound fields and in a change of format for the paintings.

As well as the horizontal format many panoramas also use the horizon as a key aspect or
point in the composition. Panoramas are traditionally based on a specific vantage point; the
point being critical as it inherently determines both the composition and the subject. The
panorama is then created by looking outwards in all directions from this point and looking
towards the horizon is consistent to most panoramic viewing. It is both the anchor and the
defining point of a panorama, locating the viewer in the visual landscape whilst
simultaneously confirming space and distance. Historically this relates to the opening up of
travel and exploration at the time when panoramas first became mainstream. In terms of
interpreting the painting the horizon is key to the visual understanding and reading of the
work, primarily because it is horizontal and lends itself to the act of extended viewing, so an
aspect of time becomes inherent in the work.

The horizon can be found within each of the research panoramas, generally relatively high in
the image. Although not adhering to precise perspective, the horizon and the relative placing
of structures help to locate the viewer and create a grounding point within the image. In all
of the visual work there is an acceptance that the use of perspective and the horizon are
useful. As in the traditional panoramas the horizon is key to the structure of the image and
helps to create space, distance and greater depth of field and encourages a scanning with the
eye across a horizontal plane. The principle in these panoramic paintings is not to present an
exact scene but to interpret the environment through selection of images and structures,
using a collage or montage approach to developing the image, focussing on some areas in
greater detail than others.

**2.4.2 Visual and Sonic Depth**

So far spatialisation in terms of direction and the horizontal has been discussed but to locate
distance is clearly much more difficult and imprecise. The image from a single eye can be
used to give quantitative information or ordinal depth information which have been familiar
tools used by artists to create space.

The most basic clue is that of physical size. Objects near to the viewer will project larger
images onto the retina than objects that are further away. For this clue to be useful the actual
sizes or relative sizes of the objects must be known, however in many practical situations this is not a problem since the sizes of familiar objects are understood approximately e.g. the size of a person or a tree. In addition, as the distance between an object and the viewer increases the light has to travel through increasing amounts of air containing water vapour or other polluting particles, all of which scatter the light. Any colours in an object become less saturated (effectively less colourful) and their colour shifts towards the background colour. In most landscape scenes the background colour is a general blue-grey so that distant objects appear more blue-grey in colour, although this is not always the case. The effect is known as atmospheric or aerial perspective. This measure of depth is relatively coarse and effective only over a wide range of distances.

The most apparent sonic way to determine distance is loudness, which is a close parallel to the visual measure of physical size. Sources near to the listener are louder than those further away because the sound intensity level falls off inversely as the square of the distance. The same rate of reduction applies to the visual clue of area. For this to be effective a typical loudness (or size) of the source must be known (often this is not a problem). Another clue for sonic distance perception relates to the relationship between the direct and reflected sound. When a sound is made the first sound heard is that which travels directly from the source to the listener’s ear, since this is the shortest path. Sounds that are reflected from surrounding surfaces arrive later. In an enclosed space such as a concert hall the sound heard from a source is a combination of direct sound and reverberant sound. At close distances the direct sound is most clear and at long distances the reverberant sound dominates so the brain can use its relative magnitudes to gauge distance. Even in open spaces the reflections from the ground can be significant. A further factor in determining distance is that the time interval between the arrival of the direct sound and the first reflection decreases with distance.

In a similar manner to that in which light waves are scattered as they pass through the atmosphere, sound waves are scattered by random fluctuations and turbulence in the atmosphere. This gives rise to a spectral broadening of the sound analogous to optical blur. Related to this is the fact that high frequency sound is absorbed more readily by the atmosphere than low frequency sound so when sounds travel a long distance their high frequencies are filtered out. A common example is the sound of thunder, which starts off as a sharp crack containing the whole range of frequency components but ends up as a low rumble when it reaches the listener. This can be heard in the soundscapes, where closer sounds are more clearly defined. Sounds further from the recording device have more low
frequency components with lower definition. This can help to locate distance as well as identify the reverberation of the space (see Chapter 2.5.2 for further discussion on reverberation). These spectrum change effects are analogous to the effect of colour change with distance.

In terms of identifying distance and therefore space there are two important binocular clues, which require the sight of both eyes. The most important of these is known as binocular disparity (used in early three-dimensional viewers and stereoscopes) [Grau, 2003, pp.141-143; Mather, 2006, pp.281-284]. In humans the eyes are placed at the front of the head and each sees different views of a scene [Dodgson, 2004]. The slight differences in the two images are detected by the brain and give rise to the feeling of depth known as stereopsis or stereoscopic vision, with disparity changing much more rapidly at close distances than at distant ones. A second binocular clue arises because when the two eyes fixate on one point the angle of convergence of their optical axes changes with distance, being greater for points close up and smaller for points further away. The state of the extra ocular muscles, which control this vergence angle, gives a clue for absolute distance, however this is only a reliable clue for distances below about a metre [Viguier et al, 2001 pp.115-124]. The sound signal reaching one of our ears does not produce a two-dimensional image in the same way that the eye does, however when combined, two ears give detailed directional information equivalent to the visual binocular cues associated with stereoscopic vision.

The use or control of sound spatialisation and depth allow a number of elements to be evident within the work. However, as Chion points out:

‘What does a sound typically lead us to ask about space? Not “where is it?” - for the sound “is” in the air we breathe or, if you will, as a perception it’s in our head - but rather, “Where does it come from?” The problem of localizing a sound therefore most often translates as the problem of locating its source’ [Chion, 1994, p.69].

Chion identifies the key to sound movement and the implications of a specific space, as identification of where the sound originates. Being able to change the moment within the soundscapes allows for far greater depth within the work. However, there is a stumbling block. In much artwork (both this research and sound art in general) the source is known, i.e. it is emitted literally from the speakers. The use of localised sound therefore requires the viewer to make a mental leap into the sound space of the recording just as the visual image expects the viewer to interpret the work as a form of illusion (even if that illusion is not accurate). The localisation within recording and playing allows for sound illusions and narratives to be built through a complex range of overlapping sounds, or sound fields. This
also relates to the concept of ‘spatial magnetization’ [Chion, 1994, p.70], the idea that the interpretation of depth by the viewer is always in relation to the space perceived by the visual elements. Therefore the illusion of spatial depth within the work is dependent (or potentially interrupted) by the viewing and depth within the panorama.

2.4.3 Movement and the Viewer

In setting up a system of speakers for a soundscape it is useful to consider the extent to which the viewer can identify up, down, right and left in the location of virtual sound sources. Considering the two primary clues that the brain uses (intensity and time lag) it can be seen that if we keep our heads stationary then it is not possible to identify whether the source is up or down. There is a vertical ambiguity and the brain has to rely entirely on other clues such as the HRTF. In the Sonic Arts Research Centre (SARC) in Belfast there are spaces where the viewer is surrounded by loudspeakers, therefore these ideas can be tested. In SARC the floor is an open grid and loudspeakers are places both below and above, as well as either side and front and back. When a single frequency sound is played successively through the different speakers, tests show that it is virtually impossible to identify whether the sounds are coming from above or below without moving the head. When ambiguity arises the observer intuitively moves the head in order to hone in on the location of the source. Movement is an important factor in giving spatial sonic clues to the brain so the movement of a viewer within a sound environment such as an installation is integral to viewer response and interpretation.

Most sounds are generated by some form of movement or action and it is unusual to have sounds from fixed sources. Sound therefore has an aspect of time and movement inherent to it. Chion talks about this implication of movement in sound:

‘Sound, contrary to sight, presupposes movement from the outset. In a film image that contains movement many other things in the frame may remain fixed. But sound by its very nature implies a displacement or agitation, however minimal … As the trace of a movement or trajectory, sound thus has its own temporal dynamic’ [Chion, 1994, p.9].

It is through accounting for the potential of movement, and therefore time and space, that the visual work has transformed. If we think here of the viewer entering and then standing within the circular installation, they must move within the space to see the work. They cannot be stationary to engage fully with the image. It is therefore the viewer who must move to activate the image. This is also discussed in the work of Op de Beeck:
'This sense of visual surfeit functions both laterally, whereby the eye needs to turn through a 360-degree rotation, and frontally, through the horizon reaches to infinity’ [Op de Beeck, 2008, p.43].

This is also a key consideration in the traditional panoramas such as the Mesdag Panorama discussed in Chapter 1.3.2. In describing the work the Director of Mesdag, Marijnke de Jong, asserts:

‘Unlike many modern forms of ‘virtual reality’ Mesdag’s panorama offers the onlooker the opportunity to move to a different time and place at his own speed. The images are not revolving nor are they driven – everyone can control the length and intensity of their own experience’ [in Seeliger, 2003, p.7].

In the research the movement within the visual reading is confirmed by the sound. The panoramic visual reading is echoed by the movement of the sound. The viewer will see or hear the work depending on where the viewer stands or how they move within the space. It is the viewer’s responsibility to activate movement in the visual image whereas movement is integral to the sound work.

The sounds move within the space, aurally describing the object/action that created them, such as transport. The movement in these examples is independent from the positioning of the viewer. Certain effects such as the Doppler effect accentuate high-speed movement in reference to a fixed point (the viewer). The Doppler effect [Kinsler et al, 1950] is the frequency change that arises when there is a relative motion between source and listener. In the context of this research the listener is considered static so when the source moves towards the listener the wavelength is shortened and the pitch rises whereas when the source moves away from the listener the pitch is lowered. In the research there were also more subtle techniques used through careful use of layered sound and image to create space and movement within the static work. Pierre Schaeffer considers how one can use the potential qualities of sound sources at length in his sound compositions, describing in detail different tonal, durational and frequency qualities he has found such as:

‘Effect on trains passing each other in opposite directions with that inflection when moving things pass each other their sound goes down one tone, an augmented second, sometimes a third’ [Schaeffer, 2013, p.11].

The effect of movement can be used to alter the mood or tonal qualities of the sound work, changing the overall feel or engagement with it.

As well as being central to the physical interpretation, movement brings elements of both duration and space. In the research installations the viewer moved with the circular image and the three-dimensional sound was key to creating this active relationship with the work.
In some of the earlier exhibitions there was no clear entry point to the space therefore its scope was not defined. However, in the later installations the viewer walked through an entrance and into the work, embedding movement within the viewing experience. Once a viewer entered the space they tended to remain in the central area of the chamber and move in a circular, although not always linear, way. Thus most viewers walked around the full length of the panorama, much like reading along a line of text, going back and forth between areas or straining their head to listen to sounds. A viewer often revisited certain areas or moved towards the panorama to focus more closely, just as they would move their head to hear the sounds more clearly.

If we look back to Eliasson’s panoramic walkway (see Chapter 2.2.2) where the viewer progresses through the space, the emphasis is on the movement and interaction of the viewer. The viewer is within the work. Furthermore, the work does not fully operate without the viewer i.e. it is contingent upon the viewer for its function. Let us consider a more extreme example such as a collaborative work Eliasson made with artist Ma Yansong in Ullens Center for Contemporary Art, Beijing. In Feelings Are Facts (2010) an interior environment was built within a gallery. This was lit with the colours of the spectrum in addition to artificial fog to reduce visibility within the gallery, ‘thus the visitors created their own spectrum by walking through the space’ [Xiaoyan, 2010, p.37]. Eliasson also repeatedly states the importance of perception when discussing his work. Beyond the viewer being the receiver of the work they are also part of it. As he has noted:

‘I believe that anyone encountering my object influences the project just as the experience of that project also affects that person’ [Sørensen et al, 2004, p.112].

Here the artist stresses the impact of the viewer, however, the statement starts with the impact the viewer has on the work itself. Their presence makes a shadow in the work, which people outside of the work can see. Therefore, the work can only fully be realised with people inside it. It is not only important that the viewer receives the work but that they also change it, similar to the acoustic qualities of a space with or without a viewer. This is particularly noticeable in the extreme acoustic spaces where the entry of a viewer affects the sound quality and absorption of the room, making the ideal viewing experience a solo one.

The interest in the viewer relates closely to early Minimalist approaches to physicality and the emphasis on the physical space of artworks. In his book Phenomenology of Perception (1945), the philosopher Maurice Merleau-Ponty states that we perceive the world (and therefore art) through our bodies, ‘the body is our general medium for having a world’ [Merleau-Ponty, 2002, p.169]. He believed in a sensory engagement and what he termed
‘presences’ that were later considered to be ‘the embodied mind’ [Feld, 2005, p.180]. We are embodied subjects that perceive art through ourselves. This is where the viewer can become more active and be a part of the work. This also has implications for the senses:

‘Because motion can draw upon the kinaesthetic interplay of tactile, sonic, and visual senses, emplacement always implicates the intertwined nature of sensual bodily presence and perceptual engagement’ [Feld, 2005, p.181].

This shift in the viewer’s relationship with the object of perception is critical. The importance of physically experiencing the work led to the viewer being more than a passive recipient of the work. Describing this shift, Colpitt discusses the work as confronting the viewer, which he distinguishes from, ‘the traditionally passive aesthetic experience’ [Colpitt, 1990, p.67]. The viewer is no longer passive in the work but is active. In Eliasson’s case his approach to working with light is described as being, ‘anchored in physical and biological states’ [Sørensen, 2004]. For the artist Haroon Mirza, sound, and its use within art is, ‘definitely a physical thing’ [in Borthwick et al, 2013, p.77]. Both artists are stressing the importance of the physicality of the viewer with the space, experiencing the work.

Returning again to the three-dimensionality of the installation, the combination of sound and vision bring conflicting aspects. The frontality of the painting has already been mentioned, as has the forward-looking gaze. An image always has borders, a beginning and an end. The framing of the image is always present even when the frame is expanded. Within this research context the physical boundaries of the image are expanded by its format to encircle the viewer. Therefore they are beyond the edge of vision, but this in turn confirms that there is an edge. The framing becomes the edge of the visual field:

‘If we speak of an audiovisual scene, it is because the scenic space has boundaries, it is structured by the edges of the visual frame’ [Chion, 1994, p.68].

No such thing exists in sound. Sound operates in a three-dimensional space. As Douglas Kahn describes, in Noise, Water, Meat:

‘Moreover, sounds can be heard coming from outside and behind the range of peripheral vision, and a sound of adequate intensity can be felt on and within the body as a whole, thereby dislocating the frontal and conceptual associations of vision with an all-around corporality and spatiality’ [Kahn, 2001, p.27].

Sound goes beyond the restrictions of a framing device, either physical or temporal. As Toop has described, ‘music has become a field, a landscape, an environment, a scent, an ocean’ [Toop, 2000, p.113]. The sound work takes place in time therefore it has an inherent narrative as it advances through time however the distinction is that it has no beginning and no end. The narrative is not one that is necessarily distinct but the passage through time
provides sound (arguably more so than music) with something more than purely being temporal, namely that it is part of a continuum.
2.5  The Context: Installations

2.5.1  The Sonic and Visual Environment

On entering a space the overall ambience is created predominantly by the auditory levels and the quality of the light and sound. Brightness and loudness are usually defined by intensity; the power per unit area. When we look at a visual image the overall intensity as well as the intensities of the discrete parts are important. Johannes Itten speaks of this as light-dark contrast and the same applies to sounds [Itten, 1970]. We can turn up the volume on an amplifier easily but the timbre of any particular sound depends on the relative intensities of the different spectral components. The overall intensity that the eye sees depends on the strength of the light sources but also on the reflectivity of the surfaces in the space i.e. the observed intensity comprises the intensity of the direct light plus the intensity coming from the reflected surfaces. This is notable particularly with regards to, for instance, the typical white cube gallery space where all of the light frequencies (from overhead) are reflected by the walls creating non-directional bright white light.

For sound, the effect is similar and in some respects even more significant. If a loudspeaker is placed in a space then the sound we hear comes from the direct sound together with the sounds reflected from the walls, ceiling, floor etc., known collectively as the reverberant sound. If the walls are brick or plaster then the reverberant sound level will be relatively high and may even exceed the direct sound at more than a prescribed calculable distance (known as the room radius) from the source. If the surfaces are covered with absorbent material then the room will be relatively dead. The general theory of reverberation was developed by the American acoustician Wallace Clement Sabine, usually considered to be the founder of the field of architectural acoustics [Kinsler et al, 1950]. He defined the reverberation time as the time for the overall sound level to fall by sixty decibels. Throughout the research the reverberation time has been a significant element in the work and has been measured in many of the spaces (it can be evaluated approximately from the formula 0.16 x volume/total absorption). This is the basis of the sound properties of the anechoic and reverberation chambers (discussed in Chapter 1.4.2). In the purpose-made exhibition chamber the reverberation was controlled through the use of foam sound insulation. The level of reverberation in a space is generally very obvious and can easily be heard, although is often not consciously noticed by the listener.

Sight is known for being directional and frontal. It is usual to look directly rather than
experience the aura of an object or scene. In contrast someone surrounded by sound will experience a feeling of being immersed in the sound field. It is significant to note that sight is not always purely 'the gaze' ahead and can be thought of as aura of colour surrounding the viewer. This occurs, for instance, when an observer is suddenly immersed in bright sunlight after emerging from a pitch-black environment, or even when standing in the middle of a desert or forest and relates to the artist and educator Josef Albers’ thinking about afterimage [Albers, 1963]. This is what Eliasson was working with in his work 360° Room For All Colours (2002) where the room dramatically changes colour every few minutes, an experience based on the full colour field and the afterimage that it created.

Sight can be thought of as 'incorporating' because of its experiential qualities, extending to temporal variation, so making it similar to the effect of sound. The temporal resolution of seeing is much lower than for hearing [Calvert et al, 2004] so it tends to be a slower, more contemplative sense to interpret. Sudden changes in lighting can startle, but sight lends itself to the static observation from a viewpoint rather than needing the notion of time to develop sequentially. Thus sound alongside visual work can allow the audience to have a potentially more powerful (or alternative) access point to the work. Despite the differing information sight and sound provide, the audience will always approach a work from both a visual and sound perspective, a combined viewpoint, rather than having the option to engage with isolated experiences. The two are so inextricably linked that it is impossible to completely separate them.

In Haroon Mirza’s installation at the Venice Biennale, The National Apavilion of Then and Now (2011) the viewer entered an anechoic chamber, with increasing bright white light and a loud hum of rising volume, to then be plunged into darkness and silence. The work is based on both visual and sound elements working simultaneously, so that the viewer is left in temporary visual and audio shock. Mirza has commented that:

‘Something very physical is happening to us in that space: our pupils may become dilated or our hair might stand on end; we might get goose bumps. Because we’re experiencing art we don’t think of it in terms of physics, but interpret that as some kind of emotional response. It affects you physically before you can consciously process it’ [in Borthwick et al, 2013, p.74].

In contrast to some of Mirza’s other work of the same period, which can be based on assemblage of objects [Toop, 2011; Borthwick et al, 2013] or sonic interventions, this piece relies on the immersion of the viewer in the space. The entry into the chamber and the immersion into the stimuli with a sudden thrust into darkness and silence relies on the drama
of intense stimuli leading to nothing, an emptiness, only to build and reoccur again. Haroon is said to have taken ‘a stand on art’s ocularcentric bias’ [Khazam, 2011] and repeatedly works with sound alongside visual work through sculptural interventions or installation [Borthwick et al, 2013]. In his recent exhibition in the Lisson Gallery (2013) he again uses visual and audio immersion (www.lissongallery.com). In one of the pieces he has used bright white light within a reverberation chamber. Here he is using the idea of the overwhelming light and sound, in a similar vein to his work with the anechoic chamber, playing with the natural properties of the spaces, whilst also taking them to an extreme. In the above example Mirza deals with the intense immersion of sound and vision, with bright/dark or loud/quiet being the crux of the works. Similar techniques are often used in cinema, however, let us look more closely at the element of surprise.

Chion discusses that there are certain sounds, which have ‘a pulse’. There is rhythm, which we can home in on, such as waves, the drip of a tap, breathing or the regular hum of machinery. These allow us to stay 'in synch' with the sound. It is the changes to these or indeed any erratic sound, which disturbs and disrupts the audience and creates suspense, tension or shock. A regular sound can become background or hypnotic, something the listener eventually switches off from the pattern. A change from regular to irregular can unnerv the viewer due to the regularity we expect to hear. Through experimenting with different found sounds and watching the public reactions it is evident that people do not notice the loud ticking of a clock or the tapping of a hammer. Allow a motorbike to drive past them, however, and they immediately respond - they must notice it, recognise it, assimilate it. Instinct makes us alert to a sudden sound. Again this is a phenomenon used within visual work, where a pattern is regular and then disturbed, placing more prominence on the disturbance. An obvious example of this was in the exhibition Panorama (2010) (see Chapter 1.4.3). Here the sounds from outside the gallery could be heard within the installation and were considered as integral to the sound and visual installation. The additional soundscape included an aeroplane passing overhead, which repeatedly caught the audience off-guard to an unusual degree. The regularity of the other sounds within the work became part of the on-going, hypnotic effect of the work, with the plane cutting through this and disturbing the status quo.

2.5.2 Synaesthesia and Transensorality

Synaesthesia [Flint, 2006], where a stimulus applied to one sense involuntarily elicits a
response from another, is known primarily through late 19th century literature which dealt
with the notion of sensory ‘correspondences’ such as Arthur Rimbaud (see the poem
\textit{Voyelles} 1872 where a certain colour elicits a specific musical sound) or Charles Baudelaire
and his quest for synaesthetic ‘communis sensis’ (illustrated in the poem \textit{Correspondances}
1857). The relationship between colour and timbre in musical sounds is illustrated by the
fact that musicians and non-musicians alike frequently use the terms timbre and tone/colour
as being synonymous. Bismarck’s [1974, pp.146-159] list of terms, which are used to
describe timbre, includes terms that can equally well apply to a painting e.g. dark, bright, and
dull. František Kupka developed some of the formats previously put forward by Newton and
Helmholtz, producing his own colour wheels and the painting called \textit{Discs of Newton (study
for fugue in two colours)} (1912), which, as the name suggests, brought together visual and
musical ideas. Despite experimentation with the relationship between the sonic and the
visual, Kupka is said to have mistrusted the subjectivity of synaesthetic experiences. He was
aware of fundamental scientific differences between sight and hearing:

‘The eye is unable to decompose compound systems of luminous waves, that is, to
distinguish compound colours from one another. It experiences them as a… simple
sensation, that of mixed color … The eye has no sense of harmony in the same
meaning as the ear. There is no music to the eye’ [Broughter et al, 2005].

His statement that, ‘there is no music to the eye’, however, is open to question. In traditional
western music, a chord is considered to be harmonious if most of the harmonics of the
constituent notes coincide. It has already been pointed out that there are no harmonics within
the visible spectrum of reflected or absorbed light (colour) but nevertheless the use of
colours beside one another create what society commonly describes as colour ‘harmonies’
[Kuehni, 1997]. Kupka went on to attempt to fulfil the specifically musical analogy of pure
painting, from a vitalist point of view, seeing colours as natural vibrations:

‘The radiation of vital energy in nature, the same energy that resides within us,
always manifests itself by the relations between different vibrations, and,
consequently, different colours’ [Kuehni, 1997].

It is interesting to note that Kupka nevertheless believed that form was fundamental to
painting, hence his desire for ‘pure' painting was never fully realised. The painter Henry
Valensi articulated this new aesthetic ideal in 1912, ‘why not conceive then a “pure
painting”? Just as a musician has his notes, why not suppose that colour by its intrinsic force,
can express the painter’s thought?’ [West, 1967, p.52]. The principle of pure visual art
(generally thought of in terms of colour) in the realms of musical notes has been a concern of
a significant number of artists throughout the last century. The connecting of notes and
colour can be seen in paintings by Paul Klee, Hans Richter and Robert Strubin or also in
works such as Alexander László’s colour organ. Synaesthesia has been discredited scientifically at various times [Flint, 2006] in the 19th century, but current thinking is that it is a neurological condition affecting around three per cent of the population. Bergman, in her paper for the American Association of Synaesthesia [Bergman, 2007] talks about synaesthesia going in and out of fashion. It is a term, which, as discussed by artist and theorist Claire Oboussier, can be both a neurological syndrome and a literary device. Her reading of synaesthesia in relation to Roland Barthes and Hélène Cixous allows us to question the differing forms and meanings as well as their relation to the object. The loose terminology and understanding of this word has only added to confusion on the subject and a variety of interpretations. Chion is quick to dismiss any connection with this term and presents a different attitude towards the relation of the senses, using the word 'transensorality', suggesting that the senses are not actually completely separate from one another and therefore have no specific point of contact. Rather they are part of one intersense:

‘Transensorality has nothing to do with what one might call intersensorality, as in the famous “correspondences” among the senses that Baudelaire, Rimbaud, Claudel and others have celebrated. When Baudelaire evokes “parfums frais comme des chairs d’enfant, doux comme des hautbois” (perfumes fresh as baby skin, sweet as oboes), he is referring to an idea of intersensorality: each sense exists in itself, but encounters others at points of contact. In the transensorial or even metasensorial model, which I am distinguishing from the Baudelairian one, there is no sensory given that is demarcated and isolated from the outset. Rather the senses are channels, highways more than territories or domains’ [Chion, 1994].

Steven Feld also considers the overlapping nature of experience and the interplay between the senses. In Empire of the Senses (2005) Feld hints at synaesthesia talking about it more as a ‘mingling’ or as a metaphor:

‘Synaesthesia points to the complexity of sensory ratios, the rich connections inherent in multiple sensation sources, the tingling resonances and bodily reverberations that emerge from simultaneous joint perceptions’ [in Howes, 2005, p.181].

Feld also discusses the idea that not all senses are considered or experienced in the same way at the same time. It is like there are sensory fields that one moves between. He describes the foreground and background of our presence in experience saying:

‘Lived experience involves constant shifts in sensory figures and grounds, constant potentials for multisensory or cross-sensory interactions or correspondences. Figure-ground interplays, in which one sense surfaces in the midst of another that recedes’ [in Howes, 2005, p.180].

Intersensorality may be a more accurate definition in this case, which is described by Howes as:
‘The multi-directional interaction of the senses and of sensory ideologies, whether considered in relation to a society, an individual or a work’ [Howes, 2005, p.9].

By interpreting the senses as intersensorial (or indeed transsensorial or cross-sensorial) we must also consider the specificity of one particular sense and its unique purpose within artistic practice. The defining element of sound must be the time frame and the particularity of sight, the space itself. Hansen [2006] talks about those differences, citing Gotthold Lessing’s separation between ‘temporal’ and ‘spatial’ arts. Lessing divided the arts in terms of time and space, which contrasts with our standard artistic disciplines, based purely on media. In recent years media-based disciplines are becoming less defined because of the increasing number of mixed-media or intermedia artists, therefore the idea of temporal and spatial arts is very useful. It allows for the describing and defining of art that can encompass the wide range of artistic practices now common.

How the body receives sound and visual information, through separate channels, and how these are interpreted, must also be considered. Chion's ideas surrounding transensorality point towards the idea that our physical senses interpret various types of information differently. Chion regards sight to be spatial and sound to be temporal and takes this to its natural conclusion where space and time are the only differences between sound and vision. He then reverses this idea to suggest that the interpretation of everything relating to space within our senses will be read as a ‘so called visual impression’, and everything time-based, including visual material gathered by the eye, will be retained, as an ‘auditory impression’ [Chion, 1994]. There are also elements, he suggests, that are not strictly one or the other, such as rhythm, which can be found in either the audio or the visual. On the other hand colour is purely visual and pitch is entirely auditory. This idea transcends the traditional notion of senses and implies complete integration, rather than mere overlapping, of our various forms of perception and interpretation. This is borne out by the research of Calvert and Lewis [Calvert et al, 2004].

### 2.5.3 Superiority of Senses

Within the context of artistic practice the medium and interpretation of ‘art’ has traditionally been through the visual, with fine art often being referred to as visual art. Therefore in terms of established norms it is sound that is entering the visual arena.

The marking of sight as the dominant sense and indeed our society and culture being
ocularcentric have been accepted as the current paradigm. Howes’s book *Empire of the Senses* [Howes, 2005], constantly questions these paradigms, particularly how our senses are formed by our specific cultural experience. In his earlier book *Sensual Relations: Engaging the Senses in Culture and Social Theory*, it states in the foreword:

> ‘Even critiques of the dominance of sight tend to remain within the realm of vision and rarely consider what alternatives to hypervisualism might lie within other sensory domains, or emerge from combining the senses in new ratios. More work evidently needs to be done to encourage academics to break free from the spell of the specular and look, not beyond their noises, but *at* their noses and all the rest of the human sensorium’ [Howes, 2003, p.xiii].

Western cultures prioritise sight, and to some extent sound, over touch, smell, taste. Haroon Mirza, when being interviewed about his work, begins by stressing the ocularcentricity of western culture in particular [Borthwick, 2013, p.73]. However, he also states:

> ‘It seems we are no longer part of such a strictly ocular or visual culture. The internet and new media are changing our behavioural patterns, and more emphasis is being placed on acoustic space. It’s nowhere near the same kind of attention as is given to visual space, but it seems to be steadily growing’ [in London, 2013, p.48].

In his book of Stockhausen texts the musicologist Robin Maconie writes that our whole tradition is visual; our concepts as well as how we describe them are so [Stockhausen & Maconie, 1989]. Chion even names the sense as ‘king sight’. He questions:

> ‘Why we generally perceive the product of the fusion of image and sound – the audio-vision – in terms of the image. In other words, why does King Sight still sit on the throne?’ [Chion, 1994].

These state the superiority of sound, particularly with regard to emotion or impact. Vision has generally been thought of as the sense through which most knowledge and information can be passed. Aristotle, in his conviction of the importance of sight proclaimed:

> 'Above all we value sight … because sight is the principle source of knowledge and reveals many differences between one object and another' [in Ihde, 2007, p.7].

Michel Foucault discussed sight as the ‘medical gaze’ and further questioned the panoptic surveillance that the visual encourages through the potential of the camera [Foucault, 1988]. However this is also where sight has been condemned. As Martin Jay has noted in *Downcast Eyes*, the eye has been criticised for its, ‘disincarnated coldness’, contrasted to, ‘more proximate pleasures provided by the other sense organs’ [Jay, 1993, p.590], and it is well documented that the eye is thought to be analogous with the male gaze, including the lustful.

Since it is generally accepted that vision has a far greater spatial resolution than audio [Shams, 2004] it is often deemed to be the dominant sense. Despite this, and perhaps as a result of this, there are arguments to the contrary. The 20th century saw a different attitude
towards sight and the senses with a distrust of the visual starting to emerge, closely related to
the emergence and dominance of the mechanical arts. Susan Sontag has suggested that the
camera is an extension of the flâneur, of the middle classes who expose and revel in images
of the slums [Jay, 1993, p.141]. In our current times when images are so easily altered and
reproducible sight makes us question what to believe. One might suggest that visual
dominance is now over and indeed in contemporary culture this has implications across
creative disciplines, particularly in the visual arts. In the writer and economist Jacques
Attali’s book Noise: The Political Economy of Music (1985) he discusses the relationship
between sound and politics suggesting that sound is now leading the way:

‘More than colors and forms, it is sound and their arrangements that fashion
societies. With noise is born disorder and it’s opposite: the world’ [Attali, 1985, p.6].

Chion highlights the benefits and capabilities of sound over the visual with reference to the
interpretation of film:

‘The ear’s temporal resolving power is incomparably finer than that of the eye; and
film demonstrates this especially clearly in action scenes. While the lazy sphere
thinks it sees continuously at twenty-four images per second, the ear demands a
much higher rate of sampling’ [Chion, 1994].

Chion suggests that sound can in fact be more exact and possibly more specific than vision
when it comes to temporal events and he suggests that it can connect more directly to our
perceptions. Chion talks of the direct access sound gives us to our emotions and perceptions
contrasting it to vision in terms of its speed, ability to shock and assert meaning through the
passage of time. He illustrates this by comparing the greater impact of a loud sudden sound
to a large sudden hand gesture.

This idea of sound having such a direct influence on us, as interpreters of the surrounding
world, gives an insight into the role of sound within artworks. Christian Marclay, one of the
pioneering sound artists of our time who is known for mixing and sampling of sounds before
this entered the mainstream art world and often works with visual imagery, film and at times
the visualisation of sound [Marclay, 2008; Marclay, 2010] stated when talking about sound:

‘It’s more likely to have that aggressive quality. You can really create something
that’s physiological, where your body reacts’ [Marclay et al, 2005, p.75].

Attali also emphasises the role of noise as being violent saying, ‘first, that noise is violence:
it disturbs. To make noise is to interrupt a transmission, to disconnect, to kill’ [Attali, 1985,
p.26]. He goes on to say:

‘In a biological reality, noise is a source of pain. Beyond a certain limit, it becomes
an immaterial weapon of death’ [Attali, 1985, p.27].
As is widely known, noise has been repeatedly used as a torture device [Smith, 2008; Rejali, 2009, pp.360-384] and is renowned for its physical and biological qualities. Sound is known not only as being physical and violent but also as non-conformist as discussed by Attali in *Noise* [Attali, 1985].

The notion that sound is such a physically direct sense creates great potential for the artist, particularly when considered in the context of the physicality of three-dimensional work. In terms of the combined use of sound and visuals an understanding of the commonalities and differences between the senses can provide the artist with an abundant resource at hand. The filmmaker has exploited this resource, although here the images are time-dependent so the inter-relationship is more explicit. However, going back to Haroon Mirza’s piece *The National Apavilion of Then and Now*, it is not a case of one or the other, both sight and sound can operate in a reciprocal relationship and can enhance each other. It is precisely the duality of the light and sound that allows for a more embedded and startling experience.

Kahn, in *Noise, Water, Meat*, describes the strength of sound in relation to the aural continuum already mentioned. Sound has a constant field, which is ongoing:

‘Thus, sound no longer tied to events but existed as a continuous state as it resonated from each and every atom. This certainly tipped the balance of the senses the other way since where one might expect night to remove light and give vision a rest, aurality would still exist. Everything always made a sound, and everything could be heard; *all sound and always sound* paralleled *panaurality*’ [Kahn, 1999, p.159].

As recognised by key figures such as Barthes, sensorial perception in the past has been marginalised and repudiated [Barthes, 1977]. A language and dialogue around the audio-visual has been built through time and there is now an increased recognition of the senses. The general acceptance of vision as the dominant sense in arts, philosophy and science has recently been challenged. It has been shown that the sound environment in which we find ourselves affects the way in which a visual image is interpreted [Calvert et al, 2004]. Ideas of perception [Oboussier, 1995], which were first introduced in Greek philosophy, are being fully explored and the positioning of the audience in an art gallery as not only the viewer but also the listener is increasingly considered the norm. For the artist (the maker) a depth of enquiry and understanding of the basic principles and devices of sound and colour are vitally important for a full and meaningful engagement with either medium. This gives the artist the practical and theoretical tools to explore and utilise the audio-visual, allowing for the meeting point, overlapping or complete immersion of the senses.
Fundamental similarities, through spectra, intensity, noise, synthesis, ambience, and so on, are underlying in any investigation of the senses and indeed our language is scattered with visual metaphors, also often used to describe sound. As Chion argued, sound and vision are not only connected but are inseparable, almost fused. However the artist also needs to understand the differences in terms of space and time and how these two senses cannot merely achieve similar or analogous effects but may enhance and complement each other. A deep understanding of their commonalities as well as a questioning of their differences can allow the artist to engage with both the audio and the visual experiences in a meaningful way, extending the boundaries of either medium and sense, to create truly audio-visual work. Jay states:

‘Indeed, it is precisely the proliferation of models of visuality that the antiocularcentric discourse, for all its fury against the ones it distrusts tacitly encourages. Ocular-eccentricity rather than blindness, it might be argued, is the antidote to privileging any one visual order or scopic regime. What might be called “the dialectics of seeing” precludes the reification of scopic regimes. Rather than calling for the exorbitation of enucleation of “the eye,” it is better to encourage the multiplication of a thousand eyes, which like Nietzsche’s thousand suns, suggests the openness of human possibilities’ [Jay, 1993, p.591].

Image is bound in space; sound is all encompassing. When these two media work together they do not just make a holistic sum of the parts but create a different way of approaching and experiencing art. The hierarchy here is not imperative, rather how they can work together. Possible synergies arise created from the translation of discoveries and successes from one discipline to another. The most rewarding audio-visual works are often where, using a variety of metaphorical terms, the two go hand in hand, in tandem, where they feed back and forth informing each other.

Throughout the main body of the thesis ideas have been explored that relate to the practice-based research and context of this work. In Part 1 the artwork developed through the research is shown. It describes the installations and exhibitions and discusses the issues that have arisen in the making of the work. Part 2 analyses the contextual ideas and aspects that were considered in the development of the artwork. They relate closely to the decisions made in Part 1. These included the fundamental properties of sound and vision, the potential of a panoramic format painting, how bringing three-dimensional sound together with a three-dimensional painting can transform both and finally the relationship between showing the sound and vision, together.
Conclusion

Throughout the thesis the idea that sound can make a difference to both the reading and interpretation of painting has been explored. Not only does painting command its own presence through sound but it also responds to this additional element. Taking painting into extreme sound environments or controlling the sound environment has an impact on the meaning of the work and of painting itself.

There are three main propositions that lie behind the line of enquiry followed in this thesis, the first one (sound) being that the sound environment of a painting affects, and potentially enhances, its reading. The second (vision) is that painting itself can be transformed through this central tenet, and that in this case the format of the work has shifted to respond to the sound. This is where the idea of the panorama or an all-encompassing environment emerges. The third (immersion) is that the installation of these together results in something more than the sum of the parts and produces an immersive environment, which expands both the painting and the scope of the sound. Development in this area was carried out through research in extreme sound environments. Here the specific acoustic properties of the spaces changed and transformed both the visual and sound work, which was critical to its interpretation. Looking at each of these aspects in more detail, it has been possible to assert the following.

The sound environment of a painting affects its reading. The idea that an artwork will always be viewed in a specific context is now often taken as a given within art criticism, theory and making. However, relatively little research has been carried out in this area in regards to painting and sound. As discussed in the introduction, existing research in this field has mainly explored painting’s relationship with music, as opposed to its relationship with its own sound environment or indeed environmental sounds being incorporated into the showing of painting. With the heightened awareness of the context of any artwork in recent decades the sound environment cannot be ignored. Rather than being subsumed in a pluralistic context, painting and its sonic environment, through the addition or specific use of sound, can be identified or employed as a specific way of working with sound and vision. The way we experience a painting through our senses directly affects the way we interpret the work. Recognising and understanding the sound environment allows space for further development of painting in an expanded way, opening up possibilities within the surface,
image and time narrative. The idea that fundamental scientific properties of both sound and vision, such as their wave-like phenomena and similarities in synthesis and spectra, means that the interpretation of sound and vision are closely linked. Sound and visual work can create intense experiences for the viewer such as in the work of Haroon Mirza (discussed in Chapter 2.5.1) where both sound and visual elements are closely linked. As well as their scientific properties, these stimuli are also both culturally and psychologically related, giving an increased potential to their relationship and allowing for transformations to happen between the two.

With sound now permeating contemporary art and indeed often being considered an aspect of contemporary art in its own right, the specific relationship between sound and vision is increasingly important. Through the research the impact the sound has had on the painting has been varied in form and identification. With the introduction of sound, an obvious change in the painting was the increased role of time and motion. This led the way for consideration of both the incidental sound environment and also an additional controlled one, in the form of diegetic soundscapes relating to the paintings. The sound opened up parameters and introduced temporal and durational elements to the visual experience. When another stimulus, in this case sound, is added to the two-dimensional image, additional subjects within the work are enabled. For example, the performance or music alongside paintings by Jutta Kouther (see Chapter 2.3.1) allows for the work to take on a number of strands within the same installation. The sound can add ideas or subject matter that do not exist within the paintings, meaning that the work has components that are not visible in the painting.

The second key proposition in the research (on vision) is that painting itself can be transformed through its relationship to sound. Not only is the sound an aspect of the visual works’ formal or physical qualities and environment, it becomes instrumental to the interpretation and therefore the making of the work. During the research period the painting changed as a response to the use of sound and the format of the work shifted. The paintings started off as individual discrete paintings, with the framing of each image limited to the edges of the canvas, to the painting taking on a horizontal format that surrounded the viewer. The framing of an image (an extreme example being the diorama) fixes a viewpoint and places the viewer outside of the work, looking in. See for example the shift in the work of Op de Beeck between his dioramic work to his more encompassing panoramas and walk-in environments (see Chapter 2.3.3). In the case of this research the viewer enters the frame and
is embedded within it. There is a shift that happened within the work, from the paintings being viewed as two-dimensional, with space coming through the image in terms of an illusion or pictorial space, to one that the viewer enters and is engulfed by. The painting, using the panoramic format, takes the image out of the viewer’s gaze and encompasses them within.

The long format of the later paintings developed over a period due to the research with sound. The paintings changed form in response to the parameters set by the sound, which led to the desire for the paintings to be entered rather than be viewed from a fixed point. The perspective of the viewer changed to one of being, literally, within the painting. The emergence of the panorama, or panoramic style installations, allowed the sound to be complemented in the visual realm, not as a copy but rather as a visual echo. The painting took on the idea of a sound or visual field, the principals of which are inherent to a sonic experience where the sound surrounds the viewer. This also shifted the painting from a one-focus work, or even a multiple focus image, to one that encompasses the viewer and is whole. Rather than viewing the work through one lens or viewpoint the viewer becomes immersed within the painting and experiences. Although some of the traditional panoramas were based on a fixed viewing point designed to be seen from a specific viewing platform the paintings in the research had multiple foci and changing scale due to their amalgamated or collaged imagery and ambiguous perspectives (see Chapter 1.5.3 for examples). Although the compositions look naturalistic they are not exact or fixed, meaning that there are multiple perspectives surrounding the viewer.

There is an inherent element of time within the act of viewing however painting has often been seen as a snapshot of a moment that the viewer has one perspective on. This focus on the presentness of painting is particularly evident within Modernist thinking where a painting is considered instantaneous and out-with time considerations. In Art and Objecthood Michael Fried describes this immediacy within modernist work as, ‘at every moment the work itself if wholly manifest’ [Fried, p.167]:

‘It is above all to the condition of painting and sculpture – the condition, that is, of existing in, indeed of secreting or constituting, a continuous and perpetual present – that the other contemporary modernist arts, most notably poetry and music, aspire’ [Fried, 1998, p.167].

This view of painting has been surpassed by a wider view of a more emboldened painting, which can be expanded beyond this snapshot in time and presence. Time and a further durational element to how we view a painting can be valuable in opening up the possibilities
that painting provides. Within the research we have explored different aspects that introduce time. There is the sound itself, being durational and ongoing, some of which have a beginning and end and some of which are continuous or ambient background sounds. Secondly there is the changed format of the work, to a long panoramic form that encourages a horizontal and physical reading in time. There is also a third aspect of time, which comes through the content of the work: the images in the paintings are of real places that can be activated through the time continuum that sound enables.

The introduction to Vitamin P discusses the more expanded position of painting today, stating that:

‘Contemporary painting contends that art is not one thing and that therefore no one way of looking is sufficient; one must always be prepared to add new aesthetic axioms. That is one reason some of the painting in this volume keeps refusing its own self-containment … It is precisely through this call for flexibility over commitment that contemporary art (of which painting is just one part) claims a higher degree of self-consciousness than Modernism’ [Schwabsky, 2002, p.8].

The inclusion of other media, forms, technologies, histories and so on to the realm of painting is part of its current status. The research has proposed that the addition of sound brings particular qualities of time and three-dimensionality that have not only changed the paintings themselves but have maintained the distinct qualities of sound and painting to create a different way of viewing painting. In Painting in An Expanded Field, Fares discusses the previous limitations of painting, one of which is that painting is normally considered strictly non three-dimensional [Fares, 2004]. He argues for a broader understanding of painting, not that ‘anything goes’ but that other dimensions and aspects to the work can strengthen and serve the purpose of painting, noting ‘these new ways are not, however, opposite to painting but, together with painting, are part of an expanded field as it has developed historically …’ [Fares, 2004, p.485]. Painting is not a static entity but one that changes through its relationship with sound. The addition of sound has led to a rethinking of painting and the viewer’s relationship with it. The viewing experience has time, space and the implication of movement inherent to it. The viewer must physically enter the space and move within it to realise the work fully, therefore the viewer has to be active within the work.

The third proposition around immersion is the key to the installations, taking on the results of both sound and vision and their affect on both the making and viewing of the work. No longer does the work invite a visual experience that the viewer can choose to look at (or not) depending on their gaze, but it demands that the viewer becomes immersed in the work. The
viewer physically enters the space and is surrounded both visually and aurally; it envelops the viewer. Once the viewer enters the chamber they are encompassed within it, to the extent that in some cases the viewer’s own body affects the acoustics, the sound they experience and their interpretation of the work. The work itself is changed by the viewer entering the space, encouraging a phenomenological engagement with the work. The viewing becomes an experiential activity, purposely making the viewer aware of their physical surroundings. They are forced to be mobile within the space and move within it, even if merely to enter and exit. The sound also moves around the space, encouraging a further element of the experience of moving.

Extreme sound environments have been used in this research to push these relationships to their limit. The anechoic and reverberation chambers allow the sound environment to be considered and controlled to maximize the impact of the surroundings. Because of their specific acoustic qualities their use helped to focus on the potential of the sonic environment for painting. Therefore two aspects of the sound were tested, both the reverberation of the environment as well as the addition of sound. The extremities of the chambers themselves gave certain oppositional experiences, one silent, very controlled and acoustically dead and the other, a noise field. These added to the complexity and the experience of the paintings.

When one combines the viewer entering a space and being surrounded by the work with the additional element of extreme or unusual acoustic spaces the physicality of the viewer becomes key, thus shifting the focus of the painting away from pure image to one of viewer experience. In an interviewing about the Soundings exhibition in Museum of Modern Art, NY [London, 2013] the curator Barbara London talks about the viewers’ relationship with the work, discussing that viewing work is a continuum:

‘The audience can be observers, or listeners, but they really have to move around in order to fully experience the work’ [in Eppley, 2013, p.4].

She finished the interview by talking about the capacity of sound to construct experience with the very nature of the sound enabling an experiential quality that can enhance and expand the scope of painting.

The process of the research led to a literal and physical shift in the work and the thinking around it. From the paintings being static individual objects they spilled over their own frames and expanded their flatness to encompass time and a physical three-dimensionality. This happened through the process and engagement of sound. The changing format through
the use of another media is evident in a number of painters working in an expanded field such as the work of Victoria Morton where the physicality of the painting changed alongside the use and reference to sound, or the animated works of Katy Dove discussed in Chapter 2.3.1. The work emerged by understanding the temporal and physical qualities of sound and the traits that are specific when sound and vision are brought together. The painting was expanded not by merging these discrete elements into one hybrid or emulating each other but by bringing together two distinct forms of work, painting and sound together.

Throughout this research the focus has been to identify and enhance the viewing experience in relation to sound. The sound and the paintings have transformed, both in themselves and through their relationship to one another. A different work has emerged, taking on the expanded nature of painting today and embracing sound and the sonic environment. The shift has led to all-encompassing installations which not only are within the realms of painting and sound art but take on how the audio-visual can affect and enhance one another.
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Appendix 1  Mindmap of Research
Appendix 2   Exhibitions and Publications

List of exhibitions and publications by Marianne Greated related to the research *Painting in a Sonic Environment.*

Please also see copies of papers at back of thesis.

### a  Exhibitions

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<td>Panechoic WASPS The Briggait, Glasgow, UK</td>
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<td>Apr ‘11</td>
<td>A Trilogy: Red, Abadi Art Gallery, New Delhi, India</td>
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<tr>
<td>Jan ’11 and Mar ’11</td>
<td>Autorama and Panechoic Non-bio Boom, Inspace, Edinburgh, UK</td>
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<td>Sep ’10</td>
<td>Experiment 2 Anechoic/Reverberation The University of Edinburgh, UK</td>
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<td>Feb ’10</td>
<td>Panorama British High Commission, New Delhi, India</td>
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<td>Mar ’09</td>
<td>Dead or Alive National Physical Laboratories, London, UK</td>
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<td>Oct ‘08</td>
<td>Marking The Terrain Glasgow School of Art, UK</td>
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<td>Sept ’08</td>
<td>Zvuk Palace of the Republic, Minsk, Belarus</td>
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<tr>
<td>Feb ’08</td>
<td>Sonitus Venkatappa Gallery, Bangalore, India</td>
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<tr>
<td>Oct ‘07</td>
<td>Milieu Falkirk Wheel, Falkirk, UK</td>
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<td>Aug ’07</td>
<td>Louder Now Waterfront, Belfast, UK</td>
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<td>Jul ‘07 and Oct ‘08</td>
<td>Experiment 1 Anechoic/Reverberation, The University of Edinburgh, UK</td>
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<td>May ‘07</td>
<td>Kyst København’s Akvarium, Denmark</td>
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<td>Dec ‘07</td>
<td>Kyst Nordso Museet, Hirtshals, Denmark</td>
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<td>Oct ‘06</td>
<td>Sound London Metropolitan University, London, UK</td>
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<td>Sep ‘06</td>
<td>Kyst Naturhistorisk Museum, Aarhus, Denmark</td>
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<td>Jul ‘06</td>
<td>Sound Glasgow Science Centre, Glasgow, UK</td>
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<td>Apr ‘06</td>
<td>Sound Dynamic Earth, Edinburgh, UK</td>
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<td>Feb ‘06</td>
<td>Scottish Parliament, Edinburgh, UK</td>
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### b  Publications

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<tr>
<td>Oct ‘06</td>
<td><em>Conference Paper</em> Greated M, SOUND: A collaborative approach between art and science, 33rd International Acoustical Conference, Slovakia</td>
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Appendix 3  
Example flyers for exhibitions

a  Milieu, Falkirk Wheel 2007
Sonitus, Bangalore 2008

SONITUS is an exhibition of contemporary art aimed at raising awareness of the environmental issue of increasing sound levels in the community. It stems from an inspirational collaboration between an artist and scientists working at Edinburgh University and the Department of Aerospace Engineering at IISc. It consists of two-dimensional works set in a soundscape, together with posters explaining the scientific background.

exhibition open: 12.02.08 - 23.02.08 | monday - saturday
10.00am - 6.30pm | exhibition preview: 11.02.08 | 5.30pm

venkatappa art gallery | kasturba road | bangalore 560001
india | tel: 080-22864483

sponsors Department of Aerospace Engineering IISc | BITOSA Bangalore | Society for Shock Wave Research | EPSRC | The University of Edinburgh
ZVUK
Palace of the Republic, Minsk
New works by Marianne Greated
16th-31st August 2008 11.00-19.00
Preview 16th August 2008 17.00
Dead or Alive, NPL, London 2009 (back)
Non-Bio Boom | Soundscapes

Friday 11th March 2011, 5.30-7.30pm.

Inspace, 1 Crichton Street, Edinburgh EH8 9AB

Marianne Greated and Bill Davies will discuss the role of soundscapes from the perspective of an artist and scientist respectively. They both acknowledge the relevance of positive soundscapes, moving away from a focus on negative concepts of noise pollution.

The event will include a sound walk in the surrounding area and the unveiling of a new work inside our hemi-anechoic chamber. Both are aiming to identify the relationship between the acoustic/auditory environment and the responses and behavioural characteristics of people within it.
The colour Blue Black & White and The Red
A Trilogy

A Trilogy 4th June - 27 August 2011
Opening Friday 3rd June 6:00pm - 9:00pm

A Trilogy is a collection of artworks from the three colours exhibitions.
A dialogue between India and the United Kingdom on colours and their cultural meanings

Rashmi Kaleka, Shezad Dawood, Vineet Kumar, Anna Fox, Prashast Kachru,
Marianne Greated, Shivani Aggarwal.

Abadi Art Space F 213 A/1st Floor Lado Sarai New Delhi
Tel + 41078186 info@abadiart.com www.abadiart.com
Monday to Saturday 11.00am to 7.00pm
Panorama
An exhibition by Marianne Greated

The British High Commissioner & Lady Stagg request the pleasure of the company of

at a Reception
on Saturday 20th February at 18.00 hrs

2 Rajaji Marg
New Delhi - 110011
Dress: Informal

R.S.V.P. Pushpa Malik
23017805 / 9899691806
Pushpa.Malik@fco.gov.uk

(Please bring this invitation with you)
Panechoic

Private View 6-8pm Friday 30th September
WASPS @ The Briggait Glasgow UK
Open 9.30 to 5.00 17th September until 9th October 2011

Marianne Greatre
in collaboration with the SOUND Project at the University of Edinburgh and EPSRC
Appendix 4  Summary Evaluations

a  Evaluation Sound and Light experiment, The University of Edinburgh 2008

Background

This experiment was carried out in a lecture room in the James Clerk Maxwell Building at The University of Edinburgh. The objective was to gain further insight into the way in which the general public responded to viewing images together with a soundscape. It was a follow-up to the talk given by the author at the IMechE Conference in London in November 2007 where images were shown with time-varying illumination along with a changing soundscape.

In this experiment two paintings, Red Yrsa and Scarlet Girl, were shown to an audience of 24 people. The audience were a mixture of employees of the university, including academics, technicians and administrators. The vast majority (91%) of the volunteers were in either the 46-55 or over-55 age categories. 50% said that they attended sound/music events more than three times a year but only 25% said that they went to art exhibitions three or more times a year. Only two of the audience worked within the arts.

The paintings were illuminated with projected light which continuously changed colour, through the complete spectrum. The changing colours of the light from the projector can be thought of from a visual point of view as varying ratios between the three primary colours of red, green and blue, each of which occupies a finite bandwidth. When added together in different ratios they produced a gamut of colours across the spectrum.

The matching soundscape was generated by recording the voice of the author reading a section of text. This was recorded in the studio using Protools software and filtered through a band pass filter whose characteristics corresponded to known formants of the voice. The centre frequency of the filter changed continuously from a low pitch through to a high pitch and back again. The low frequency formants corresponded to a deep male voice and the high frequency formants to a child.

The physical analogies between sound and colour were adhered to by matching the low pitched voice sounds, corresponding to the low frequency formant peaks of the male voice, with the low frequency red illumination. Similarly the high pitched sounds, corresponding to high pitch formants associated with the female voice, were matched with the blues and violets.

The audience were then asked a series of sixteen questions on how they felt about the visual and audio experience. Examples of the questions are:
Would you prefer to look at the pictures without changing light?
Did you feel different about the pictures when the coloured light changed?
How did the changing colour make you feel?
Do you think the pictures looked different when the sound changed?
How did the sound make you feel?
Did the sounds relate to the colour?
Do high sounds make you think of specific colours?
In addition people were asked to give general comments about the experience.

**Summary of evaluation Results**

The majority of people questioned said that they preferred looking at the pictures with the sound, confirming previous findings from the author’s Sound exhibition. Typical comments were ‘the sound adds another dimension’ and ‘sound adds more interest’. As far as the colour itself is concerned, well over 90% of people felt different about the pictures when the colour of the illumination changed. General comments included such things as ‘I am a light/colour rather than a sound person’ ‘colour changes suggested changing seasons to me’ ‘the changing sounds made me think more of chatter, traffic, nature sounds in the course of a day’ ‘background sounds which don’t require concentration are fine but I don’t like sounds to dominate the visuals’ and ‘low sounds match with dark colours’.
b Evaluation Zvuk, Palace of the Republic Minsk, 2008

Background

Due to language problems the evaluation for this exhibition was carried out by an evaluator who worked at the gallery. Thirty people attending the exhibition were selected by the evaluator and asked to give written responses to 14 questions whilst others were selected to be interviewed on a one-to-one basis. The questions were composed in collaboration with the evaluator who also wrote them out in Belarusian and afterwards translated all the questions and answers into English. The evaluation included questions relating to the age and background of the respondents. These were selected to represent a spread of ages from under 25 yrs to over 55 yrs, of which nearly two thirds of the people questioned were below the age of 30 and virtually all of these said that they attended art events at least once a year, reflecting the fact that a high proportion of those attending cultural events in Belarus are young people. 20% of the respondents had some professional connection with the arts and most of the responses were quite detailed, well considered and in depth, indicative of both a high level of interest in the artwork and environmental subject matter and a well informed audience.

Summary of evaluation results

The first questions put by the evaluator related to the paintings, e.g. ‘have you enjoyed seeing paintings of industrial structures?’ and, ‘how did the panoramic paintings make you feel?’ In response to these there were many comments of a general nature like ‘very contemporary, condensed but simple’, ‘not so much enjoyment, rather a quite new form of painting’ which suggested that the exhibition was understood to be significantly different to what people were used to seeing in Belarus. Comments relating more specifically to the industrial landscapes included ‘I meditated on a complicated civilisation and man-made world’, ‘odd attraction’ and ‘I began to think about the noise problem’. There was much interest in the panoramic room, exemplified by comments such as ‘like finding yourself in the centre of action’, ‘proximity to noise’, ‘it creates a feeling of being in a cage; the panorama begins to evolve’ and ‘there are no corners; it seems like everything is surrounding you’.

The contrasting colour palettes between the different spaces in the exhibition appear to have made a significant impact. One visitor remarked, ‘the serious subject was brought to life but in the kingdom of hope there is no winter; the colour shows it’. Another remarked that ‘the pink painting remains in the mind most of all because it is pulsating’ a reference to the predominantly pink painting Arches. The comment ‘absolutely vivid and new; bright colours and deep imagination’ again appears to relate mainly to the railway and harbour paintings.

One of the primary objectives of the evaluation was to ascertain how the sound affected the perception of the visual images. As the exhibition was set up, the sound was focussed in Room 2 containing the panoramic images so the audience could contrast viewing the individual paintings in a quieter environment with sporadic background noise to the panoramic room where the images were accompanied by the surround-soundscape. Virtually all the people questioned felt that the sound had a marked effect on how they viewed the images. Typical comments were ‘the sound draws attention to the images and makes them more vivid’, ‘the sound amplifies the illusion of a large space’, ‘the addition of the sound intensifies the impressions’, ‘the
sound makes it real’ and ‘the sound vivifies the panorama’, ‘the sound is the reflection of life’, ‘the perception of the painting depends on the sound’, ‘the sound with the painting creates a plastic performance in my mind; the picture begins a life in motion’, ‘the sound helps you to feel ecological problems connected with man-made objects’, ‘with sound the impression is more absolute’ and ‘the sound helps you to imagine the objects moving’.

A number of people said that hearing the sounds within the visual environment of panoramas encircling their space, made them aware of sounds that would otherwise go unnoticed. One viewer commented, ‘I just want to stop and try to distinguish different sounds; those you can hear almost every day but pay no attention to’. A number of people noted that the sound introduced a temporal effect into an otherwise static image. One person said, ‘the picture seems to turn into a movie; the panorama begins to evolve’. Another said, ‘the sound helps one imagine that the events and objects are moving’.

Some of the questions related to the overall effect of the exhibition. Out of all the respondents, only one said that they had seen an exhibition like this before. A couple of respondents said that they had previously come across exhibitions where background music was played. Some of the people found the effect on them to be disturbing so they left the exhibition with vivid images and an impression of anxiety, rather than a sense of aesthetic pleasure and some of the comments here were quite extreme. Some examples are ‘I had a feeling of alarm, stress and even fear. I just wanted to leave the gallery and even the city as quickly as possible’, ‘if the painter had wished to awake the public from their daily mental state, she has succeeded in it’, ‘the images are good but I can’t say I like them because the objects induce abhorrence’. One expressed a feeling of ‘effort and exhaustion’ and said that they would have ‘liked the subject matter to have been different e.g. of nature or children’. Yet another remarked ‘it takes your breath away’. Another respondent saw the exhibition as ‘unusual’ but ‘a harmonious combination of painting and sound’.

There were also questions relating to the social implications of the work and the responses show a general consensus that the exhibition helped to make the audience experience visually and aurally the contemporary world we live in. One visitor remarked ‘I meditated on our complicated civilisation; with the help of sound, the painter uncovers some of the problems of our man-made environment’. Another visitor remarked ‘the painter makes an impression on me; I feel the subject really troubles her’. Most people already knew about the issues associated with increasing sound levels in the environment but thought that the exhibition raised their level of awareness e.g. one person said ‘my opinion was consolidated – I already knew about the damaging influence of industrial development on living nature but the exhibition consolidated my opinion’. The comments suggest that the exhibition stirred the viewers’ feeling of what is happening in our present milieu and provoked contemplation and thought.
**Evaluation Dead or Alive, NPL 2009**

**Background**

People attending the Dead or Alive exhibition went into the installation reverberation chamber first. After spending some time in there they could go into the hemi-anechoic room, which was very close by. If they wished to they could return to the reverberation chamber. Both rooms had paintings and surround sound. Visitors could pick up a questionnaire as they left and thirty-seven completed questionnaires were received, mostly completed in some detail. As well as questions about the installations there were also questions on visitor profile. From the profile questions we were able to see that there was a reasonably flat distribution across the age groups with a slight bias towards the older visitors. The majority of people attended art and music events about three times a year but some attended much more than this. A few people attended less than once a year. A little under twenty percent of viewers worked in the arts field and the number was about the same for people working in science.

**Summary of evaluation results**

Question one asked if visitors had visited similar exhibitions before. The majority of people (76%) had not been to a similar exhibition before and one viewer noted that it was something they had wanted to do for a long time. About one in five of the visitors had seen installations and or contemporary art which included sound and visuals but not in not in spaces like these ones. Names of other artists working with sound that were mentioned were Laurie Anderson, John Cage, Steven Reich, Brian Eno, David Cunningham, Bill Viola, Bruce Nauman and Janet Cardiff. Exhibition centres mentioned where related works had bee seen were the Laing Gallery Newcastle, RCA Gallery, Brunel Art Centre, Tate Modern and Tate Britain.

In response to question two the majority of viewers said that they enjoyed seeing drawings and paintings of roads and industrial landscapes. One viewer particularly liked the architecture and industrial landscape images and another remarked that it was good to see images of everyday things. Amongst the comments were that ‘roads without cars mean something else; become themselves’ and that ‘the sounds add ambience’.

Question three related to the way in which the panoramic painting surrounded the viewer. Nearly all the viewers responded positively to this, remarking that the experience was richer when the viewer was part of the painting. One remarked ‘why don’t we have more totally immersive artwork i.e. floor and ceiling too?’ It was also felt that the surround effect ‘changes your emotions to a lively feeling’. Another viewer commented that it reminded them of other panoramic art work and Rothko was also referred to.

The responses to question four indicate that more than half of the viewers liked their experience of being in the panorama installation in the large reverberation chamber although almost as many (41%) were unsure. Some felt the experience rather overwhelming and felt imprisoned. ‘As an experience of a cold bleak industrial landscape it was depressingly lonely’. Two viewers said it made them feel as though they were in central London ‘very busy with lots of people around and pollution’, ‘noise and confusion’. There were differing views on the colouring and effects used in the panorama. One felt that more colour would have added impact whereas another said ‘I personally found the grey scale approach very pleasing’ and thought ‘the far-field effects were very well done’.

Question five relates to the individual paintings in the hemi-anechoic chamber. About two thirds of the viewers liked this installation with the remaining third nearly all being unsure. It
was felt that they helped to create an ‘illusion of silence’ and that ‘it changes your feelings a bit more than you would expect’. The main reservation was that some people had expected the paintings to be larger although as one said ‘I was expecting them to be bigger before I went in but felt the size was appropriate for the different sound’. One person felt that the impressiveness of the room itself overshadowed the paintings.

Question six asked more specifically about the individual paintings. The responses pointed to a general feeling of space which contrasted with the intimacy of the room ‘relaxed, peaceful and slightly lonely, as if in the countryside with no one around for miles’. One viewer remarked ‘initially a feeling of cosy comfort, warm and nurturing, this changed after a while to feel rather oppressive’. Other descriptive phrases used were ‘as a path ahead, journeys, sound travelling, pure, simple, open’. It was felt that the paintings worked better as a group than individually.

Question seven was an opportunity for people to add any more general comments on the paintings. It was felt that the colours were appropriate for each of the accompanying sound tracks and there were favourable comments on the texture/markmaking and ‘innovative’ aspects of the work. One person remarked that some paintings looked unfinished and another would have liked ranging sizes.

Responding to question eight, only eight percent of people said that they would have preferred looking at the paintings without the sound. The prevailing view was that the sound and visual worked together to create an atmosphere and make you think more about the paintings. One viewer said that they liked the sound in the reverberation room but not in the hemi-anechoic but another gave a completely conflicting opinion, liking the sound in the semi-anechoic chamber but not in the reverberation room. One viewer remarked ‘can we have sounds and something to taste as well’.

From the responses to question nine it is clear that nearly all people felt that the sound affected the overall impression of the paintings, ‘adding an extra dimension which brings the artwork to life’ and ‘makes you feel in the painting’. Analogy was drawn with the film sound track which can change the impression given by the visual sound track. One viewer thought it would be interesting to swap tracks between the two rooms and observe the effect produced. On the negative side, one viewer found it difficult to concentrate on the picture in the reverberation room.

Question ten was an opportunity for people to express in more general terms how the sounds make them feel. About one third of the respondents reported a happy experience. The reverberation room was portrayed as being ‘confusing and sinister’, making people feel stressed and anxious and uncomfortable. One person said ‘this is London, get me out’. This contrasted with the hemi-anechoic room which gave a feeling of peace and calm. ‘I felt like I was in a vacuum of silence, peaceful and calm’ said one person. Moving from one room to the other left some people disorrientated; they found the hemi-anechoic room disconcerting, especially in the quiet pauses of sound. Overall there were many positive comments such as ‘I loved both rooms’ and ‘helped imagine I was in the picture’.

Question eleven asked if people had ever seen pictures with added sound before. Forty percent of people said they had, quoting the Brunel Art Centre, Tate Modern, Baroque exhibition National Gallery (with music) and the Tate Modern. The name of Bill Viola was mentioned. One respondent said ‘rarely but ought to be tried more’.

Question twelve solicited any other comments about the sound. Some of the responses here were just repeats of what had been said earlier in the questionnaire. New comments include
‘incredible difference between them making you realise the stress associated with sound’ and ‘it told a story’.

Question thirteen asked about the relationship between art, science and the environment. Respondents here were unanimously in favour of greater crossover between the disciplines with comments such as ‘this adds another dimension and reaches a wider audience’ and ‘makes you think about things you wouldn’t normally think about’. One quotes Richter as saying ‘artists are a priesthood for modern society, so can help us in all spheres’.

Asked in question fourteen if the exhibition makes you think differently about sound in the environment, nearly three quarters of people said they did and the importance of sound in galleries and performance spaces was particularly noted. It was generally felt that the exhibition ‘brought home the levels of noise pollution around us’ and ‘made you aware of how sound affects our everyday living environment’. ‘It makes you listen more’ and ‘it makes you realise what you hear and don’t hear’ said another.

Finally in question fifteen people were asked for any other comments. From these general comments the overall response was clearly positive. Comments included ‘Wow! Thanks for making my day. Me and my 4 kids couldn’t stop talking about your wonderful rooms’ and ‘have long understood the beauty and magic of the natural world through microscopes etc to link in sounds – other than music - is opening up a whole new scene’. One respondent said ‘I’d like to explore artwork which itself modified acoustics passively’.
Evaluation Experiment 2, The University of Edinburgh 2009

Background

A total of twenty-six people were invited to view the experimental panorama installation in the reverberation room in the James Clerk Maxwell Building, The University of Edinburgh and after the visit each was asked to complete a questionnaire. Most of the questions were answered by all of the visitors. All the invited people were adults, over the age of 20. Their backgrounds ranged from professional artists to architects, academics, technicians, administrators and science students. The people invited came in small groups and entered the installation either individually or in groups of two or three. They 1) first looked at the panorama without any sound, then 2) with the soundscape in stereo played through two speakers and finally 3) with the soundscape played in binaural through headphones. In the latter case the sound files were recorded onto small hand-held mp3 players.

Summary of evaluation results

The first question relates to the viewers’ reaction to the visual panorama. A number of people remarked favourably on the rather grey monotone nature of the colours used and the general sombre feeling of a city on a rainy autumn day; a sense of drabness. Knowing that the panorama originated from Glasgow quite a few people found themselves searching for familiar shapes and clues of recognisable landmarks.

The second question developed this further by asking more specifically how people felt about the painting surrounding them, rather than being in the form of framed images. The general feeling was that by making the painting into a single piece the immersion into the city and its atmosphere was unbroken, leading to a sense of continuity and a feeling of ‘being there’. The viewer becomes more easily drawn into the scene when it surrounds you. One viewer remarked that they felt themselves within the environment, rather that outside looking in which can be the case with individual images. One viewer said they felt that the panorama was less formal because it was not in ‘gallery’ style. On the negative side, one viewer felt that the buildings were pressing towards them, whereas individual images are easier to view close up. There was also a feeling that with the panorama other people in the room disturbed the view.

The third question relates to the reaction of the viewer to the sounds playing. The fact that there were no people or vehicles in the panorama became more obvious to people when the sounds were played. Viewers generally felt that the addition of the sound dimension activated the panorama, or brought it to life. They found themselves looking more closely at the painting to try to relate visual and sound images, sometimes looking or listening for things that obviously were not there. One viewer remarked ‘I started to notice silhouettes of people and imagined vehicles on the road’. It was felt that the lack of parallel connection between the sound and visual gave the viewer flexibility in their thoughts or to make their own narrative. Some viewers felt the experience to be unnerving and made comments such as ‘you expect to see movement when you hear cars and voices’.

The fourth question related to the difference between the sounds being played through stereo loudspeakers and binaural headsets. Opinion was more or less evenly divided as to whether the loudspeakers or headphones gave the most substantial experience. All viewers felt that with the binaural headphones the individual sounds were clearer and more distinctive which resulted in a more immersive experience, as though you were really in the space with things happening around you. For at least two viewers the binaural sounds were so realistic that they found themselves turning round expecting to see cars behind them. On the other hand,
some viewers felt that the loudspeakers felt more part of the painting and allowed the room itself to add effect to the experience. With the loudspeakers viewers tended to look at the city as a whole rather than individual parts of the image. They also commented that there was something to be said for the shared experience of the loudspeakers when several people were in the room at the same time. Speakers were also more suited to people taking a brief walk through the space or exiting and re-entering.

Question five followed up the previous question by asking more specifically how the sound and visual images affect one another. Out of twenty four responses only three viewers felt that the two did not affect one another and they were not closely connected. The general opinion though was that the two mediums reinforce each other, giving a sense of a living, breathing environment and making the image seem more ‘real’ or alive. This added to the wider experience and overall enjoyment of the installation. One viewer said about the sound that ‘without it my impression of the visual image was quite different’.

Question six asked about the different interpretations of the sound and visual images. There were many comments about the degree to which the visual images and sounds were related but all viewers felt that some degree of connection was important. One viewer remarked ‘just needs some petrol fumes etc. to excite the other senses’. The feeling was that the mismatch between the sound and visual makes for a more challenging experience for the spectator and makes ‘the art work an experience one has to work for’. One viewer remarked ‘I enjoyed the fact that the sound made such an impact on my perception of the picture. Without the sound the picture showed an abandoned city. With the sound it became a very busy place’. Another viewer felt that the painting creates a more direct image right in front of you whereas sound, on the other hand, can stimulate the human mind and create its own image.

There were eleven responses to question seven which solicited more general comments about the relationship between sound and vision in an artistic context. Some of these responses were quite detailed. It was noted that combining sound and vision closely resembles the way we experience the world around us, so is the most natural way for us to experience art. It was also suggested that an exhibit like this focuses consideration on the environment in which the art exists. One viewer felt that perhaps the sense of sound is stronger and raised the question, ‘if I listen to country sounds with a city panorama, or urban street noises in a rural panorama, what would I be seeing? Country or Town? In the context of the panorama in question one viewer felt that ‘the limited palate of the greys helped to focus attention on the sounds – the missing elements of the colour, shade, contrast were provided by the sound’. In a similar way one person said ‘I enjoyed the way in which the painting was left to the imagination e.g. vehicles, people’s features and moving components in general. The sound provided the rest of the painting effectively providing the listener with the palette with which to colour and liven the canvas of the city’. A single viewer felt that music would have left a greater impression but this view was not shared by the person who said ‘to have music [as opposed to sound] playing in the background defeats the purpose’.

Finally question eight was an opportunity for people to add general comments. The most common general observation is summed up by the viewer who said ‘this was a totally new experience for me – it is interesting how the different sounds and voices began to make you look more closely at the panorama and relate to the visuals.’ Just one viewer, on the other hand, said ‘I have clearly totally missed the point’. An interesting more general comment about sound and vision was, ‘it’s easier to visualise with the sound alone as opposed to recalling sound with the visual aid alone’ suggesting that it is easier to imagine visually than to imagine sounds. Two viewers remarked that a bigger space would have made the panorama more effective and one thought that a more sophisticated sound system including
treble tweeters and bass bins would have made it easier to get engrossed in the sound field. Finally, one viewer suggested that it would have been interesting if the panorama and related sound field evolved from day to night.
Evaluation Sound walk, Non-bio Boom, Inspace 2011

Background

The Soundwalk was associated with the showing of the installations Anechoic and Panechoic and as part of the thematic on Anthropogenic sound Non-Bio Boom at Inspace, Edinburgh. It was part of an event with a series of talks centred round the theme of soundscapes and was carried out in collaboration with Bill Davies, Salford University.

People who attended the event were invited to actively participate by joining a half hour sound walk around the surrounding area in order to attune their ears to the sounds around them. Participants on the excursion were asked to listen attentively to the soundscape in a critical and discriminative way and to make judgements about how appropriate the soundscape was for the purpose of the space and the balance of the different sound components to the overall sonic environment. They were encouraged to listen attentively to all the sounds they heard, including ones they themselves were making, e.g. their footsteps and voices, and even the tiniest ones from external sources.

Results of evaluations

Observations of the sound walkers were noted down on evaluation sheets which were handed out before the walk. Fifty six returns were received.

The first question was ‘what sounds can you hear’. The responses are listed below. Stars after the sound indicate multiple listings; m indicates a human made sound such as machinery, vehicles, electronics; h indicates the sound made directly by a human; n indicates a natural sound such as wildlife. Traffic sound was the most frequently listed, followed by talking and then footsteps. Very few people listed natural sounds; two listed birds and two listed wind.

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<tr>
<td>cars***</td>
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<tr>
<td>car tyres</td>
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<td>m</td>
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<tr>
<td>car horn **</td>
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<td>m</td>
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<tr>
<td>cash machine</td>
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<tr>
<td>crimpling of plastic</td>
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<td>m</td>
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<tr>
<td>cyclist / bike wheels **</td>
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<td>m</td>
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<tr>
<td>door shutting **</td>
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<td>m</td>
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<tr>
<td>echoes *</td>
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<td>m</td>
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<tr>
<td>exit door screen raised and lowered *</td>
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<td>m</td>
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<tr>
<td>grinder</td>
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<td>heartbeat</td>
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<td>h</td>
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<tr>
<td>industrial sounds</td>
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<tr>
<td>jogging *</td>
<td></td>
<td>h</td>
</tr>
<tr>
<td>laughter ***</td>
<td></td>
<td>h</td>
</tr>
<tr>
<td>opening gate</td>
<td></td>
<td>m</td>
</tr>
<tr>
<td>paper rustling *</td>
<td></td>
<td>m</td>
</tr>
<tr>
<td>pedestrian crossing beeps **</td>
<td></td>
<td>m</td>
</tr>
</tbody>
</table>
pram * m
radio m
scraping on ground/tables being moved *** m
talking/voices ******************************** h
till m
traffic/general ******************************** m
trolley wheels m
walking pedestrians/footsteps ********************* h
wheelchair * m
whistling * h
wind* h

34 sound were listed in total
24 were made human made (machines, vehicles, electronics)
8 were sounds of humans
2 were sounds from nature

Asked how they felt the soundscape fitted with the main use of the space, most people felt that the fit was good.

Soundwalkers were asked to mark four separate score charts relating to how they felt about the soundscape.

Chart 1
Score 0 Soundscape is a poor fit to main use
Score 10 Soundscape is a very good fit to main use
The average score here was 8.0

Chart 2
Score 0 Extremely unpleasant
Score 10 Extremely pleasant
The average score here was 6.6

Chart 3
Score 0 Agitated, stressed, disturbed, not relaxed
Score 10 Calm, peaceful, tranquil, relaxed, smoothed, unhurried
The average score here was 6.8

Chart 4
Score 0 Gloomy, bored, dreary, dull, flat, lifeless, tired, no sense of life, artificial
Score 10 Fun, exciting, thrilled, interesting, energetic, varied, alert, attentive, sense of life, real
The average score here was 6.1

Finally soundwalkers were asked to say which of the following they felt were important characteristics of the soundscape. The numbers following each characteristic indicate the number of responses.

Able to listen 31
Activities taking place 33
Overall outcomes

The list of different sounds shows that Traffic was the most frequently listed, followed by talking and then footsteps. Out of the thirty four sounds listed only two, i.e. birds and wind, were from the natural environment around us. Both were noted by two people. Eight of the sounds e.g. walking and laughter, were of human origin and all the remaining sounds were from the human made environment. Generally speaking people felt that the soundscape was in keeping with the purpose of the space.

On the characteristics of soundscapes that people felt important, both activities and natural sounds came out high, although they did not feature large in the actual sounds heard on the walk. Source proximity and sounds changing over time also came out strongly.
Appendix 5  Example timelines for soundscapes

a  Milieu, Falkirk Wheel soundscape timeline in Protools
b  Zvuk, Minsk soundscape timeline in Cubase
c Panechoic, Briggait, Glasgow soundscape timeline in Cubase
Appendix 6 DVD of Sounds

Please see DVD inserted info the back cover of thesis.

a Examples of Recorded Sounds

1. Binaural recording in Old Delhi
2. Grandfather clock
3. Harley Davidson motorcycle
4. Ship’s horn in Hirtshals harbour
5. Underground train entering and leaving station
6. Underwater bubbles recorded with hydrophone
7. Wind turbine

b Examples of Soundscapes for Installations

1. Kyst, Nordsø Museet, Hirtshals, Denmark 2007 16m10s
2. Louder Now, Waterfront, Belfast, UK 2007 15m0s
3. Sound and Light experiment 2008 12m0s
4. Sonitus, Ventakappa Gallery, Bangalore, India 2008 9m30s
5. Zvuk, Palace of the Republic, Minsk, Belarus 2008 10m0s
6. Dead or Alive (anechoic), NPL, London, UK 2009 10m20s
7. Dead or Alive (reverberation), NPL, London, UK 2009 10m40s
8. Panorama, British High Commission, New Delhi, India 2010 5m0s
9. Autorama, Inspace, Edinburgh, UK 2011 11m20s
10. Panechoic, The Briggait, Glasgow, UK 2011 7m20s

All soundscapes are presented in stereo. The original soundscapes were all in 5.1 except for
Appendix 7  Prints of Paintings

Please see separate book with prints of paintings.