Transcribing Reality: how the nature of audio and visual media have affected culture, perception, and the role of the artist.

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Submitted for the degree of Doctor of Philosophy

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Date submitted: 24/05/2017

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ACKNWLEDGEMENTS

Firstly, I would like to thank my supervisors Miguel Mera and Newton Armstrong for their support and advice while writing this PhD. I would also like to acknowledge the financial support I received from City, University of London in the form of a three-year studentship and fee-waiver.

Peter Ablinger, Jean-François Charles, Lief Inge, Johannes Kreidler, Cliff Lauson, Malcolm Le Grice, Axel Roebel, Bill Schottstaedt and John Smith were all kind enough to correspond with me by email, or meet me in person in order to answer some of the technical and artistic questions I had while researching various aspects of this thesis.

Finally, I would like to thank Laurence Crane and Karin Weissenbrunner for providing the voices for my father and his mysterious friend in *The Grand Tour*, John Croft and Fabrice Monet for building the Max freezing-patch according to my specifications, Rick Campion for helping me install *Northampton Square* and teaching me about parallel compression, and Francesco Dillon for recording *Trains* so beautifully.

I would like to dedicate this thesis to my mother, Maria de los Angeles Bailie. She witnessed me begin work on my doctorate with great interest, but sadly passed away before it was completed.

DECLARATION

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ABSTRACT

The research presented in this thesis was motivated by my own need as a composer to position my work within the broadening of artistic practice that has become a significant aspect of the contemporary music scene. Roughly speaking, this research consists of two interconnected topics: the nature of the complex relationship between reality and the means we have to record it, and a rethinking of the audio-visual correlations that might arise as a result of such an investigation into the workings of media. Through the study of these two topics, further important issues will be brought to light such as the distinction between discrete and continuous recording methods, ideas of medial loss, intermedia, and the role that we ourselves play in the development and consumption of media, and as makers and spectators of artworks that use media.

I will investigate these questions through my own artistic work. This work, as befits the research topic, employs a variety of formats including some, such as film and audio-visual installation which I have never used before. As a counterpoint to my portfolio I have chosen to examine a carefully selected set of pieces by other artists, also in a variety of media, that taken as a whole help to outline the artistic and theoretical territory to be studied. The investigations of my own work as well as of these case studies are knitted together with theory drawn from a wide-range of sources including psychology, science, art, media and music theory, in addition to ideas gleaned from fiction, in order to form the basis of the written part of my thesis.

The text is divided into an introductory chapter, three main chapters and a concluding chapter, and has a quasi-historical trajectory starting with the long-exposure that characterized early photography, moving through the single short sample, to the stringing of these samples together into film and digital audio. The fourth chapter concerns sound film, synchronisation and the FT domain, and explores what happens when we put sound and image together, or try to imagine one through the lens of the other. The concluding chapter deals with recent developments in media technology

such as high film frame rates and the domination of the digital world, and examines the problematics associated with these developments.

Chapter 1

INTRODUCTION, THE INDEX AND THE OVERLY-WIDE SAMPLE

1.1 General introduction

Within the European art music scene over the past few years, there has been a growing focus on a perceived broadening of practice amongst composers, and a general veering away from the creation of exclusively instrumental or electronic musical works. The Darmstadt summer courses, often considered a barometer of the state of new music,[1] have in recent editions included workshops by Marko Ciciliani and Jennifer Walshe devoted to the exploration of expanded compositional practice and in fact both composers have spoken about their approaches to the subject. In his lecture "Music in the expanded field"[2] Ciciliani, inspired by a text by the art critic Rosalind Krauss on the changing nature of contemporary sculpture, provides an overview of new practices in music, and the practical, aesthetic and technological issues that accompany them. Walshe's text on what she describes as "The new discipline"[3] on the other hand, focuses on notions of performativity and the role of the body in the contemporary music concert, as well as stressing the importance of gathering new compositional tools and strategies from other art forms. Since the mid-1990s when I first began writing instrumental music, my own practice has broadened considerably to encompass performance projects, the use of field recordings, audio-visual installation and film. In many ways this PhD thesis and portfolio might be considered as an opportunity to place myself as an artist within this evolving and broadening new music context, to clarify and consolidate elements latent in my work previous to 2012, and to investigate an array of aesthetic and theoretical concerns that I feel are specific to my own practice, and as such constitute an original and relevant field of research. Broadly speaking this research consists of

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[1] Admittedly, Darmstadt is only a barometer of a certain part of the new music world, which as far as I can tell comprises many different overlapping scenes.

[2] Marko Ciciliani's lecture "Music in the expanse field" was given as part of the Darmstadt summer courses on August 10th, 2016. The author kindly provided me with a copy of the text.

[3] The text was originally written for the Borealis festival 2016 and can be found here: http://www.borealisfestival.no/2016/the-new-discipline-4/

two interlocking themes: the nature of the complex relationship between reality and the media we use to capture it, and the potential rethinking of audio-visual connections that might be brought about by this investigation into the workings of media. My definition of 'media' for the purposes of this thesis, is a means of communicating or storing information, with electronic recording media being of primary concern. With the results of this research I would like to be able to answer the following main questions: How can an artwork both be aware and show awareness of the ways that media function? In what manner can thinking about and comparing audio and visual media result in a fresh perspective on intermedial work and how might this manifest itself artistically?

1.2 The main issues: discrete versus continuous, loss, intermedia and the human factor

The starting point of this research is the assertion made by theorist Friedrich Kittler that media can be divided into two distinct categories: the discrete and the continuous. To a certain extent we might consider continuous media to more closely resemble reality than discrete media, after all the world we live in is constituted by indivisible continuums of time, frequency, speed and intensity. However, the list of genuinely continuous media is limited to analogue audio recordings, the 'live streaming' of a camera obscura, and in certain respects, the long-exposure photograph. Discrete media are plentiful and becoming more so in the digital age. Media that can be described as discrete include analogue film and photography, and all digital audio and image. I wish to investigate how Kittler's categories might be useful to an artist working in the highly digitized contemporary world, and whether the differences evoked by discrete and continuous may in turn lead us to think in terms of related dualities such as the finite and the infinite, the universal and the particular. The digital itself will be the focus of further scrutiny with regards to the nature of the uneasy trade-off between ease of access to technologies and the standardization of outputs that it brings about.

It is important to bear in mind that a fundamental translation or adaptation must take place in order to capture continuous reality in discrete media. In most cases this translation involves a sampling of the subject being recorded. Information is inevitably 'lost' in such discrete translations, or at least discarded with the remaining data subsequently reconstituted into a whole by computer algorithm. It has generally been the aim when developing discrete media technologies to minimize the noticeability of losses, abridgements and artificial reconstitutions. Indeed, much of this loss in temporal and spatial resolution is beyond our perceptual limits. However, as we shall see, we have also become somewhat inured to the differences between reality and how it is represented in media. Given the indexical nature of these media,[4] it is not surprising that we might wrongly assume they possess an essential one-on-one, authentic relationship to the thing that they have recorded. Of course 'loss' is a word with a highly negative connotation and an additional question that I wish to answer during the course of this research is whether the type of loss we are talking about can ever be a good thing. Can the discrete view of the world offered by the single sample reveal anything to us, and can the loss of information incurred by sampled formats be regarded as a helpful reduction of a bewildering continuous reality?

I have decided to work with an expanded definition of 'intermedia' that goes beyond the original use of the word as found in Dick Higgins's 1965 article.[5] For the purposes of this thesis, intermedial art might refer not only to these in-between media forms favoured by Higgins, but to formats that are a composite or synthesis of two or more media (sound film for example), or that could in some way incorporate another media into themselves by way of reference, adaptation or simply by having been conceived by thinking through the lens of another medium. The main type of intermediality I will consider here is audio-visual in nature, and involves various

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[4] All the image and sound recording media we will talk about are essentially indexical because they involve light acting on a surface in a black box or audio waves on a microphone. We might consider this indexicality to be broken if this effect is subsequently turned into digital information, but at the moment of capturing there is always an element of the indexical. This subject is covered further in sections 1.4 and 3.5.

[5] See Dick Higgins, "Intermedia," *Leonardo* 34 (2001): 49-54.

types of interaction between recorded audio, photography and film. I like the idea that the primary adaptation between reality and digital media could be echoed and extended in artistic works that are concerned with further (often 'pointless') adaptations from audio to visual and vice-versa. Such artistic adaptations may well involve a loss of quality or fidelity, but they might also underline the nature of media transformations and uncover some interesting intermedial gaps for art to inhabit. Above all, an intermedially-minded, audio-visual approach to this research might be considered appropriate simply because we navigate the world predominantly through sight and sound. I hope to discover that looking at sound and image in tandem, as a whole 'gestalt' other than the sum of its parts,[6] or even by imagining one through aspects of the other, will lead to a deeper understanding of media forms and provide unusual new strategies for the artist dealing with intermedia (and intermedially-conceived monomedia). In fact, I wonder if we can even really talk about 'monomedia' in the context of my vastly expanded definition of intermedia, but for the purposes of this thesis I will define it as any conventional single-media artistic format such as silent film, painting and orchestral music.

The last issue that I wish to outline in this introduction is the role we ourselves play in the development and consumption of media, and as makers and spectators of artworks that use media. My research will centre around the question of how important our perceptual limitations are with regards to audio and visual media: What does it mean if media present us with either too little or too much information, and to what extent are we willing to overlook the deficiencies of media and even become inured to them? In addition, I would like to investigate the role that art can play by intervening in the relationship between people and media. Is there still artistic potential in making work that reminds the spectator of the way media function, or can we go beyond this and encourage active spectatorship that is either physiological in nature or that makes use of our mental capacity for connection-making? Finally, is there a more unexpected relationship to be uncovered between

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[6] This is a reference to Gestalt psychologist Kurt Koffka's adaptation of Aristotle's well-known phrase "the whole is greater than the sum of its parts".

media and ourselves? In what ways might media forms reflect aspects of the human condition and how can an artist harness these resemblances?

1.3 Methodology — connection-making is key

The set of works by other artists that I have chosen to include in this thesis text is vital to the setting up of the territory to be studied in theoretical terms as well as helping to define the operating space which I inhabit as a composer. I have worked as a curator on many occasions and in some ways I regard the choosing of works to be studied here as a curation of sorts to be deepened beyond the context of an exhibition or concert by the creation of an extensive theoretical context and my own artistic responses. I came across most of the works included in this thesis by chance as a visitor to exhibitions and festivals, and only a few (Sugimoto and Fischinger come to mind) through reading theory. My intention was to create cross-fertilisation between theory, the task of working as an artist, and the act of experiencing other art myself as a spectator — a toing and froing between these three things that would produce a network of connections operating on different levels. It is difficult to talk of a consistent method in all of this because different aspects of the thesis arose in very different ways. For instance, *The Grand Tour* was made over a period of two years while writing Chapters 2 and 3 in parallel, an intertwining of theory and artistic practice that is also mirrored in the knitting together of the sound and image in the film. On the other hand, the very genesis of the thesis lies in a different type of relationship between artistic practice and theory. During previous experiences of working with a camera obscura, I had been struck by the quality of its image: how it looked almost ‘too real’ and entirely unlike the quality of film and TV visuals. I attributed this quality to its framelessness and mentioned this observation in one of my first PhD tutorials. It was in fact my supervisors who alerted me to the existence of the discrete and continuous, and Kittler’s *Gramophone, Film, Typewriter*, where I was to find my artistic hunch already fleshed out into theory by somebody else.

Descriptions of the working processes for my portfolio pieces, and the practical issues that arose while I was making them can be found in the indices. Discussions

regarding the composition of each work and its relation to the theoretical concerns of this thesis appear in the corresponding part of the main text. *Artificial Environments Nos.9a-d*, *The Grand Tour* and *To be beside the seaside* are examined at length in Chapters 2, 3 and 4 respectively. Explanations of *Trains* and *The place you can see and hear* are mainly confined to the indices to avoid duplicating the description of certain compositional processes.

Even though connection-making between writing, personal compositional practice, and pieces by other artists has been key to the genesis of this thesis, it is difficult for me to talk about the creation of my pieces solely as an intertwining of theory and practice. It is also important to mention that other factors came into play while making the works, such as the context for their creation and public presentation (the orchestra and ensemble commissions), and not least creative instinct with regards to durations, choice of materials and whether or not things sounded or looked 'good'. Although the matter of fine-tuning compositional systems, and rejecting or tinkering with the results of these systems lies for the most part beyond the theoretical concerns I have engaged with during this PhD, I will summarize some of the main considerations here. Firstly, it is important to mention that in every piece presented in my portfolio, I was able to listen to and work with an electronic model of the sound before the piece was finalized. In contrast to most of my purely instrumental works from the 1990s and early 2000s that were often written without any kind of audio aid, my recent work has been influenced by the fact that I am directly confronted with how it sounds while composing it. Much of this has to do with the increasingly large role that tape parts, transcription and computer processing plays in my music, but also with a growing realisation that I am interested in finding a sonic identity for my work that is different from some of the more dominant harmonic and timbral tendencies in new music today. The finding of this new sonic identity is linked both to the expansion of musical practice I mentioned at the beginning of this chapter, as well as to the demands of the subject matter and materials of the work itself. I believe that composing with field recordings and other 'found' recorded material requires me to listen, process and edit very carefully in order to find the most interesting potential

music lying latent in that recorded material. The resulting music may contain tonal elements, familiar material, microtonal harmony, simply orchestrated pitches and strange juxtapositions, without any intended irony or the desire to compose stylistic exercises. If this work differs quite radically at times from any of the dominant languages of new music, then so be it. I consider the broadening of new music practice in all directions not only to be desirable, but essential to its continued survival as an art form in the coming decades.

The other important point regarding the way I compose my works relates to the processes and concepts that lie behind them. Although the conceptual element of my work is important and is intended to be clearly perceivable, I allow myself to adjust material until it sounds musically pleasing to me. I do not believe this to be a kind of 'soft' conceptualism, rather I consider the moulding of the material into convincing musical shapes an important part of the act of conveying an idea. Related to this, I also choose not to use some of the compositional aids that might be at my disposal (for instance IRCAM's program for computer-assisted orchestration Orchids), instead preferring to 'get my hands dirty' with the material, however time-consuming this might ultimately be. There is something in the process of making things in this way, whether it is calculating a satisfying accelerando for a freezing patch using a calculator and trial and error, or trying to orchestrate a complex chord with only a sonogram and my ears, that enables me to stay close to the material, and to squeeze out its potential music a little bit more easily. It is difficult to define exactly what I desire my music to be like, but perhaps it is best described as being located somewhere between the need to get across an idea, the wish to expand the sound of new music by paying close attention to the potential of the material, and my own personal compositional instincts. This last element, I imagine has been formed through forty years of listening and reacting to music, as well as writing it and learning about it in a wide variety of contexts.

This thesis is divided into an introduction, three chapters and a conclusion, and traces a quasi-chronological path through the history of media from the nineteenth century

onwards. The introductory chapter and the three following chapters, each focus on a particular aspect of visual and sonic media, by looking at (mainly contemporary) artworks that make use of this element, and using theory drawn from psychology, art, media and music theory as well as philosophy, to examine the issues that are raised. Many of the comparisons between aspects of visual and sonic media, or different artworks, might seem strange or unwieldy and indeed they are designed to produce friction or foreground intermedial spaces. I hope that the exploration of these difficult areas might yield challenging, invigorating art and ideas in unexpected formats, and in any case I regard the bringing together of what and how we see and hear as a key task of this thesis. As I mentioned earlier, Kittler, and in particular his book *Gramophone, Film, Typewriter,* is an important point of reference for this research. Other central texts include Jonathan Crary's *Techniques of the Observer* and Jonathan Sterne's *The Audible Past* both of which, in contrast to Kittler, place emphasis on the importance of the physiology of the viewer or listener in relation to media. These texts have been important to my research concerning the human aspect of media and art, as have Svetlana Boym's *The Future of Nostalgia* and Alison Winter's work on memory. The idea of an art that underlines the way media function is supported by the more political approach of Apparatus theory as explored in the writings of Jean-Louis Baudry and Laura Mulvey. Three texts on sound and music that through their breadth and boldness of approach have been an inspiration to my research are Aden Evens's *Sound Ideas*, Douglas Kahn's *Noise Water Meat*, and Allen S. Weiss's *Varieties of Audio Mimesis.* Intermediality is a relatively new area of theory, but Jens Schröter's four intermedial types have been quite useful to my research, as has the notion, originally put forward by Fluxus artist Dick Higgins and media theorist Marshall McLuhan, that the key to reawakening the senses of the observer is a continual renewal and recombining of media forms. Other sources have been very useful for exploring intermediality regardless of whether the term itself is in evidence. These include texts on sound and film by Michel Chion and Kevin Donnely, Cytowic and Eagleman's book on synesthesia. Kittler's *Gramophone, Film, Typewriter* is arguably also a text on intermediality since he is concerned with both audio and visual media. Given the expanded definition of intermediality that I

am using for the purposes of this research (see section 1.2) it seems fitting that I try to assemble my own network of texts around the subject as I understand it.

I am also unapologetic concerning my inclusion of many references from fiction. Even though they may not constitute 'theory', I have found ideas in novels and short stories by Borges, Vonnegut, Wells and others to be of great relevance to this thesis. Fictional contexts have allowed the writers in question to imagine situations that go far beyond our perceptual, cognitive or technological experiences and as such their writings provide an extreme conceptual touch-stone against which to compare many of the issues that arise during the course of this thesis.

Finally, some words on what is not included in this thesis. My research has been by necessity quite far-ranging and I hope that it serves as an appropriate accompaniment to the artistic portfolio which includes a film, audio-visual installation and instrumental works with and without fixed media parts. However, being broad also means not being able to cover everything that might potentially fall within the boundaries of the range of issues dealt with. I do not, for instance, talk in any great depth about the long history of audio-visual relationships, preferring instead to focus on a few specific aspects of these relationships. Holly Rogers covers the subject in detail in her book *Sounding the Gallery,* as well as dealing with important audio-visual artists such as Nam June Paik and Jordan Belson whose work is not included here. There is also only a limited discussion of techniques used for creating electronic music, mostly centring around the manipulations in the frequency domain that I carry out using Audiosculpt or my Max freezing patch. For instance, I will not cover the kind of time-domain based processing exemplified by techniques such as granular synthesis (though this is briefly mentioned in conjunction with Lief Inge's *9 Beet Stretch* in the following chapter), nor have I engaged with them compositionally. An excellent account of granular synthesis and related concepts can be found in Curtis Roads's 2001 book *Microsound*.

In fact the field of sound and in particular of music may seem under-represented in this thesis in terms of the amount of theory and number of artworks presented (though the work of Austrian composer Peter Ablinger features quite heavily). This is in part due to a personal bias born out of the attraction an investigation into the fresh fields of photography and film offered me as an composer wishing to broaden my own practice beyond the purely musical realm. In any case, just as this thesis does not contain a history of audio-visual relationships, nor does it intend to present in full an account of musical movements and tendencies that are related to the area of music in which I am operating. However, I would like to take the occasion to briefly address a few of these related areas of musical investigation before we move on to the main part of the text. The "transcribing reality" in the title of my thesis is a metaphor for the act of recording things both sonically and visually, and does not refer to the process of transcribing sound (recorded or otherwise) into musical notation. Nevertheless, this second type of transcription is central to my practice and I have been using it as a compositional tool since 2002 when I wrote the piece *Five Famous Adagios*. Between 1999 and 2000 I studied with Tristan Murail at Columbia University, and in 2001 I took a one month course in computer music at IRCAM. It was in these contexts that I learned to develop an understanding of spectra, how to analyse sounds in the FT domain, and gradually honed my skills of transcription. I cannot deny that my practice has been informed for many years now by the spectralist movement (of which Murail is a part), their compositional techniques, and the computer technology developed in order to facilitate their work. Transcribing elements of audio recordings using IRCAM's Audiosculpt is as important a basic compositional tool to me as spinning out a harmonic progression, or developing a formal structure. Although some of the pieces in the portfolio, especially the orchestral work *To be beside the seaside,* show the influence of the spectralist movement more strongly than others, in the end I do not believe I share their compositional concerns. My work is about the foregrounding of recording processes, sampling, nostalgia, memory and audio-visual correspondences rather than the exploration, manipulation and orchestration of pure spectra. I would also like to mention the related compositional practice of transcribing 'real life sound' into

musical notation with or without the aid of a sonogram analysis. Making musical pieces out of the noises of the world is a very long tradition that has been practiced by composers such as William Byrd, G.F. Handel, Charles Ives, and more recently by Olivier Messiaen, François-Bernard Mâche and Carola Bauckholt. There has been a great deal of this particular kind of transcription in my work of the last few years, and it is certainly evident in pieces such as *Artificial Environments Nos.9a-d* and *Trains*. I have decided not to include an account of the notation of real life sounds, despite its presence in my portfolio, because I do not feel that it is central to the concerns of this thesis. Finally, with regards to the idea of adjacent musical practices, I would like to talk about plunderphonics. In a pre-concert talk before the premiere of *To be beside the seaside* in Glasgow in May 2015, I was surprised when the conductor of my piece, Ilan Volkov, described it as being a work of plunderphonics. I had never heard the term before, and after investigating it a little more, and in particular the work of John Oswald, I can quite clearly see its imprint (even indirectly) on some of the pieces discussed in this thesis such as Johannes Kreidler's *Sound Compression Art*, Peter Ablinger's *Quadraturen V* and my own *To be beside the seaside*. Perhaps all of these works are plunderphonic works in the broadest sense of the word since they take audio recordings and then process them in order to make new pieces that still possess some of the identity of the original plundered recordings. I would note some differences between Oswald's work and the orchestra pieces by Ablinger and myself, however, especially with regard to the complexity of the processing used and the fact that what was once electronic has been adapted into an orchestral format. Oswald's work is also very much concerned with foregrounding the 'stealing' of the original material, and dealing with the economic and political ramifications of audio piracy — and although this issue relates to some extent to Kreidler's work, I do not believe it is of great relevance to either my own or Ablinger's use of pre-existing music.

For the remainder of this introductory chapter, and by way of a prologue to the thesis as a whole, I am going to look at two of the issues surrounding the very first photographs: indexicality and overly-wide samples. The fact that these issues are still

of interest to contemporary artists, speaks to the complexity of media history and notions of technological progress. The long-exposure photograph and the way that it problematizes and de-vectorizes time is of key interest here, and I end the chapter with my first attempt at intermedial comparison by trying to find the equivalent of this kind of image in musical works by Peter Ablinger and Johannes Kreidler.

Chapter 2, entitled *Freezing time to observe the transient/ slowing down time to discover the discrete,* will continue the investigation of the single sample but this time a sample that is short enough to be able to reveal information about the world that we are normally unable to apprehend. The snapshot photograph and audio-freeze are examined in parallel as are my own installation and ensemble piece, and a work by Olafur Eliasson. The second part of the chapter focuses on, again in parallel, an audio installation by Lief Inge and and a visual one by Douglas Gordon. The way in which slowing down media may also reveal things, and how this slowing down differs radically in the sonic and visual realms is central to the discussion. We will also begin our first investigations into the role of the spectator and how they can participate in a work of art both physiologically and by creating their own forms.

Chapter 3, *Sampling media: gaps, nostalgia and memory*, is concerned with what happens when we start stringing separate audio samples or film frames together, the relationship between this sampled simulation and reality, and the essential differences between dealing artistically with sampled sound and sampled image. As the title suggests, there are some surprising parallels to be made between sampled media and aspects of the human condition, namely remembering and related to this, nostalgia. I will be looking at *Trains*, my cello piece that deals with high audio sampling rates, as well as *The Grand Tour*, a film that in many ways incapsulates the concerns of the chapter as a whole. Works by John Smith, Yasanao Tone and Malcom Le Grice are also examined, as is the possibility that the revelation of the mechanisms of media amount to an act of uncovering ideology.

The fourth chapter is called *Sound and image together: film synchronization, music made visible and visualizing to make music,* and is about what happens when we put sound and image together, or try to imagine one through the lens of the other. Our perceptual and intellectual relationship to media is again examined, this time in relation to audio-visual synchronization, and the involuntary connection-making that characterises synesthesia is seen as a possible model for intermedial art. Oskar Fischinger's *Motion Painting No.1* is studied in relation to these two phenomena. The last part of the chapter is concerned with the quasi-visual spaces which we can use to imagine sound, in particular the grid and the frequency domain. We will look at Peter Ablinger's work on ideas of sonic resolution in his *Quadraturen* series, and my use of sonic pixels in the orchestra piece *To be beside the seaside*.

The concluding chapter deals with recent developments in media technology such as high film frame rates and the domination of the digital world, and examines the problematics associated with these developments. Bringing back themes from previous chapters, it will be questioned as to whether the ultimate recording machine is in fact a desirable future goal, or if there is more to be gained through accepting the imperfections of media.

1.4 The allure of the index

The quality that binds photography, film and audio recording is that of indexicality, meaning that the images or sounds captured are the result of a direct causal relationship between the object of this capturing and the media concerned. The media allow the object to leave an imprint, recording the patterns of reflected light bouncing off a particular scene onto a photosensitive material either once (photography), multiple times in rapid sequence (film), or by engraving the minute changes in air pressure that constitute sound onto wax or some other surface capable of preserving the indentations (phonography). The digital, as we will discover later, problematizes this quality by encoding the images or sound into a series of discrete values, and thereby 'breaking' the indexical link. The index, along with the icon and symbol constitute the three parts of the semiotic system designed by the nineteenth

century American philosopher and logician Charles Saunders Peirce. Peter Lunenfeld points out that Peirce's system was in many ways a product of the invention of photography, a medium that "ruptures the dichotomy between writing and painting — between the symbolic and iconic" and "vastly expands the realm and power of the indexical sign".[7] Certainly in cultural terms, before the advent of photography (and of Pierce himself), the fingerprints, footprints, brass rubbings and Chladni plates of the indexical, barely constituted a category in their own right.

According to Kittler, the allure of the index, as manifested by sound and image recordings, rests in an authentic relationship with its object, which is characterized by "physical precision".[8] However, this precision is of a very particular kind — far from reproducing something in the abstract, the index is in fact a record of a certain thing that happened or existed at a defined moment in time. Mary Ann Doane believes that the agency of index-creating technologies lies in their recreation of the particular rather than the universal. She states:

> Indices are characterized by a certain singularity and uniqueness; they always refer to individuals, single units, single collections of units, or single continua. They are dependent upon certain unique contingencies: the wind blowing at the moment in a certain direction, a foot having landed in the mud at precisely this place, the camera's shutter opening at a given time.[9]

Perhaps then, beyond the physical fact of how it was created, we trust in the index because it appears to represent or give body to the stream of one-off instances that constitute our own experience of the world. That is not to say that there is an element of subjectivity at play, on the contrary, a photograph or audio recording is inherently 'objective', often going beyond what we can perceive, sometimes giving us more

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[7] Peter Lunenfeld, *Snap to grid: a user's guide to digital arts, media and cultures* (Cambridge: The MIT Press, 2000), 60.

[8] Friedrich A. Kittler, *Gramophone, Film, Typewriter*, trans. GeoffreyWinthrop-Young and Michael Wutz (Palo Alto: Stanford University Press, 1999), 12.

[9] Mary Ann Doane, *The Emergence of Cinematic Time: Modernity, Contingency, The Archive* (Cambridge: Harvard University Press, 2002), 92.

information than we need, and capturing instances that occur too quickly to be comprehended or frequencies above the range of human hearing. On the other hand, though they record exactly what they 'see' and 'hear', indexical technologies are also subject to human bias in terms of how they have been designed,[10] in the choice of moments that have been captured, and of course in the various kinds of manipulation that might be applied in the dark room or sound studio. There is a problematic area here, sometimes referred to as the 'reality effect',[11] and created by the conflation of indexical representation with reality itself, that results from the strong resemblances these two things bear to each other. Similarity is not equivalent to sameness, however, and such a potential for confusion might of course form the basis of the kind of 'ideological effects' that we will talk about in connection with Jean-Louis Baudry later on in this thesis. It is worth remembering that the index tells us nothing, even though it may be presented in a context where some kind of additional meaning is implied, as Mary Ann Doane remarks, it is "a brute and opaque fact".[12] Further problematization of the index has been identified by Clive Scott in his book on street photography, where he states that "the longer a photograph exists, the more it empties itself of its initial meaning, the more it becomes an indexicality without a referent."[13] I will return to this subject in Chapter 3, where I propose that the empty index, after losing this initial meaning, has the potential to get filled up with other things instead, not least among them nostalgia.

Kaja Silverman suggests another attitude to the index (and again to photography in particular) in her book entitled *The Miracle of Analogy*.[14] Instead of seeing the not-quite-sameness of index and referent as problematic, she proposes that we view this similitude as analogy, and in doing so we can give the index a new role:

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[10] Why for instance do films and photographs have a rectangular frame, if not for the traditions of format inherited from the Western art tradition?

[11] Steve Edwards, *Photography: A Very Short Introduction* (Oxford: Oxford University Press, 2006), Kindle edition**,** 103.

[12] Doane, *The Emergence of Cinematic Time,* 94.

[13] Clive Scott, *Street Photography from Atget to Cartier-Bresson* (London: I.B.Tauris, 2007), 31.

[14] Kaja Silverman, *The Miracle of Analogy* (Redwood City: Stanford University Press, 2015). Excerpts found at http://nonsite.org/feature/the-miracle-of-analogy

> Photography is able to disclose the world, show us that it is structured by analogy, and help us assume our place within it because it, too, is analogical.[15]

I would like to keep Silverman's proposition in mind, with the idea that it might serve as a kind of validation for the extensive analogy-making that I will engage in throughout this thesis.

1.5 Overly-long photographic samples[16] and extended presents

The relationship between index and time in discrete media is always problematic. In the next chapters we will look at short photographic exposures, freezes, slowing down and stringing samples together to form a fake continuity, but for the moment I would like to concentrate on a particularly difficult, even paradoxical type of index that was encountered at the beginning of the age of photography. Until 1878 and the invention of a specific type of gelatin emulsion that could react very quickly to light, the slow-changing chemicals used in early cameras meant that photographic exposures were anything but short. Nicéphore Niépce's heliograph *View from the window at Le Gras* (1826 or 1827) was made using an exposure time of eight hours (or possibly even more), and while Daguerre's *Boulevard du Temple* (1838) was the result of significant technological advancements in photography, ten to fifteen minutes of exposure time was still required in order to create a viable image. Long exposure times create pictures that do not really correspond to our way of experiencing the world. In Niépce's heliograph we see a view of rooftops, but one in which light appears to be striking the buildings from different directions, and in the Daguerre, a street that was in fact bustling with carriages and people seems to be empty because the light reflected by any one moving object has made too small a contribution to the overall luminosity that created the image. Daguerre's picture is,

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[15] Silverman, *The Miracle of Analogy*, found at http://nonsite.org/feature/the-miracle-of-analogy

[16] For the purposes of this thesis, I will consider the photograph or individual film frame to be 'samples' of the visual world that is being captured inasmuch as they are fixed, indivisible units which may or may not be subsequently strung together in order to achieve the illusion of continuity. Photographs and film-frames are not the same as digital audio samples, but there is an element of equivalence.

however, not completely empty. There is a man having his shoe shined by a boy — these are the only two people to have remained long enough in the frame to have been ‘sampled’. In *View from the window at Le Gras* we are given an abundance of information (what the rooftops looked like at nine in the morning and at three in the afternoon), while in *Boulevard du Temple* much of the information we might have been able to obtain had we been standing there ourselves for fifteen minutes, has been sifted out. In many ways these early photographs display a certain truthfulness inasmuch as they expose the problematic nature of something that was traditionally hidden in European painting — the relationship between the time taken to make the image and that of the apparent time-frame that is represented in this image.

Fig. 1.1 Nicéphore Niépce — *View from the window at Le Gras* (1826 or 1827)

Fig. 1.2 Louis Daguerre — *Boulevard du Temple* (1838)

We might ask ourselves what kind of sampling duration would actually correspond to our way of experiencing a moment of the world. Clearly not fifteen minutes, eight hours, or on the other hand the split-second of high-speed photography that we will look at in the next chapter. The nature of the basic unit of our own temporal perception — that which might constitute the 'present' — has been a source of much philosophical contention. For instance, Thomas Reid, founder of the Scottish School of Common Sense, proposed that the present moment is without duration and that we are simply unable to perceive it as such, due to the limitations of our own 'temporal acuity'. However, a century later (and perhaps not insignificantly some decades into the age of photography), the American philosopher William James put forward his influential idea that the present moment must have duration — a notion he termed the specious present:

> In short, the practically cognized present is no knife-edge, but a saddleback, with a certain breadth of its own on which we sit perched, and from which we look in two directions into time. The unit of composition of our perception of

> time is a *duration*, with a bow and a stern, as it were — a rearward — and a forward-looking end.[17]

James's proposition favours actual experience over the abstract scientific characterization of the present as having no duration at all. The most important rationale lying behind this doctrine is that the present must have duration in order for it to be able to span any perception of change between one state and another.[18] Clearly, this issue touches on fundamental questions concerning the nature of consciousness that are beyond the scope of this thesis, however, it may be interesting to look at ideas from other fields that bear some relation to the specious present. In *Microsound*, Curtis Roads presents us with the whole range of time durations from the infinite to the infinitesimally small in relation to musical and sonic objects. Somewhere in the middle of this durational scale lies the 'classical note', which Roads estimates can vary between 0.1 and eight seconds.[19] Might the unit of the note constitute a musical present of some kind? Elsewhere Roads mentions an estimate of 0.6 seconds that constitutes the 'thickness' of the present, given by psychoacoustician Fritz Winckel and based on the size of the temporal lag between the functioning of perceptive and cognitive apparatuses as they pertain to hearing.[20] A more general, and perhaps useful concept relating to the duration of the present comes from psychology and concerns the shortest element in our systems of memory. Sensory memory acts as a kind of 'buffer' between perception and short-term memory and involves the involuntary retention of the information received by our senses. The maximum duration for this buffer is normally estimated as being around 200 to 500

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[17] William James, *The Principles of Psychology* Vol. 1 (New York: Henry Holt and company, 1890), 609.

[18] Holly Andersen's article on James and the specious present was particularly helpful here, especially in establishing a context for the doctrine and its relationship to Scottish Common Sense. See Holly Andersen, "The Development of the Specious Present and James' Views on Temporal Experience," in *Subjective Time: the philosophy, psychology, and neuroscience of temporality*, ed. Dan Lloyd and Valtteri Arstila (Cambridge: MIT Press, 2014), 25-42.

[19] Curtis Roads, *Microsound* (Cambridge: The MIT Press, 2001), 18.

[20] Roads, *Microsound*, 4.

milliseconds, but it is believed that echoic memory (the auditory part of sensory memory) might be as long as a few seconds.[21]

1.6 Bragaglia and Sugimoto

> "The creatures can see where each star has been and where it is going, so that the heavens are filled with rarefied, luminous spaghetti. And Tralfamadorians don't see human beings as two-legged creatures, either. They see them as great millipedes — 'with babies' legs at one end and old people's legs at the other,' says Billy Pilgrim."[22]

The Tralfamadorians, an alien species encountered by Billy Pilgrim in Vonnengut's *Slaughterhouse 5*, possess a sense of simultaneous time that extends far beyond the temporal compass of sensory memory, the specious present, or even *View from the window at Le Gras*. In fact, the Tralfamadorians collapse all time into a simultaneity that gives them equal access to past, present and future, and for them "there is no beginning, no middle, no end, no suspense, no moral, no causes, no effects."[23] Far from being the result of low temporal acuity, their extended present offers them omniscience and they pity humans whose linear sense of time they consider to be a severe perceptual-cognitive disability. Long-exposure might be thought of as a way of accessing a Tralfamadorian-like reality, and decades after the invention of snapshot photography, artists have continued to use the medium in order to represent a sense of time very different from our normal temporally-blinkered apprehension of the world. The Italian futurist film-maker and photographer Anton Giulio Bragaglia (1890-1960) believed that in their ability to express duration and even continuity, long-exposure images offered a viable alternative to the 'flawed' temporality of cinema and snapshot photography. In a 1913 article entitled "Futurist Photodynamism", Bragaglia puts forward his theories on how the long-exposure can

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[21] See Jonathan K. Foster, *Memory: A Very Short Introduction* (Oxford: Oxford University Press, 2008), Kindle edition.
[22] Kurt Vonnegut, *Slaughterhouse 5* (London: Vintage, 2000), 71.
[23] Vonnegut, *Slaughterhouse 5*, 72.

be used as a tool to capture and observe movement in a way that corresponds more closely to our perception of it in the real world. In the following passage he compares the relative temporal resolution offered by short-exposure photography, film and long-exposure.

> To put it crudely, chronophotography could be compared with a clock on the face of which only the quarter-hours are marked, cinematography to one on which the minutes too are indicated, and Photodynamism to a third on which are marked not only the seconds, but also the *intermovemental* fractions existing in the passages between seconds. This becomes an almost infinitesimal calculation of movement.[24]

Looking at his photograph *Change of Position* though, it is a little difficult to tell what exactly is being depicted (see Fig. 1.3). The sense of movement having been captured is there of course, but I am not certain of the details of this 'change of position' that took place. The man appears to have been bent over and then straightened himself up (or did the action happen the other way around?), and it seems that he might have been holding something, but then again I am not sure. Mary Ann Doane describes Photodynamism as "representation characterized by a certain illegibility",[25] and Bragaglia himself admits that although movement is "infinitely multiplied and extended" in these images, "the figure present will appear diminished."[26] Long-exposure is in many ways an exemplary, almost 'honourable' medium, insofar as the losses and gains it incurs in the process of recording are writ-large on the surface of the images. In Chapter 3 we will look at how media can either reveal or disguise the way in which they function in more detail.

Over sixty years after Bragaglia's *Futurist Photodynamism*, the Japanese photographer Hiroshi Sugimoto (born 1948) began work on *Theaters,* a series of

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[24] Anton G. Bragaglia, "Futurist Photodynamism," trans. Caroline Tisdall in *The Cinematic: Documents of Contemporary Art*, ed. David Campany (London: Whitechapel Gallery, 2007), 26.
[25] Doane, *The Emergence of Cinematic Time,* 88.
[26] Bragaglia, "Futurist Photodynamism," 28.

beautiful long-exposure images in which loss and gain is very clearly and knowingly foregrounded. Using a large-format camera from the nineteenth century, Sugimoto took photographs requiring an exposure time of ninety minutes or more. In fact a film has been screened during the exposure time, and though it serves as lighting for the rest of the scene, the hundreds of thousands of frames that compose the film itself have been condensed into one incandescent white rectangle. The images are named after the cinema, whose interiors (and exteriors) are revealed in the kind of detail and vast tonal range that is made possible by the combination of small aperture and long-exposure time. In "Little History of Photography", Walter Benjamin describes the making of early photographs as follows:

> The procedure itself caused the subject to focus his life in the moment rather than hurrying on past it; during the considerable period of the exposure, the subject (as it were) grew into the picture[27]

Fig. 1.3 Anton Giulio Bragaglia — *Change of position* (1911)

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[27] Walter Benjamin, "Little History of Photography," trans. Rodney Livingstone, in *Walter Benjamin: Selected Writings Volume 2 1927-1934*, ed. Howard Eiland and Gary Smith (Cambridge: The Belknap Press of Harvard University, 1999), 514.

Fig. 1.4 Hiroshi Sugimoto — *Union City drive-in, Union City* (1993)

Fig. 1.5 Hiroshi Sugimoto — *Movie Theater, Canton Palace, Ohio* (1979)

I think that Benjamin has highlighted a quality that could easily be applied to Sugimoto's series. In particular it is the location represented in a photograph such as *Movie Theater, Canton Palace, Ohio* (1979) that in all its vividness might be thought to have 'grown into' the image. The film itself remains featureless and unnamed, and though it is the object that is most clearly supposed to represent the passing of time, its content remains, as Doane would say, illegible. Vonnegut's "luminous spaghetti" is immediately brought to mind by the airplane trails that criss-cross the sky in *Union City drive-in, Union City* (1993). The trails in this case offer us a more tangible illustration of time passing and of movement, but as with Bragaglia's images, I cannot always tell the direction of this movement within this context of verticalized de-vectorized[28] time. Beyond the clearly defined contrast of lost and gained information in the images, *Theaters* also fulfils the criteria for Jens Schröter's third type of intermediality, which he refers to as "transformational intermediality". This kind of intermediality involves the appearance of one medium in another (in Sugimoto's case film within photography), but without any sort of synthesis or hybridization taking place. The situation allows the containing medium to "comment on the represented medium" and even to "represent the represented medium in such a way that its everyday, normal states of being are defamilarized or transformed."[29] The condensed movies of *Theaters* are certainly defamiliarized and transformed renderings of normal films, and Hilde Van Gelder and Helen Westgeest even go as far as to say that the series represents "a defeat of film by photography."[30] However, I feel the portrayal of film in these photographs is maybe a little more neutral than that. Contrary to the manner in which a short-exposure makes all time-spans equal by creating a temporal cross-section in an instant (as we shall see in the next chapter), the overly-wide sample highlights the different durational nature of things — from

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[28] The composer and theorist Michel Chion often employs the word 'vectorized' in relation to the way that sound can underline or even create narrative direction in a movie scene. My use of 'de-vectorized' however is much simpler — I wish to describe a situation where beginning and ending, and a sense of linear time, is not apparent.

[29] Jens Schröter, "Four Models of Intermediality," in *Travels in Intermedia[lity]: ReBlurring the Boundaries,* ed. Bernd Herzogenrath (Lebanon: University Press of New England, 2012), Kindle edition, loc. 678-82.

[30] Hilde Van Gelder and Helen Westgeest, *Photography Theory in Historical Perspective* (Chichester: Wiley Blackwell, 2011), 80.

the long-lastingness of a building, to the ninety minutes of a film and the five minutes it takes a plane to cross the sky.

1.7 Is there a musical response to the long-exposure photograph?

Sugimoto's films, because they are contained inside photographs are of course mute, but one could try to imagine what they might sound like anyway. In many ways I have saved the trickiest intermedial comparison for first. The most obvious difficulty, and maybe one that cannot be solved, concerns the role that duration plays in photography and sound. Although the length of the moment of sampling might be comparable, the way a spectator experiences each medium is not. A photograph is an image and has no real duration except for the variable length of time that someone might gaze upon it. Sound on the other hand clearly only exists in time and the experience of it is fixed in duration. However, there are potential musical analogies to the long-exposure to be made. Bearing in mind the idea that even though a long-exposure photograph might 'contain' time, this time is de-vectorized, we might turn our thoughts to Jonathan Kramer's concept of vertical music:

> ... the holistic music of vertical time telescopes past, present and future by minimizing the significance of the sequential order of events… Vertical music denies the past and the future in favour of an extended present.[31]

Kramer cites various kinds of non-teleological non-western music, minimal American music and experimentalism as examples of vertical music, and though it is a useful point of reference, I am not sure it is exactly what we are looking for here. In the end, Kramer's vertical music is too general, the specific quality that we are after is one that mirrors the long-exposure photograph in its clear de-vectorizing of what was once vectored-time. The piece *Sound Compression Art* from 2009 (video example 1.1) by the German composer Johannes Kreidler (born 1980) proposes another kind of vertical, or almost-vertical music. During the short video, various

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[31] Jonathan Kramer, *The Time of Music: New Meanings, New Temporalities, New Listening Strategies* (New York: Schirmer Books, 1988), 375.

heavily time-compressed pieces, or collections of pieces, are presented to the beat of an electronic metronome along with appropriate captions and images. The context is a humorous one, ending in a rendition of *Silent Night* that consists of a selection of bleeps and buzzes produced by the compression process.[32] The various compressed works vary a little according to the music involved and the extent to which they have been shortened. "Complete Beethoven symphonies, played in one second" for instance, is not entirely illegible, and as Kreidler himself has commented, you can hear the distinct sound of vocal music right at the end of the one-second duration, that corresponds to the Symphony No.9.[33] Other compressions are less easy to relate to their source sounds — "All Beatles songs ever released, played in one tenth of a second" is just a grain of sound, a vaguely chord-like blip, and "Entire audio track of Rambo 3, played in one third of a second" is a brief opaque composite of noise and pitch. Kreidler believes that in the change in temporal scale "form becomes a detail" and that "the ideal of compression is, on the one hand, to save all important information, on the other hand, to reduce it to a handy size."[34] I would not argue with Kreidler here, but in the end he has made a one-off piece that does most of what it can do with these extreme compressions within its three-minute scope. The compressions do not bear much contemplation on the one hand, and on the other they cannot be contemplated in any case because they are so brief. Perhaps it is a case of adjusting our own way of listening to this new time-scale, of honing our audio temporal acuity, if such a thing is even possible. But for the moment, the experience of such compressions seems to me like glancing at a Sugimoto photograph for a tenth of a second.

Perhaps the closest we will get for the moment to a sonic version of the long-exposure is a series of works by Peter Ablinger entitled *IEAOV (Intstrumente und*

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[32] The compression process in question, not unlike *9 Beet Stretch* which we will look at in the following chapter, consists of a series of granular synthesis operations. The pitch of the original is retained. If Kreidler had tried to make the compressions by simply speeding up playback, he would have ended up with nothing since the sound would have gone way beyond the limits of human hearing, and indeed of any commonly used sampling rates. However, this means that the compression in Kreidler's piece is not a compression so much as an abridgement of the works concerned — something more in line with time-lapse which will be discussed in Chapter 3.

[33] Found at: http://www.kreidler-net.de/theorie/neural-interview.htm

[34] Found at: http://www.kreidler-net.de/theorie/neural-interview.htm

Elektro-Acoustic Site-specific Verticalization) written between 1995 and 2001. The series was actually inspired by long-exposure photographs that Ablinger took with a panning camera in which "movements in space would condense into colour spectra."[35] He applied the idea quite simply to sound by having a 'palette' of successive sound events, usually pitches on an instrument, accumulate and verticalize into a dense timbre of collected sonic events (audio example 1.1). The larger the palette of materials, the denser and noisier the resulting timbre and we could imagine palettes that would produce something close to white noise. Ablinger says that in the works that constitute the *IEAOV* series, "sound seems to stand still in time" and that "time has ceased to be perception-defining dimension of sound-structure."[36] In fact there is something here that is very similar to the idea of the audio-freeze that we will look at in the next chapter, but in this case instead of just extending one short moment in time, the process of verticalization gathers up a succession of sounds, turning time on its side in the process. I believe that Jonathan Kramer would probably consider the *IEAOV* series to be vertical music, but as with other kinds of vertical music, the context is too general and musically abstract for the creation of simultaneity or directionless-time to really mean anything.

1.8 Conclusion to Chapter 1

This discussion of the index and overly-wide sample is intended as a setting up of the territory to be explored during the course of the thesis. The idea of indexicality must be central to any research into recorded media since it is the very quality of the index — the uncanny resemblance to reality that is created through precision and ability to register the particular, which lies at the heart of our fascination with and ongoing use of these media. In her book on memory, Janet Coleman has written of a gap that exists between our experience of the world with its "infinite particularities" and everything we have at hand to record it, be it language, memory or media.[37] I would like to expand and elaborate on her idea of a gap or a space, and give it a slightly

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[35] Found at: http://ablinger.mur.at/ieaov.html

[36] Found at: http://ablinger.mur.at/ieaov.html

[37] Janet Coleman, *Ancient and Medieval Memories: Studies in the Reconstruction of the Past* (Cambridge: Cambridge University Press, 1992), 61.

different emphasis. One might imagine it is the closeness of the index to reality that opens up a kind of frictional area in which art can reside and where it may construct connections between things in a manner different to the ones that were possible before the advent of recording media. In turn, this frictional area is also a space where we can begin to see aspects of ourselves in the not-quite-correspondences between photographs, film and audio media, and lived experience.

The overly-wide sample represents an early manifestation of the new indexical technologies of the nineteenth century, an unwieldy first attempt that yields paradox, beauty and ultimately unreadability. I am quite happy to leave the long-exposure photograph, and musical explorations of simultaneity here in the first chapter. They are in part an artistic dead end because they neither correspond to the way we experience the world, nor do they compensate for this lack of resemblance by telling us anything about this world. It is art for Tralfamadorians — dense images and sounds that could only be unpicked by those with the capacity to comprehend de-vectorized time. In the next chapter we will look at what happens when you shorten the duration of the single sample. Again, the short-exposure photograph and audio freeze with their apparent suspension of a moment in time, do not correspond to the way we experience the world. They are ‘useful’, however, and the nature and possible artistic applications of this utility will be of central concern to us.

Chapter 2

FREEZING TIME TO OBSERVE THE TRANSIENT/ SLOWING DOWN TIME TO DISCOVER THE DISCRETE

2.1 Introduction

This chapter concerns two related types of 'time axis manipulation',[1] freezing and slowing down, focusing on how they might be used to reveal things about our world, and in turn about the media that have been employed to capture this world. In the course of studying these processes across a variety of media and artworks, we will see gaps opening up between what might initially appear to be pairs of comparable items: the photograph and the audio freeze, the exposure time for an image and a single STFT analysis window, a live freeze and a recorded one, and a slowed down film and its 'equivalent' in audio. Even the acts of freezing and slowing down time in media do not form a seamless continuity — there is a fundamental conceptual aporia separating the two that is illustrated by the differences in technique that must be employed to realize them. The first half of the chapter will concentrate on the idea of freezing with reference to my own work, snapshot photography and the installation *Model for a Timeless Garden* by Olafur Eliasson. The second part of the chapter will look at slowing down by way of an intermedial comparative analysis between the (silent) video installation *24 Hour Psycho* by Douglas Gordon and Leif Inge's sound art piece *9 Beet Stretch*. In the course of looking at the works in this chapter we will investigate the idea of the creative spectator who actively participates in his or her own experience through a degree of co-authorship with the artist, and in this manner begin our research into the human aspect in media and art, one of the main themes running through this thesis.

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[1] This term is taken from the "Gramophone" chapter of Friedrich Kittler's *Gramophone, Film, Typewriter*.

2.2 Freezing sound and image

> The Forms, which the mind isolates and stores up in concepts, are then only snapshots of the changing reality. They are moments gathered along the course of time; and, just because we have cut the thread that binds them to time, they no longer endure. They tend to withdraw into their own definition, that is to say, into the artificial reconstruction and symbolical expression which is their intellectual equivalent. They enter into eternity, if you will; but what is eternal in them is just what is unreal.[2]

Audio freezing is a fairly gentle type of manipulation of recorded sound consisting of the prolongation of the frequencies present at a particular moment of time in this sound. This 'moment' has (and indeed must have) a duration in order to contain frequencies. However, the duration in question is a relatively short one lasting a fraction of a second. I first tried my hand at making audio freezes in 2007 while working on a project involving the *Wizard of Oz*. It seemed desirable to make a sonic equivalent to the film freeze frames that I had used in creating the visual part. At this point I was working in the time domain and would repeat and crossfade tiny snippets of sound in order to make a freeze. A great deal of trial and error was involved in finding attractive freezes that mirrored my idea of what suspended time might sound like (these repeated, crossfaded snippets would often end up as honks or machine-gun like noises). When they were successful, however, these first audio freezes, especially in conjunction with the film freeze frames, produced an effect far beyond what I had imagined. They were suspenseful and peculiarly sentimental at the same time, leading me to realise how powerful they might be in other contexts, such as when processing field recordings. The next freezes I made employed the frequency domain and the IRCAM program Audiosculpt, and finally in 2011 the Max patch, where the problem of honking freezes was taken care of by the stochastic blurring of phase and amplitude (see section 2.3).

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[2] Henri Bergson, *Creative Evolution*, trans. Arthur Mitchell (Salt Lake City: Gutenberg Project, 2008), Kindle edition, loc. 4537-47.

A comparison to a Bergsonian view of the world might be quite useful when thinking about freezing: the idea that by manipulating sound in this way we are mimicking the coping mechanism of the intellect which pulls things out of the continuous flow of reality and creates (artificial) objects from them.[3] Because sound freezing as a digital audio-processing technique has only been around for a decade or so, very little literature exists on the subject.[4] It seems quite logical to take the abundance of theory on photography and film as a starting point, and to discover how effectively it might be applied across media. As we shall see, as evident as the correspondences may be on a phenomenological level (we experience photographs, freeze frames and audio freezes as the suspension of a moment in time) in other ways these connections are littered with holes of incomparability.

To begin the comparison, however, we might turn to the issue of recognizability, meaning the relative ease with which we can identify the source of an out-of-context sound-freeze in comparison to that of an isolated photograph. Even if we presume an equal clarity of subject and method of capturing that subject when making the audio or visual recording, do we respond in the same way to a horizontalization of frequencies as to an actual image? I think the answer depends very much on the nature of the sound. The source of an audio-freeze is much more difficult to recognize when it is normally identified by a time-varying component of some kind such as an amplitude envelope (the sea) or a melodic shape (a car engine glissandi caused by the Doppler effect). On the other hand, sounds that have very easily identifiable spectra, such as the bells with their signature inharmonicity, or car horns (which are often tuned to the same pitches), are much easier to spot in frozen form. A freeze that is made from a rich and layered sound source (such as a busy public

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[3] Of course we are turning Bergson's metaphor back on itself. In *Creative Evolution* Bergson simply uses the imagery of photography and the cinema as a means of conveying the nature of the chasm that separates our way of experiencing the world and the way it actually is.

[4] Kittler does not mention it as a type of time axis manipulation. The only literature that I have found is Jean-François Charles' article from *Computer Music Journal*, which is focused on the technical aspects of freezing audio in the frequency domain.

space) is very hard to identify.[5] It is perhaps important to add here that the audio freezes I use in my work are generally either entirely, or partially framed by the source recordings in an unfrozen state. As we will see, the effect these freezes have is heavily dependent on them being part of a sonic narrative.

2.3 Exposure time and fakery

In *Gramophone, film, typewriter*, Friedrich Kittler reminds us that there is a fundamental difference between audio and visual recording. While a gramophone registers sound waves directly, film and photography only record the effects of light since the waves themselves are impossible to capture given the current limitations of imaging technology.[6] The 'exposure time' (the moment taken to seize the material that will become the frozen image or sound), is also dependent on the type, speed and frequency of the waves involved. The length of an ideal photographic exposure, in order for it to be completely devoid of motion blur, will tend towards the infinitesimally small, and as we will see can be as short as a microsecond long (section 2.4) or even briefer. Short-time Fourier Transform windows however, must have a minimum duration to allow them to contain at least one cycle[7] of the lowest frequency present in the source sound. Based on this calculation, an analysis window that is shorter than 50 microseconds will not contain any audible frequencies at all. Frequency resolution in fact grows finer as the window size increases but time resolution sharper as the window size decreases, therefore the ideal sound exposure time varies according to the properties of the sound in question and must be adjusted accordingly. It is perhaps interesting to compare the relative length of the moment to be frozen in an audio analysis window and a snapshot photographic exposure. The analysis frame that I use is around one twentieth of a second (2048 samples) in

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[5] As part of a presentation on freezing sound given at Darmstadt, Bath Spa University and City University, I invented a game for the audience, playing them seven isolated audio-freezes and asking them to identify the sources. The freezes were of the sea, the dawn chorus, a hall full of chattering people, a plane, a bell, a car and a car horn. The conclusions I reach above were as a result of my own reaction to the freezes and those of a few of the more forthcoming members of the audience. These freezes can be listened to in audio example 2.1.

[6] Friedrich A. Kittler, *Gramophone, Film, Typewriter*, trans. GeoffreyWinthrop-Young and Michael Wutz (Palo Alto: Stanford University Press, 1999), 118-119.

[7] According to Axel Roebel from IRCAM, four or five cycles of the lowest frequency (rather than just one) are needed to resolve the spectral peaks in an STFT window in Audiosculpt. Axel Roebel, e-mail message to the author, August 22, 2013. For my Max patch it is just one cycle.

length, which is short but certainly still imaginable — it could be the duration for instance, of one stroke of an extremely fast drum roll. On the other hand, a standard short photographic exposure of one millisecond feels more like an abstraction in terms of human time.[8]

The computer program I use to create the freezes is a Max patch based on jitter elements designed by Jean-François Charles.[9] It takes several analysis-windows at the point where the sound needs to be frozen and then smoothes them into a more or less continuous sound through a process of stochastic blurring. An understanding of the workings of the process serves as a reminder of exactly how 'fake' this process actually is. Sound of course is never (to my knowledge) frozen in real life, indeed as Joanna Demers points out, even sound that is perceived as static is produced by moving acoustic waves, just like any other sound.[10] Freezing is simply a temporal manipulation of recorded material made possible by technology. Just as in a film freeze-frame where a single still image has to be repeated 24 times per second in order to create an illusion of immobility, in sonic-freezing we must overlap and repeat tiny segments of audio material in order to create a similar effect. The audio freeze is in fact a micro-loop, albeit a relatively well-disguised one. There is something inherently disappointing in this fact, looping and repeating are not the same action as 'sustaining an instant', and the exposure time of the audio analysis frame is not anywhere near as short as one might think it should be. Some fluctuation is still apparent in the frozen sound, and again it is not the perfectly flat sustained sound that corresponds to the audio freeze of our imagination.

In any case, fakery is a relative concept. Recorded sound, whether frozen or not, is in no way a portrayal of 'reality' per se, but a heavily mediated version of it. The journey between the occurrence of the sound in real life and its playback in another

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[8] Interestingly enough, both the duration for the short exposure and the analysis window are still far shorter than the ideas of the 'present' we looked at in the last chapter, that ranged between half a second or so and a few seconds.

[9] The patch used in *Artificial Environments Nos.9a-d (from fast to slow)* was created by John Croft, and modified by Fabrice Moinet.

[10] Joanna Demers, *Listening Through the Noise: the Aesthetics of Experimental Electronic Music* (Oxford: Oxford University Press, 2010), Kindle edition, loc. 1747-51.

context is a complex one, full of both technological and artistic intervention.[11] Jonathan Sterne's remark concerning the speed at which people became used to the new audio technologies during the nineteenth century,[12] might also be applied to the present day. Perhaps we have become so used to listening to (manipulated) audio recordings that they have become all too easily conflated with the original source sound and with the sound science fiction imaginings of freezing and slowing-down.

It is always important for us to bear in mind the size of the technological gap separating the way we record and manipulate sound and image. As we can see from the paragraphs above, the methods I use to make an audio freeze in my work are far more involved than the simplicity of freeze frames and snapshots. Audio freezing techniques that are flexible and easy to control, are relatively new and reliant on a digital environment. Over the course of this chapter, we will see the same pattern emerging in the art works and media technologies being studied: sound has to jump through digital manipulatory hoops in order to achieve effects that have been available in image technology for almost as long as it has existed. Perhaps we might think of another frictional space, similar to that which exists between reality and media, being created by the closeness, but not-quite-sameness of audio and visual technologies. Again I think that this intermedial space is a place for art to reside, and we will see in works by Eliasson, Gordon, Inge and myself, how artists (and audience) react to this space. However, before we move onto this, it might be interesting to consider whether we can find any equivalence between audio and image freezes in terms of what they mean and whether or not they can be 'useful'.

2.4 Discovering the transient

If we are willing to overlook differences in how they are made and indeed the inherent 'fakeness' of the sound freezing technique, freezes in all media appear to be quite rich in potential readings. David Campany describes the idea of a palpable

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[11] For a detailed explanation of this journey see Rick Altman, "The Material Heterogeneity of Recorded Sound," in *Sound Theory, Sound Practice,* ed. Rick Altman (New York: Routledge, 1992), 15-31.

[12] Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction* (Durham NC: Duke University Press, 2003), 6.

contradiction between the simplicity of a movie freeze-frame and the complexity of what it might mean.[13] I would like to extend this description to audio freezes, and broaden its scope to go beyond the narrative complexity that Campany is talking about, to include the technological and temporal issues that I spoke about in the last section. However, amidst this complexity, there might be something slightly more straightforward to be grasped from the freeze in both its visual and audio forms. All of the freezes we are talking about, regardless of the size of the 'instant' they use as their material, or the possibly 'compromised' technological means that was employed to create them, consist of a prolongation of a transient moment in one form or another. The freezes allow us to dwell on audio and visual information that passes too quickly to be comprehended or examined and as such we might consider the freezing mechanism to be a temporal microscope of sorts. Writing in 1931, Walter Benjamin equates the uncovering of the unseen offered by photography with the unconscious that is revealed through psychoanalysis. He names this visual world at the edge of human perception, that is seen but not attended to, the 'optical unconscious':

> For it is another nature which speaks to the camera rather than to the eye: "other" above all in the sense that a space informed by human consciousness gives way to a space informed by the unconscious. Whereas it is a commonplace that, for example, we have some idea what is involved in the act of walking (if only in general terms), we have no idea at all what happens during the fraction of a second when a person actually takes a step.[14]

Benjamin brings to mind here the efforts undertaken by the nineteenth century photographer Eadweard Muybridge to examine the motion of a galloping horse in Palo Alto during the 1870s in order to discover whether the horse had all of its hooves off the ground at any one moment. Muybridge's initial experiment developed

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[13] David Campany, *Photography and Cinema* (London: Reaktion Books, 2008), 57.

[14] Walter Benjamin, "Little History of Photography," trans. Rodney Livingstone, in *Walter Benjamin: Selected Writings Volume 2 1927-1934*, ed. Howard Eiland and Gary Smith (Cambridge: The Belknap Press of Harvard University, 1999), 510-511.

into a sustained research project into human and animal locomotion. It is important to note that although Muybridge pioneered high-speed photography by increasing shutter speed and discovering chemical compounds fast enough to react to the short exposure, his intention was not to create a movie camera. The photographs were taken by a series of cameras set up along the path of a subject moving in front of a gridded wall, and were intended to be kept separate as objects of scientific contemplation rather than strung together to form the an illusion of movement. Tom Gunning places the photographer's work at the intersection of science, technological development and art, "Muybridge served as a model of a way to move beyond art as self-expression towards an art that, flirting again with science, seeks to demonstrate its essential conditions."[15] I think Gunning's description of Muybridge's photographs also tallies with most of the works discussed in this thesis, inasmuch as these works also foreground and question the means used to produce themselves, and as a consequence 'flirt' with science to a greater or lesser degree.

Fig. 2.1 Eadweard Muybridge — *Galloping Horse* (1878)

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[15] Tom Gunning, "Never seen this picture before: Muybridge in multiplicity," in *The Cinematic: Documents of Contemporary Art*, ed. David Campany (London: Whitechapel Gallery, 2007), 23.

Fig. 2.2 Harold E. Edgerton — *Death of a Light Bulb* (1936)

Fig. 2.3 Harold E. Edgerton — shot from Tumbler-snapper atomic tests, Nevada (1952)

Another important figure in the development of high-speed photography was the American scientist Harold Edgerton. His use of a strobe light in a dark room (rather than a shutter) allowed him to produce photographs of bullets shattering light bulbs

and droplets of milk mid-fall, using exposure times of a millisecond and thus containing minimal motion blur. Edgerton's high-speed photography was also strongly tied to science, and indeed warfare, the use of the strobe light itself having originated in an industrial process for checking the functioning of fast-moving machinery. Edgerton enlarged the strobe so that it could be used to light enemy terrain for aerial shots taken in reconnaissance missions during World War II, and perhaps more disturbingly, he was employed as an official photographer for the nuclear tests in Nevada in the 1950s. For this occasion he had to develop a new type of high-speed camera called the rapatronic using magnets and polarized lenses since strobes would not have functioned in this case (the bomb would have provided its own lighting). The forms he produced in Nevada are truly alarming. Rather than representing the optical unconscious of our everyday life, perhaps Edgerton's photos reveal the details of an unimaginable horror that usually sits dormant and slightly out of focus in the back of our minds. Kris Belden-Adams comments that Edgerton's work in general drives the idea of the photographic exposure time further into the realm of the abstractly short.[16] I am not sure if this idea of the impalpable could be applied to the nuclear test shots though. The coupling of photographic technology and subject makes for a powerful apocalyptic vision in which we are confronted by scales of both time and destructive power that are certainly difficult to conceive of, but that are too terrifying to be deemed abstract.

If high-speed photography provides us with the means to contemplate the transient in the visual domain, what might freezing sound produce? I like to think of freezing sound as a kind of revelation of a hidden spectral content in the recording, where a parallel world of this latent harmony is opened up as a result of being given duration. It also makes me think about the nesting of a potentially infinite chord in a very small space and indeed the (not quite) infinite potential of the recorded sound as source material for the generation of harmony.

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[16] Kris Belden Adams, "Harold Edgerton and Complications of the 'Photographic Instant'," *Frame* 1 (2011): 102.

My piece *Artificial Environments Nos.9a-d (from fast to slow)* for ensemble and tape (2013)[17] uses recordings that were made at the seaside in Greece, Gare du Nord in Paris, in the waiting room at my local town hall, and on the streets of Brussels while Spanish fans were celebrating their semi-final victory in the 2012 European Championships. The speech that dominates the third of these soundscapes (audio example 2.2), and in particular its vowel sounds, is an extremely fertile ground for freezing and finding hidden harmonies. As one might imagine, there is nothing static about the harmonic content of this recording or indeed of any of the others used in this piece — in fact it is quite 'random' and the compositional challenge in this case is to try to make music out of this randomness. The most important formal strategy of the piece as a whole involves the use of a large-scale decelerando in the rate of alternation between frozen and unfrozen sounds. The idea is that the order (and even predictability) afforded by this formal process counterbalances the randomness of the field recordings themselves, and the spectral content of the freezes they produce. The sound of the sea in the first section of course only produces white noise when frozen, but all the freezes in the subsequent three sections were analyzed for their frequency content and transcribed to the nearest quarter-tone. The ensemble plays mostly in a rhythmic unison that corresponds to the freezes on the tape, but in certain parts of the piece such as the third section, the notated pitches are pulled around a little rhythmically to form a kind of tracery around the field recording and its freezes. The electronic part consists of the field recordings punctured regularly by the frozen prolongations, which are sometimes 'reinforced' with sine tones, and towards the end of the last section, ring-modulated in a way that suggests the arrival of a new difficult to define location, just beyond the world of the celebrating football fans. It is probably important to mention that when the patch freezes a pre-recorded sound, it returns to the moment in the recording just after the freeze was captured, rather like a film freeze-frame. In this way the freezes are only expansions of the recorded material and no information is 'lost'.

[17] See Appendix 1.

In terms of the process of writing the piece, one of the most time-consuming aspects of the work was the development of the freezing 'score' in the cue list of the Max patch. Finding pleasing rates of deceleration, ones in which the slowing-down was both perceivable and provided enough interest over the entire span of the piece, was a matter of trial and error, and in the end I developed a method that would allow me some flexibility when editing the tape part. The freezing score was divided into seven parts, with each part either ending with a prolonged freeze or section of unprocessed field recording that could be shortened or cross-faded with other material afterwards. I put all four of the recordings through the Max patch score and then proceeded to edit this processed material together. The order in which these recordings appear is determined to a certain extent by how rich the dramaturgy is. The sea for instance, which is only a succession of noisy waves, is used at the beginning when the sections and freezes are short, while the football fan recording which is quite dramatic, musical and varied in timbre, is saved for the long section at the end of the piece. The editing together of the processed recordings was also a rather involved process, again requiring a certain amount of experimentation in order to achieve a form that I was happy with. The seven parts of the freezing score do not necessarily correspond to the beginning and endings of the four recordings, with both the fourth and sixth parts consisting of 'cross-fades' between two different recordings. Methods of cutting and splicing the material were varied throughout: sharp cuts with or without a separating silence, a freeze fading-out under the beginning of a new section and a complex cross-fade which was formed by using the freezes of one environment and the unfreezes of another. I always had in mind that the tape part was somehow filmic, and these edits were like the cuts and cross-dissolves between scenes in a movie.

After I had edited the recordings together, I analyzed the timing and the content of the freezes using Audiosculpt. In fact, as the piece progresses, the material becomes more pitched and even 'musical', going between the sea freezes that are a series of different gradations of noise, the slightly muddy sound of the train station, the chattering crowds at the town hall, and the horns, chanting and shouting of the

football fans. After analyzing, I created a sine tone doubling of the most prominent pitches in the freezes that was then mixed in with the processed field recordings. In addition to this, I ring-modulated the sine tones corresponding to the final section of this piece, and then in turn mixed this into the main tape part. The last section consists of a long cross-fade between the football fan recording with sine tones, and the ring-modulation. This technique was used more extensively in *Trains* (see Appendix 5). The main idea behind the ring modulation was to create a kind of harmonic extension to real world sound, an enhanced listening experience that might arise if our ears (and brains) could perform additional calculations on the frequencies they hear.

2.5 The moment: before, after and during

The writer Clive Scott has stated that photography has the ability to turn an 'instant' into a 'moment'. Scott defines an 'instant' as an exceedingly short space of time which is at the edge of human perception and thus difficult to apprehend, and a 'moment' as a more inhabitable duration that is accessible to memory.[18] Such a theory is of course extremely pertinent to the ideas of revealing the hidden that I have just mentioned, with the idea of the 'moment' perhaps corresponding to the notions of sensory memory and specious present we saw in the introductory chapter. In addition it also suggests that by plucking 'instants' out of the continuum and giving them duration (the duration of the audio or film freeze, or the time someone takes to look at a photograph) and even a different space (the concert hall, a cinema or a photo album) they are fundamentally altered and given significance. We might also want to think further about this significance-containing moment, and what exactly it could represent for us. The type of weight given to the instant through its extension in time is complex, and has been debated extensively in the field of photography theory. Roland Barthes's play with tenses, his idea of a photograph as representing something "that has been"[19] is somewhat tinged with nostalgia and reminiscent of the Japanese concept of 'mono no aware', a sensitivity towards the

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[18] Clive Scott, *Street Photography from Atget to Cartier-Bresson* (London: I.B.Tauris, 2007), 43.
[19] Roland Barthes, *Camera Lucida: Reflections on Photography*, trans. Richard Howard (New York: Hill and Wang, 1982), 76-77.

ephemeral nature of things.[20] On the other hand, Hilde Van Gelder and Helen Westgeest think about the photograph more in terms of what comes after it, as the creation of a moment of suspense.[21] It might be interesting to apply this idea to Edgerton's nuclear test shots which, perhaps because of the brevity of the exposure time and nature of their subject, contain a very clearly delineated sense of past, future and present. They are photographs that essentially look forwards in time towards the dreadful and inevitable unfolding of the explosion that I suppose might be called 'suspense'. If there is a sense of Barthes's 'that has been', it does not concern the moment of exposure itself but the period of time before the detonation. This time is not exactly tinged with nostalgia, but perhaps with a wish to undo the irreversible. The frozen moments in *Artificial Environments Nos.9a-d* respond slightly less well to being described in terms of nostalgia, 'that has been' or suspense, no doubt because they are contextualized — we actually know what comes before and after them in terms of 'narrative' and a power-point presentation tells us the date and occasion of each recording. What I do believe happens though, is that the moment of the freeze retains this feeling of significance (or even sentimentality) without referring to past and future. There is an ambiguity to it, moments are given 'weight' by being dwelled upon but it is not clear why, or what this weight actually means. The significance in this case is open to interpretation and thus a space is opened up for the listener to negotiate his or her own narrative journey through the piece.

Beyond feelings of sadness, dread or significance, the freeze might also allow us the opportunity to rethink the durational relationships existing in the real world. Returning to Clive Scott, later on in *Street Photography* he describes the notion of the multiple temporalities contained within one photograph. The instant of exposure effectively captures a cross-section of things and events which each possess their own time.

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[20] See https://plato.stanford.edu/entries/japanese-aesthetics/#2

[21] Hilde Van Gelder and Helen Westgeest, *Photography Theory in Historical Perspective* (Chichester: Wiley Blackwell, 2011), 81.

> …the coincidence of different temporalities, timescales, different speeds of perishability. A closed book is 'slower', more 'durable', than an open one, a knife set perpendicularly to the table-edge more stable, 'slower', than one set diagonally; a chair is slower than a fruit, a building than a cloud.[22]

This idea can be transposed quite successfully to the realm of sound. An audio-freeze from *Artificial Environments Nos.9a-d* might be said to capture and present together a passing vowel-sound from a cheering football fan, a car horn and the sound of passing traffic into one fused chord with no respect for temporal hierarchy. The cross-section of sound-time produced by each freeze, shows us how different (and in fact unrelated) events of varying durations can be made equal by being processed in the same way. In this manner the freeze foregrounds the egalitarian nature of the audio index and its act of bringing together all the frequencies present into one signal. One might also question whether this equality could be thought of as a kind of flattening out of the complex relief of temporalities that occur in the real world. However, even though the freeze may contain an aspect of loss in this sense, it is also possible that these audio and visual simplifications help make aspects of the world more graspable, reaffirming the idea that we have invented technologies that reflect a Bergsonian view of the coping mechanisms of the mind (see 2.2).

It seems that in comparison to the overly-wide sample of Chapter 1, the short-exposure of the snapshot and audio freeze yields much that may be of use to us. Instead of illegibility, the short sample offers us the opportunity to see and hear what might normally pass too quickly to be apprehended. In place of de-vectorized time and simultaneity, we gain isolated fragments of sustained time, and feelings of nostalgia, sadness or dread may emerge that intensify our sense of past, present and future. In the next sections we will look at two art installations that deal with freezing within a live context, and how this change of context might in turn give rise to other experiences of time and a different kind of audio-visual friction.

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[22] Scott, *Street Photography*, 46.

Fig. 2.4 Olafur Eliasson — still from *Model for a Timeless Garden* (2011)

2.6 The analogue, real-time freeze

An example of contemporary art drawing on technological developments of times past, can be seen in Olafur Eliasson's installation, *Model for a Timeless Garden* (2011, video example 2.1), which was exhibited as part of the *Light Show* at the Hayward Gallery, London, in spring 2013. Central to the workings of the installation is the strobe light, which as we have seen, was first employed by Harold Edgerton more than 80 years ago as a substitute for a high-speed shutter. Eliasson, however, is not taking photographs — the strobe flashing in a dark room at the rate of 5 times per second, illuminates a collection of 27 fountains of varying design and density that are displayed on a platform raised to waist height. Although the frozen image remains on the retina slightly longer, the flash itself lasts a matter of microseconds and its brevity is such that the fountains appear motionless to the naked eye during this moment of illumination. The viewer effectively perceives frozen images framed by periods of blackness.

Similar to the way that the audio-freezing in *Artificial Environments Nos.9a-d* produces a succession of unique chords infused with the sound of the world, one

could think of the mechanism of Eliasson's installation as a generator of ever-changing watery sculptural forms. The difference of course is that *Model for a Timeless Garden* is genuinely real-time — the freezes are instantaneous and entirely analogue. The world of the installation is similar to that of a stop-motion film: reality is only partially on display, and we might wonder if the water is behaving differently from expected in those moments when the lights are off. Unlike *Artificial Environments Nos.9a-d*, Eliasson's work presents no context for the freeze except for the existence of other freezes. In turn there are no feelings of nostalgia, suspense or layered cross-sections of time to be experienced. It is a refined, abstract universe stripped down to basic elements and calibrated so as to create strange relationships between these elements, and with the viewer.

The paradox lying at the heart of the work concerning the presence of a freezing effect that is taking place in real time and using live materials, is heightened by the continuous white noise produced by the fountains. The sound reminds us that what we are seeing is an illusion, and that two temporal realities coexist inside the installation: the real noisy unceasing motion of the water and the abridged version of this reality created by the strobe lighting effect. Madeleine Grynsztejn sees the effect of discontinuity created by Eliasson's strobes rather differently. Instead of 'abridging' reality, the strobes generate in the viewer a sense of a present moment that is being continually renewed.

> This cognitive tripping-up is deliberate: it disables the perception of the world as an uninterrupted continuum… Instead what one actually 'sees', what this artwork seeks physically to instantiate, is the here-and-now, snapping into immediate focus over and over… as if our world was constructed from 'an infinite number of suspended static moments' or 'now-apprehensions'.[23]

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[23] Madeleine Grynsztejn, "Attention Universe: The Work of Olafur Eliasson," in *Olafur Eliasson*, Madeleine Grynsztejn et al. (London: Phaidon, 2002), 38.

Eliasson is a particularly articulate advocate of his own work and as Grynsztejn explains, has constructed an aesthetics centred around a phenomenological approach to perception, invoking in particular Husserls's 'now effect' (the coming together of self and outside world in an absolute present),[24] as well as the idea that it might be possible, even preferable, to experience his installations by first discarding our previous knowledge and ingrained habits of perception.[25] It is interesting to contrast the ideals of reception that Eliasson holds important with my own personal experience of the work. Already forewarned by the notice outside the entrance of the installation about the use strobe-lighting, I was prepared for the kind of disorienting visual encounter one has at dance clubs. The cultural associations of the strobe never quite faded from my mind entirely, and this coupled with the fact that I had understood how the work functioned almost immediately (and was contemplating its connection to my own research), led to a delay of several minutes before I managed to 'see' what I was supposed to be seeing, namely the series of frozen watery images. I experienced a certain satisfaction when I finally 'got into the work' and the jolt in my mind (because the change was sudden) reminded me a little of the heady, almost nauseating brain switch that takes place when you see the 'other image' in an optical illusion such as a Necker Cube.[26]

It is not surprising that Jonathan Crary has also written about Eliasson's work, given their shared interest in art and media where the observer and his or her perceptual system takes centre stage. In his essay entitled "Your Colour Memory", Crary explains the importance of the viewer's body in the making of Eliasson's work, and the idea that this viewer effectively functions as a kind of co-author of the work. In the case of *Model for a Timeless Garden*, the element of co-authorship might be

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[24] I cannot find any direct references to Husserl in Grynsztejn's text. Her Husserl material comes from a chapter on Duchamp in a book by Bois and Krauss that does not quote him directly either. Perhaps this speaks to certain practices amongst art writers. See Yve-Alain Bois and Rosalind Krauss, *Formless: a user's guide* (New York: Zone books, 1997), 135.

[25] Grynsztejn, "Attention Universe," 41.

[26] A Necker Cube is an optical illusion consisting of a line drawing of a cube that could be interpreted in either of two ways, with the lower-left square as the nearest side (the cube as seen from above) or with the upper-right square as the nearest side (the cube as seen from below). As with many of these optical illusions with two possible interpretations, when I first view the drawing I find it difficult and somewhat dizzying to go between one interpretation and another.

thought to reside in our involuntary retinal reaction to the strobe, namely the creation of positive after images. Returning to my encounter with *Model for a Timeless Garden*, it seems that I certainly had a very personal experience that was not only formed by physiological reactions to the work, but also by my own biographical and cultural baggage and the way their influence on my perception changed over time. What I am trying to say here is that of course we are co-authors of the work, we are co-authors of all artworks, even those of the most conventional form, and that co-authorship consists of many different elements including some that might jar with the very specific aesthetic outlook of an artist like Eliasson.

Eliasson has said that he hopes the hyper-perceptual experience of his pieces can in some manner be transposed onto the world at large by the viewer[27] and that part of this process involves acknowledging the role that the body plays in the formation of our reality. As Crary states:

> Most of us, most of the time are completely unaware of how the specific physiology of the human optical system is intertwined with what we assume to be a direct and 'objective' view of external reality. Our body, in many different ways, is always part of our visual experience, yet we habitually delete those corporal features from conscious awareness.[28]

There is also something implicitly political at play here, the notion that Eliasson could be trying to recalibrate our senses, dulled through exposure to and consumption of the more common-place media that fill the world, and that this recalibration might function as a liberation of sorts. As Crary says, Eliasson's work is to a certain extent "a strategy of challenging and displacing perceptual habits imposed by dominant features of contemporary technological culture."[29]

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[27] Grynsztejn, "Attention Universe," 41.

[28] Jonathan Crary, "Your Colour Memory: Illuminations of the Unforeseen," in *Olafur Eliasson: Minding the world*, ed. Olafur Eliasson and Gitte Ørskou (Aarhus: ARoS Aarhus Kunstmuseum, 2004), 1.

[29] Crary, "Your Colour Memory," 3.

2.7 *The place you can see and hear*

The installation *The place you can see and hear* (2012) has so far had six incarnations in a variety of locations in Brussels, Belfast, Kent, East Flanders and London (see Appendix 2). It pushes the process of freezing one stage further by using a live microphone feed as a source and takes the possible comparison between sound-freezing and photography quite literally by placing the two elements together in the same installation. The visual aspect of the work consists of a room-sized camera obscura, which is effectively half a camera, but lacks the chemical fixing agent needed to produce a permanent photograph. It looks for the most part like a projection of eerily high quality. The action that takes place in the projected scenes is by its very nature continuous, in contrast to the illusory motion produced by regular film and video. There is also an element of physiological co-authorship in *The place you can see and hear*. On entering a very dark space after being in a bright one, it takes the eye 30 to 40 minutes to fully get used to the darkness and therefore see the image at maximum luminosity. There is an unavoidable visual 'fade-in' to the work that is the result of the reactions of the rods and cones on our retina, and serves as a reminder that the enormous range of brightness levels that we can perceive (one to ten thousand million)[30] is subject to a period of adjustment.[31] The idea of the 'frame' as manifested concretely by the projector screens, and temporally by the patterns of alternating frozen and unfrozen sound, is central to the work. The presence of these frames asks us to consider at what point in the process of creative mediation/ interference, the raw sonic and visual materials might be considered a work to be contemplated and experienced as art, rather than just a live streaming of reality.

The sonic element in particular teeters on the edge between music and non-music (audio example 2.3). On one hand the sound is composed: it is coaxed into a fixed rhythmical framework of accelerandos and decelerandos, and its spectral content broken open and extended into chords. On the other hand, the sound is clearly at the mercy of the 'accidental dramaturgy of what happens', be it helicopters passing

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[30] More on this in Chapter 4 when I compare hearing and seeing.

[31] In fact the dark adaptation curve has two stages. The cones recover and adapt to the dark after 10 minutes, but the rods take much longer and only regain full sensitivity after 30 to 40 minutes.

directly overhead, people talking or very little at all. In some ways the sound here is a 'live' version of that found in *Artificial Environments Nos.9a-d*, especially with regards to the patterns of expanding (and in the case of the installation, shortening) freezes. However, the freezing aspect of the work also differs significantly to that of the ensemble piece exactly because the material to be frozen is live and never recorded, only buffered by the patch. This means that after a freeze takes place, instead of going back to the point just after the freeze was captured (as happens when a recording is used), the patch simply returns to the live stream. For the duration of the freeze whatever is happening in real-time outside the installation is not heard by the spectator and the freeze effectively smoothes over a moment of abridgement. The audio part is therefore full of gaps with regards to its relationship to the reality it is supposed to be 'streaming'. This aspect of the installation is most noticeable when people are holding a conversation near the microphones (audio example 2.4). The pattern of freezes and non-freezes, especially when alternating quickly, causes a kind of half temporal pixilation to take place that effectively scrambles the contents of the speech, and acts as an (unintentional) safeguard to privacy. The frozen segments of sound are of uniform timbre and frequency content, like a pixel in a computer image which is only one colour. These frozen segments lack the fast moving audio detail of real sound and information is lost. The pixilation is only 'half' because the freezes alternate with unfrozen microphone feed in which these sonic details are still available to the listener.[32] In fact, this is the first freezing piece in which I was able to make the freezing patch produce a pattern alternating four times a second. At this rate, the freezes lose their peculiar significance almost entirely and give an impression of a kind of stuttering through reality. Because the alternating patterns of freezes and non-freezes are decelerating and accelerating, it is possible to determine a gradual transition between the two opposite qualities of frozen moments (stuttering or significant) as those moments expand and contract in duration.

In some ways, the installation might be thought of as the inverse of Eliasson's *Model for a Timeless Garden.* In *The place you can see and hear* two temporal worlds exist

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[32] I will talk more about pixilation in Chapter 4.

side-by-side, but in this case it is the image that provides the evidence of a continuously changing reality and the sound that presents this reality in an abridged form. However, both works are concerned with the senses and set up a situation where sound and image become almost entirely untethered from one another through polarization into either continuous or discontinuous presences. If Eliasson recalibrates our senses with his strange arrangement of abstract elements, I hope that *The place you can see and hear* in turn performs a similar function but in a site-specific context where the material is (more or less) unpredictable real life.

In these two installations we have seen how an audience member can be involved in a piece and even be considered a 'physiological co-author' of it, because of the involuntary work (the making of positive after images or retinal fade-ins) done by the senses. The question remains as to what this might mean in terms of our relationship with media art beyond simply an encounter with, and participation in the spectacular. I believe the answer may lie in the idea that both these pieces draw

Fig. 2.5 Joanna Bailie — *Performance Space #1/Rue Darimon* (Brussels, September 2012)

Fig. 2.6 Joanna Bailie — *Donegall Street* (Belfast, April 2013)

Fig. 2.7 Joanna Bailie — *Northampton Square* (London, June 2013)

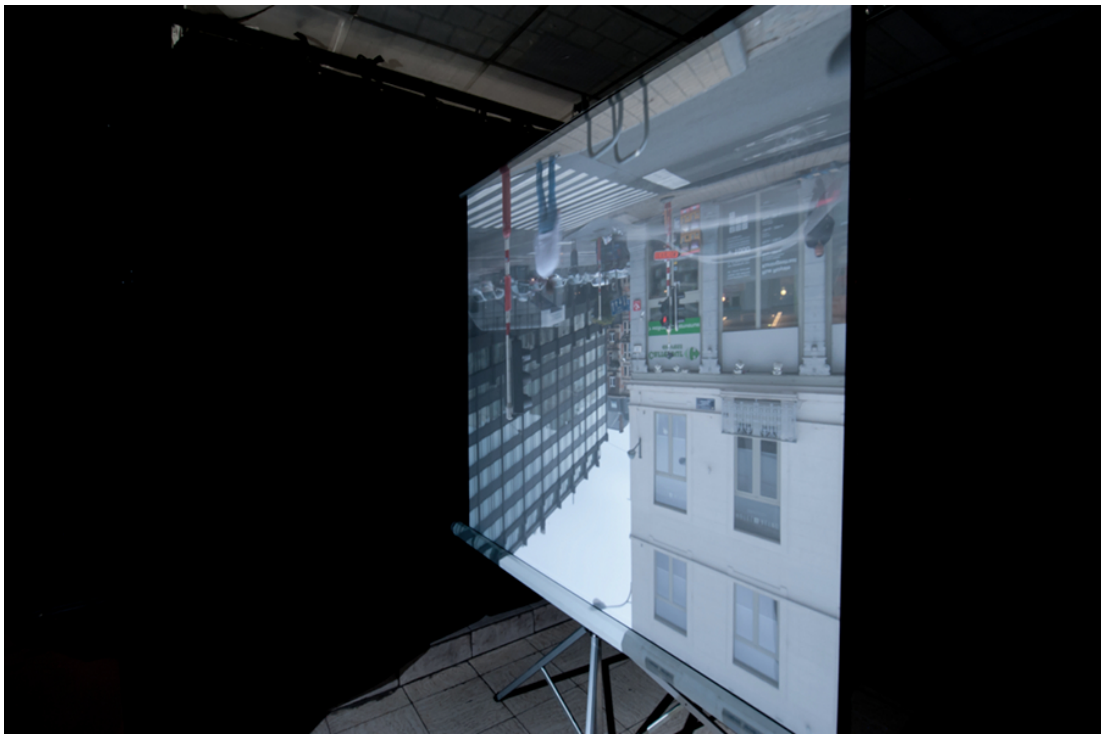

Fig. 2.8 Joanna Bailie — *Rue Royale/Rue Traversière* (Brussels, June 2013). Photo: Sophie Degroote.

attention to aspects of existing media, either by showing us how they do not work (the infinite resolution of the camera obscura is a reminder of the lower quality of image we are used to in TV and film), or by exaggerating them strangely (the strobe-lit fountains resemble a series of separated and slowed-down movie frames). We will encounter this artistic strategy of drawing attention to the way media works consistently throughout this thesis, though the manner and precise reason for raising this kind of awareness may differ from piece to piece.

2.8 Getting from freezing to slow-motion via film

Taken as an abstraction, it is hard to think about the existence of a continuum of time axis manipulation with freezing at one end and fast forward (or even verticalized time) at the other. How do we get from freezing to slow motion even though they are 'adjacent' elements on this series? As I suggested in the introduction, there is a fundamental aporia between the two states, the zero velocity of the freeze is somehow isolated from the rest of the continuum with no way in which to kick-start

it into life. However, we can cheat a little by transposing the problem into the realm of film. Film's easily imagined discrete units (frames) are in any case already moving at a fixed velocity, providing a technological structure which can easily accommodate freezes and slow motion, simply through the alteration of the rate of change of images. A freeze-frame is the repetition of the same image, and a basic type of slow motion called half speed works in a comparable way by repeating pairs of frames (a sequence of mini freezes-frames).

Laura Mulvey has written about the freeze-frame and the way it provides a conceptual and material bridge between the photograph (which it resembles) and film (of which it forms a part). Mulvey is interested in the idea that the 'stopping of time' represented in the freeze-frame is fundamentally two-fold in nature.

> The freeze-frame ending leads in two directions, one that relates primarily to narrative and the other that relates to the materiality of film. First of all, the freeze frame represents the fusion between the death drive in narrative and the abrupt shift from the cinema's illusion of animated movement to its inorganic, inanimate state.[33]

Perhaps the relative scarcity of freeze-frames in movies is due to this 'double-punch' that they pack, and the ease with which such striking effects can become cliché. A large number of the most well-known (or at least the most written about) freeze-frame moments occur at the end of movies, underlining the cessation of the film's narrative journey, a fact that perhaps hints at the difficulty of having anything happen after this rupture of film time.

Another interesting aspect of the freeze-frame is the way that it is handled within the intermedial context of sound film. If the visual freeze-frame, as Mulvey says, brings into question the materiality of film, then it also raises in turn the issue of the

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[33] Laura Mulvey, *Death 24x a Second: Stillness and the Moving Image* (London: Reaktion Books, 2011), Kindle edition, loc. 1199-1206.

materiality of the sound that accompanies the film, the way that the sound and image are linked, and indeed easily decoupled. David Campany addresses the question of what sound 'goes' with a freeze-frame.

> Sound is always disrupted. Sound does not come in frames and cannot be suspended in the same way. The freeze frame must either be left silent (very rare, either in mainstream or avant-garde films) or it is domesticated by non-synchronous sound such as music or a voice-over. But most often the synch-sound continues after the freeze, emphasizing its silence as much as its stillness.[34]

After reading Campany's text I carried out a small survey of few well-known freeze-frames. Indeed, *Thelma and Louise* and *The 400 Blows* both employ music (and a little ambient sync-sound in the case of the *The 400 Blows*) to accompany their final freeze-frames. Satyajit Ray's *Charulata* keeps a few seconds of silence before continuing the musical soundtrack, and during the mid-story flashback freeze-frame in *Goodfellas*, the sync-sound of an explosion continues unfrozen. Campany as we know, is absolutely right when he points out the essential difference between recorded sound and image, and the fact that the sound cannot be suspended using the same techniques as film, but that is not to say that it cannot be frozen in a different way, as we saw earlier in the chapter. Tim MacMillan's video work *Dead Horse* (1998) and the feature film *The Matrix* (1999) both employ frozen or slow motion sound of some sort to accompany the images. It is perhaps important to note that in both these films, the freeze-frames are of central importance, and in the case of *The Matrix*, part of the actual narrative. This all suggests that a freeze-frame with a regular-speed soundtrack is an editing device that is conventional enough to be absorbed into a realistic narrative, whereas time-manipulation of the sound accompanying a freeze-frame will push the reception of that narrative moment into the realm of fantasy and science-fiction.

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[34] Campany, *Photography and Cinema,* 56.

2.9 Intermedia

In *Varieties of Audio Mimesis*, Allen S. Weiss traces the history of the ideal unifying artwork or *Gesamtkunstwerk*. For Weiss, the incarnation of the Gesamtkunstwerk has been subject to historical and cultural change; in the 18th century it was epitomized by the encyclopaedia, in the 19th century by Wagnerian opera and the novel, in the first half of the 20th century by film and in the latter half of the 20th century by multimedia works.[35] I would prefer to avoid this historically loaded term, however, and turn instead to intermedial theory to provide a less unwieldy replacement for the kind of composite forms we are talking about.

Jens Schröter has arranged the various types of intermediality and the discourses surrounding them into four categories.[36] His first category, what he calls "synthetic intermediality"[37] [38] consists of the "fusion of several media into a new medium"[39] and owes a great deal to the ideas put forward by Fluxus artist Dick Higgins[40] and media theorist Marshall McLuhan. Synthetic intermediality finds its force in new combinations of media the meeting of which create as McLuhan says, "a moment of freedom and release from the ordinary trance and numbness imposed by them on our senses".[41] In order to maintain this effect, intermedial forms must be continually renewed before we become inured to them, perhaps explaining Weiss's list of historical shifts in the nature of the unifying artwork. Breaking the habits of

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[35] Allen S.Weiss, *Varieties of Audio Mimesis: Musical Evocations of Landscape* (Berlin: Errant Bodies Press, 2008), 12.

[36] We have already encountered his third type, "transformational intermediality" in Chapter 1 in relation to Sugimoto's photographs. I have not found types two and four useful for the purposes of this thesis, but for the sake of completeness I will quickly outline them. Type two "transmedial intermediality", concerns the possibility of structures such as narrative that can be transferred from one media to another, and type four "ontological intermediality" is about how to define different media in relation to each other. See Jens Schröter, "Four Models of Intermediality," in *Travels in Intermedia[lity]: ReBlurring the Boundaries,* ed. Bernd Herzogenrath (Lebanon: University Press of New England, 2012), Kindle edition.

[37] Schröter, "Four Models of Intermediality," loc. 427.

[38] We could categorize many of the works we have been talking about as types of synthetic intermediality, including sound movies in general, *Model for a Timeless Garden* and *The place you can see and hear*. Both installations might be seen as live proto-cinematic works, contrasting continuous and discrete elements, with the camera obscura in *The place you can see and hear* functioning as a film free from what Laura Mulvey calls the 'detour' in time required by the developing and printing process. See Mulvey, *Death 24x a Second*, loc. 207-210.

[39] Schröter, "Four Models of Intermediality," loc. 428.

[40] See Dick Higgins, "Intermedia," *Leonardo* 34 (2001): 49-54.

[41] Schröter, "Four Models of Intermediality," loc. 445-50.

perception through art is of course a central theme of this research. However, there is something slightly daunting about the idea that this can only be achieved through a series of ever-changing formats. Our work as artists in this case then, is the continual renewal of media forms rather than consolidation of those forms — it is an ongoing search for the new and never seen/heard before. It is unsurprising that so many of these new embodiments of the intermedial involve a recycling of older (and forgotten) forms in a process that is a kind of media archeology.

One possible attribute of a synthetically intermedial artwork is that it directly addresses more than one sense at a time — those senses being more often than not sight and hearing. How image and sound are put together or go together is of great importance to ideas of intermediality and so it might be time to remind ourselves of the way this is executed in a standard film projector. The film frames and optical soundtrack are both present on the reel but must be treated separately by the sound and image processing compartments. While the optical soundtrack has to be fed continuously through the sound reader at a steady speed, the film stops momentarily on each frame in the image compartment. The difference between these continuous and discrete movements means that corresponding sound and image must be printed at different points on the reel and so what will eventually appear to be synchronized in projection, is physically decoupled in terms of the material. It could be said that the functioning of a film projector embodies the fundamental gulf between recorded image and sound in the realm of analogue media.

The last two works I want to talk about in this chapter, Douglas Gordon's film installation *24 Hour Psycho* (1993) and Lief Inge's sound art piece *9 Beet Stretch* (2004), when taken together might also be seen to embody this gulf between image and sound. Though they are not synthetically intermedial works in the sense that they contain audio and visual elements equally vying for our attention, we will think about them intermedially by looking at one through the lens of the other. The works are built around similar ideas executed in the visual and audio domains: *24 Hour Psycho*, is a slowing down of Hitchcock's 1960 black and white thriller, notable for

having relinquished the film's famous soundtrack in favour of silence, while *9 Beet Stretch* lengthens Beethoven's Symphony No.9 so that it lasts a day, without altering the pitch of the source recording.[42] Both pieces are presented as installations in which the public is at liberty to come and go as they wish. What I would like to propose is an exploration of the intermedial space lying between and around, rather than within these two works, through a process of cross-analysis. The points of resemblance are evident; one might at first glance even consider one work to be an audio equivalent of the other. However, as we shall see, beneath these easily forged links lies a gap full of intermedial confusion, born of the differences between recorded sound and image media, and heightened by the means used to alter 'speed'.

2.10 *Slow-motion sound* and reflecting the possibilities of the age

In order to last 24 hours, Hitchcock's *Psycho* must be slowed down by a factor of 13.21 and Beethoven's Symphony No.9 by a factor of between 19 to 23, depending on the recording used.[43] The variation of time-stretch factor in *9 Beet Stretch* reminds us of something quite important: it is the recording of the symphony rather than the symphony in another sense (the score, live performance or the version in our heads) that is the subject of the manipulation. In terms of slowing down its subject, *24 Hour Psycho* presents few technical problems. It involves changing the playback speed of the original film, a technique that is available on film projectors, VHS decks and DVD players. Time axis manipulation has existed for as long as the technologies it is created on, and indeed non-intentional changes in playback speed were an aspect of these technologies in their earliest forms. Presumably it would even have been possible to make *24 Hour Psycho* in 1960 as soon as the source film came into circulation using a modified film projector. *9 Beet Stretch* differs form *24 Hour Psycho* in that it does not involve a simple change in playback speed. Its creation is a testament to the fact that by 2002, the year that the first test version of the work was made, the digital technologies for time-stretching sound without altering its pitch had advanced markedly. The algorithm used to stretch the sound is granular based and

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[42] *9 Beet Stretch* might well be considered a work of plunderphonics (see 1.3) and *24 Hour Psycho* 'plunderoptics'.

[43] From the *9 Beet Stretch* website: http://www.expandedfield.net/

was developed by Bill Schottstaedt as part of the Snd, and then Common Lisp Music environments. It takes successive 100 millisecond sections of the sound, and then duplicates and overlaps these grains to produce the effect of elongation.[44] The process, in common with my audio-freezing technique, involves tiny sections of overlapping enveloped sound, but unlike the audio-freeze, it takes place entirely in the time domain. Again, we are confronted with the fact that certain types of time effects that are easily achievable in film and even in some respects inherent to the discrete frames of the technology itself, are much more complicated to imitate in sound and require extensive (digital) manipulation. Perhaps 'imitate' is the important word here, sound it seems often takes its cues from film (rather than vice-versa) as is evident in the following example from Steve Reich.

In 1967 Reich created a conceptual work entitled *Slow Motion Sound*. It consisted of the following instruction: "Very gradually slow down a recorded sound to many times its original length without changing its pitch or timbre at all."[45] Writing about the work seven years later in 1974, Reich explains that although some non pitch-shifting time-stretching techniques were available at the time in the form of early vocoders and tape decks with multiple rotating heads,[46] they were not able to lengthen the sound to the extent and in the way that Reich desired. What is perhaps most interesting in Reich's commentary, is that he sees his non pitch-shifted 'imagining' of slow-motion sound as the natural analogue of slow motion in film.[47] He also considers the slowing down of both audio and film as a way of revealing hidden aspects of a recording:

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[44] Bill Schottstaedt, email message to author, July 14, 2013.

[45] See Appendix 3 for a copy of the score.

[46] The Springer Tempophon, Varisphrase and Eltro Information Rate Changer were all versions of a multiple tapehead device developed in the 1960s. These machines could also alter pitch without changing length and were used to manipulate the voice of Hal the computer in Kubrick's *2001— a Space Odessey* (1968) and on the Beach Boys album *Smiley Smile* (1967). The composer Wendy Carlos wrote about the Eltro device in a text available on her website http://www.wendycarlos.com/other/Eltro-1967/.

[47] Steve Reich, *Writings about Music* (Halifax: The Press of Nova Scotia College of Art and Design, 1974).

> The roots of this idea date from 1963 when I first became interested in experimental films, and began looking at film as an analog to tape. Extreme slow motion seemed particularly interesting since it allowed one to see minute details that were normally impossible to observe. The real moving image was left intact with only its tempo slowed down.[48]

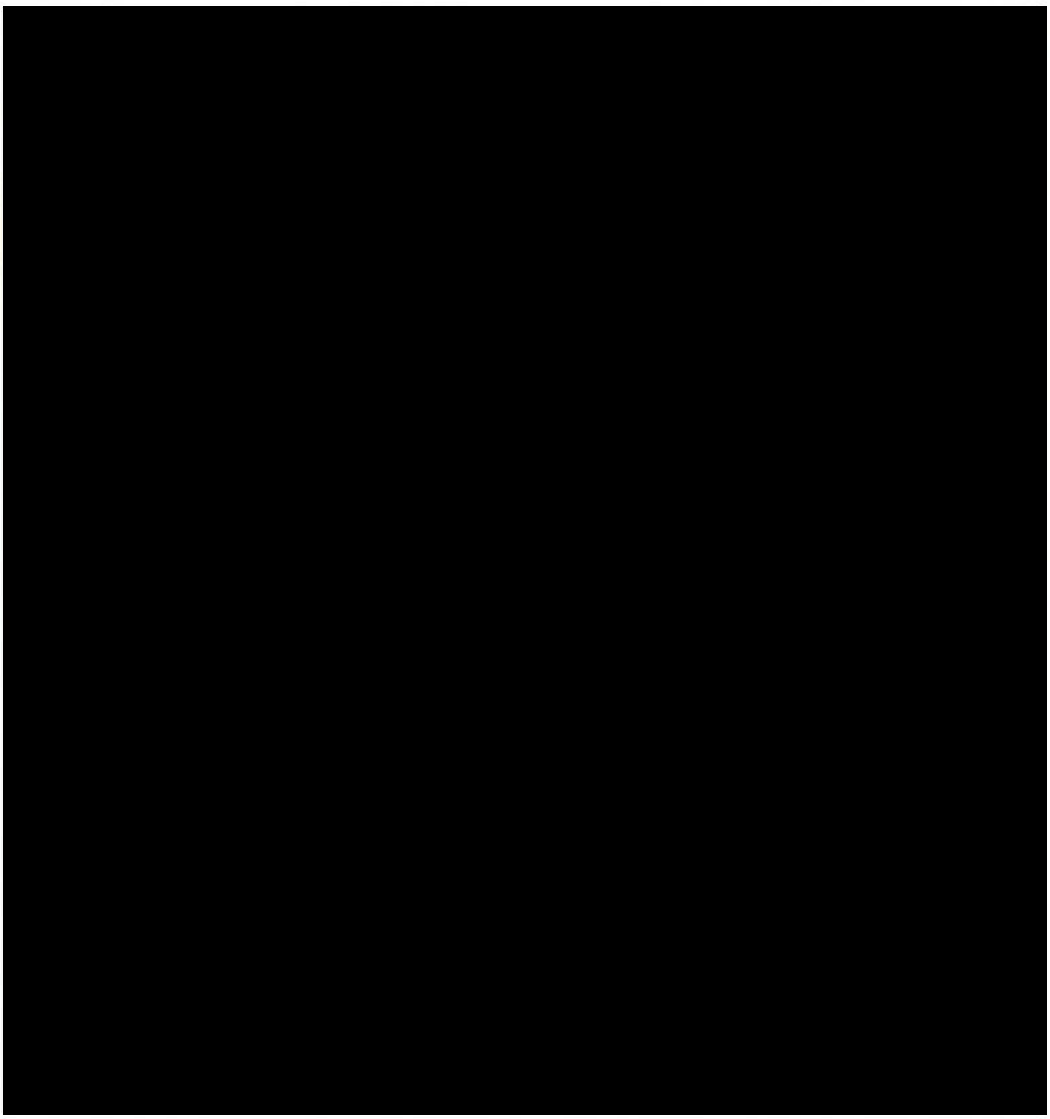

Fig. 2.9 Douglas Gordon — still from *24 Hour Psycho* (1993)

[48] Reich, *Writings about Music*.

2.11 Revealing

In fact Reich's search for extreme slow motion sound without pitch shift, seems to have arisen from a desire to examine transient elements in sound. Later on in the text he describes an experiment with slowed down speech using a vocoder, which allowed him to hear what he believed to be the melodic and timbral details of the voice. He eventually gave up on the idea of slow-motion sound because he did not consider the product of the vocoder's processing to be good enough. There is something inherently problematic about Reich's assumptions. Although we can describe the results of computer synthesis as sounding more or less real, it is quite difficult to judge the 'realness' of results when the object of the synthesis (slowed-down sound without pitch shifting) does not exist in any form other than as a computer synthesis. Reich is measuring the computer's output to the idea of slow-motion sound he has imagined in his mind. As in the section on freezing audio from earlier in the chapter, I would emphasize the use of the word 'imagining' to describe Reich's idealized notion of what slowed-down sound should be like.

In fact, when slowing things down, we might expect aspects of the sound or film recording to be revealed in much the same way as they are through audio freezing and photography due to the longer duration we have been given to observe them. Again we can turn to Benjamin and the optical unconscious. He speaks of "image worlds, which dwell in the smallest things—meaningful yet covert enough to find a hiding place in waking dreams".[49] Norman Bates's strange parlour, filled with stuffed birds, might be such an image world that can be accessed and studied in detail because of *24 Hour Psycho'*s change in speed (video example 2.2). In the context of the source film, the parlour scene not only passes much more quickly, we also tend to concentrate on the dialogue and unfolding of narrative rather than the specifics of the set design. However, an even more prominent consequence of slowness is the way in which the speed of the installation changes our perception of certain gestures. Rather like the audio freeze, the slowing down seems to encourage us to pick out certain aspects of the film, and give them an ambiguous significance with which they were

[49] Benjamin, "Little History of Photography," 511.

not originally invested in the frame of *Psycho*. In the same parlour scene, Marion appears to be regarding her sandwich disdainfully while batting her eyelashes quite deliberately at Norman, and as a result I start to reassess the nature of the story and the relationship between characters that I thought I knew from the original movie. Later on in the installation, the pace at which Marion's sister gets out of the car and enters the hardware store renders the moment mysterious, full of a glacially unfolding not-quite-suspense. These strange new readings of the action of *Psycho* that take place when watching *24 Hour Psycho* are understandably greatly facilitated by the fact that there is no soundtrack to offer more information or point the narrative in a particular direction.[50]

Slowing down a film shot at 24 frames per second by a factor of 13.21 also serves to reveal the frame itself. At the slower speed, we get just under two frames per second and the basic mechanism of film, this rushing past of separate but sequential images that gives the illusion of motion, is uncovered and its smallest unit foregrounded. As we will see in Chapter 3, addressing the illusory nature of film by showcasing its materials is an activity that is frequently carried out by the film avant-garde. Such an act could be thought of as another way of 'recalibrating the senses' of the audience, or at least reminding them of the nature of a media convention they have become very much accustomed to. We are also confronted by the fact that our eyes are easily fooled: 24 frames per second is not very many and when slowed we can see the limit of film's 'temporal resolution'. Don DeLillo describes *24 Hour Psycho* in the prologue to his novel *Point Omega* from the vantage point of a museum visitor fixated by the work. This passage beautifully describes the revelation of the discrete in what had previously seemed continuous:

> Anthony Perkins is turning his head. It was like whole numbers. The man could count the gradations in the movement of Anthony Perkins' head. Anthony Perkins turns his head in five incremental movements rather than

[50] Though presumably these sounds would have been slowed down. There will be more discussion of this in section 2.12.

> one continuous motion. It was like bricks in a wall, clearly countable, not like the flight of an arrow or a bird.[51]

The comparison between *24 Hour Psycho* and *9 Beet Stretch* becomes more difficult when we start looking at the works in terms of what they do or do not reveal. *24 Hour Psycho* does not exist as a material thing, there is no video file of the work full of the duplicated frames that would be necessarily made as part of its creation. Instead, the work consists of the movie *Psycho* and the apparatus for slowing it down. This means that *24 Hour Psycho* has a fundamental material connection to its source film and nothing extra is 'made' during the time-stretching process. This is not the case with *9 Beet Stretch,* which creates a great deal of new material (duplicated grains) in its endeavour to slow down without shifting pitch. In light of our knowledge of how synthetic it is, regarding *9 Beet Stretch* as a reliable 'temporal microscope' proves problematic. I am surprised at how unquestioning Kyle Gann is of the relationship between source recording and time-stretched version:

> Crawling across Beethoven's magnum opus with a microscope, so to speak, with every note stretched out to 24 times its normal length, is frighteningly revealing. One thing you learn is that string sections aren't exactly synchronized; those melody notes bleed into each other. Also, the timbre of European classical music isn't as pretty as you think. In the fourth movement (which Inge's website splits into fourth and fifth movements, for some reason), the rasp of horsehair against strings while sopranos hold forth on high Gs, sustained instead of allowed to bounce by, has a noticeable fingernail-on-the-blackboard quality.[52]

I do not know if Reich would be impressed by the output of the algorithm used to create *9 Beet Stretch*. To my ears it certainly, for the most part, sounds 'orchestra-like' and only occasionally resembles a swarm of insects (an effect I imagine caused

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[51] Don DeLillo, *Point Omega* (London: Picador, 2010), Kindle edition, loc. 57-61.

[52] http://www.villagevoice.com/2004-02-10/music/norwegian-minimalist-raises-beethoven-molto-adagio-bar/1/

by the shimmering results of granulation). From time to time I hear a partial very strongly, especially in unison lines, and I wonder if it might be the product of grain superimposition rather than a transient element of the source recording revealed through slowing down. Trying to prise apart artefacts of the processing from what might have been 'brought to light' by being stretched is perhaps not a very satisfying way of approaching *9 Beet Stretch* (audio example 2.5 from the 4th movement). Inge himself is not interested in revealing the performance details of the source recording, and cites making "the grand gesture massive" as a primary goal of the work.[53] It seems that Inge wishes us to keep the connection between the installation and its source work in mind, as evidenced of course by the title and his suggestion to follow the score while listening.[54] In fact I find myself increasingly inclined to approach the work on its own terms, by which I mean as a work in its own right independent of constant cross-referencing to Beethoven. There is a case for listening *to 9 Beet Stretch* as a surprisingly differentiated series of micro-textures that unfold, one after the other.

2.12 The roads not taken

What about the piece that Leif Inge did not make, the slowing down of Beethoven's Symphony No.9 to 24 hours *with* pitch shifting? In terms of revealing the limits of the recording media it certainly fares better as an audio equivalent to *24 Hour Psycho*. I made a few small sections of this alternative version using a Karajan/Berlin Philharmonic recording of the symphony from 1963. The recording was slowed by a factor of 21.47, which is equivalent to transposing the material down 5309 cents (just over four octaves and a fourth). By reading through the audio information more slowly, the effective sampling rate is reduced from 44.1 kHz to 2054 Hz and it is in this regard that the nature of a digital audio recording become apparent. The highest frequency offered by a 2054 Hz sampling rate is 1027 Hz, placing the frequency 'ceiling' of the alternative version near the centre of our range of hearing (from a logarithmic perspective) rather than just beyond it. One can hear this ceiling, what

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[53] Leif Inge, e-mail message to the author, July 11, 2013.

[54] Inge, e-mail message to the author, July 11, 2013.

was high-frequency noise of around 22 kHz in the original recording, transformed into an airy whirring sound that seems to contain alternating pitches (audio example 2.6). The temporal resolution of the frame that is uncovered in *24 Hour Psycho* is mirrored by the lowered sampling frequency in this time-stretching of Beethoven, but only to a limited extent. The temporal resolution of film and the upper frequency limit of a segment of digital audio can never really be equivalent things given the differences in how visual and audio events are captured. By bringing the sampling rate into the range of audibility, the alternative version of the Beethoven stretch offers us another reminder of the time-dependent nature of frequency.

Inge briefly thought about making a version of *9 Beet Stretch* with pitch-shifting, but abandoned the idea, preferring to wait for the non pitch-shifting algorithms to evolve.[55] I think that it was probably a good decision in the end: despite its inherent fakery, *9 Beet Stretch* closely matches our 'imagining' of what a Beethoven symphony might sound like rendered (I hesitate to say 'played') extremely slowly and that creates quite a powerful experience. My slowed playback version of Beethoven has an extremely limited frequency range and this does not make for interesting extended listening. It maintains an ominous low rumbling throughout, never breaking into a perceivable tune except in the louder choral sections (audio example 2.7), where partials in the original recording extend up to very high frequencies (and even then its not quite the melody you might expect). Transposing music and sound over four octaves downwards is a great equalizer of the material — most things trapped in the range between 0 and 1000hz will inevitably remind us of submarines or orchestras of double basses (playing only on their lowest strings). Even though the process of simple time-stretch is relatively 'unfake', it is destructive to our ears: almost nothing of what we think of as Beethoven's Symphony No.9 is left.

We could also talk about the alternative versions of *24 Hour Psycho* that Douglas Gordon did not make, those either containing pitch-shifted or non pitch-shifted

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[55] Inge, e-mail message to the author, July 11, 2013.

slowed-down sound. Again, having tried out the first of these, I can report that some of the audio from the movie holds up quite well after the pitch shifting of 4468 cents: the screeching strings of the shower scene turn into strange wavering held chords (audio example 2.8) and dialogue into an eerie clicking. I imagine this version of a slowed-down psycho would certainly be a rich one, full of potential intermedial comparison and exhibiting the same type of dislocation of sound and image that we observed in *Model for a Timeless Garden* and *The place you can see and hear*. However, Gordon's choice of silence creates another experience focused on visual information and generating an atmosphere of extreme concentration. It seems that lying embedded in each artwork, are all the works that it is not, but might have been.

2.13 Culture and slowness/ the role of memory

David Campany has observed that experimental film tend towards extremes of speed, whereas mainstream movies occupy a middle ground of not too fast, not too slow.[56] In terms of avant-garde film, this slowness can manifest itself in the extreme slow motion found in the works of Douglas Gordon or Bill Viola, or the slowness brought about by a choice of near-static subject and manner of shooting, as in Andy Warhol's *Empire* or Michael Snow's *Wavelen*gth. In the case of *24 Hour Psycho*, Gordon not only exposes the mechanism of film, he challenges us with a time-scale and rate of change that goes against narrative film conventions such as those displayed by the source movie. Campany believes that the slowness of certain experimental films "opened up a space for philosophical and aesthetic reflection *within* the film."[57] As we will see below, slowness can also open up a space for a different way of listening and looking. In her book on Eadweard Muybridge, Rebecca Solnit discusses the considerable changes in the speed of life that characterized the 19th Century. She describes a world, prior to the building of the railways, where extremes of speed and thus communication and travel, were set by the natural limits of horses, tidal movements and wind.[58] I would argue that the invention of various technologies not

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[56] Campany, *Photography and Cinema*, 36.

[57] Campany, *Photography and Cinema*, 37.

[58] Rebecca Solnit, *Motion Studies: Time, Space & Eadweard Muybridge* (London: Bloomsbury, 2003), 9.

only gave us access to extreme speed, but also to extreme slowness via certain types of media manipulation. Even theoretical physics might have fed into a culture of extreme speeds, both real and imagined — consider Einstein's example of a spaceship moving close to the speed of light and the slow motion of the people on board that would be seen by an observer.

An important aspect of both *24 Hour Psycho* and *9 Beet Stretch* is that they are adaptations of celebrated artworks. In Chapter 4 we will look at the idea of adaptation in more depth, but in the context of the current discussion it is worth referring to Linda Hutcheon's theory that the combination of newness and familiarity that occurs in an adaptation of a well-known piece is an inherently attractive one to the spectator.[59] If we take this idea a little further we could also imagine that for each of us, the deviations from the original material observed when experiencing the unfolding of an adaptation will be very different in kind depending on the extent and nature of our familiarity with the source. Personally speaking, I find that the quality of my familiarity with the source works is related to their genre. I know many passages and melodies from the Beethoven's Symphony No.9, especially from the beginning of each movement (I remember 'how they go'), whereas my familiarity with *Psycho* is more concerned with plot, the faces of the actors and the appearance of the locations. The only specific passage I can remember from the film is unsurprisingly that of the shower-murder scene. When experiencing the time-stretched works though, forehand knowledge of the source materials in real tempo can often be a source of frustration. While listening to the opening of *9 Beet Stretch*, I try to cross-reference the time-stretched music I am hearing with my memory of the opening, and inevitably 'get lost'. It seems as if the time-stretched version never arrives at certain markers I have in my head, or else they pass me by because I was listening out for the wrong things. Douglas Gordon explains this phenomenon in relation to his own work:

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[59] Linda Hutcheon, *A Theory of Adaptation* (New York: Routledge, 2006), 4-5.

> I was concerned above all with the role of memory. While the viewer remembers the original film, he is drawn into the past, but on the other hand also into the future, for he becomes aware, that the story, which he already knows, never appears fast enough. In between, there exists a slowly changing present.[60]

Susan Gaensheimer explains this idea in a different way. For her, the large-scale form has been stretched so far that it is impossible to follow the plot, and instead the experience of watching *24 Hour Psycho* is centred around the structural unit of the gesture (the turning of a head or a the closing of a car door) and the process of going from gesture to gesture.[61] Gaensheimer's comment might lead us to conclude that we should let go of our familiarity with the source material and engage with the time-stretched works anew, in terms of their vastly altered time-scales. It might be interesting to consider how Borges's character Funes the Memorious (who we will talk about further in Chapter 3) would deal with the installations if he encountered them having watched *Psycho* and listened to the Naxos recording of Beethoven's ninth beforehand. I imagine that either his prodigious autobiographical memory would be a hindrance to enjoyment and the experience excruciating, or that he out of all of us, would recognize the clear ontological distinction between source and time-stretched work, and it would not occur to him to attempt to cross-reference them.

2.14 D.I.Y. artworks and a different kind of creative spectator

Not having access to the installation *24 Hour Psycho*, I decided to make it myself at home using my computer and a DVD of the original Hitchcock movie.[62] Of course the result was only approximate, my computer's DVD player could only run the movie eight times more slowly (three frames per second) and watching the results on a laptop screen is hardly the same as looking at a projection in the context of a large gallery space. However, I do not think Douglas Gordon would disapprove of my

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[60] Douglas Gordon in Katrina M. Brown, *Douglas Gordon* (London: Tate Publishing, 2004), 26.

[61] Susan Gaensheimer, "Moments in Time," trans. Pauline Cumbers, in *The Cinematic,* 70.

[62] Video example 2.2 is the result of another DIY attempt. In fact there are several ways of approximating the effect of *24 Hours Psycho* at home.

approach. He claims that *24 Hour Psycho* is a 'D.I.Y.' piece that had its beginnings in a late-night experiment at home with a VHS copy of the film. In fact the first showings of the piece were not even 24 hours long; the Panasonic tape deck that was used to play the video had fixed slow-motion settings and was unable to slow it down by a factor as exact as 13.21. Until the availability of DVD technology then, *24 Hour Psycho* ended up being considerably shorter or longer than 24 hours.[63] To a certain extent, by revealing the humble origins of the work, its initial lack of technological precision and the ease by which it can be achieved, Gordon encourages us to try the same thing ourselves at home. Perhaps it is a way for the artist to avoid the pretensions of authorship of what is finally a very simple (though effective) idea executed using someone else's material.[64] Inge's *9 Beet Stretch* contains a similar component of D.I.Y., and the artist allows anyone to execute a version of the piece as long as the name of the work remains the same and Inge is listed as the creator. According to the score we may even use Mozart's Requiem instead of Beethoven's Symphony No.9 and a different algorithm to stretch the work as long as it is not pitch-shifted and is indeed 24 hours long.[65] We might see this idea of pieces we can execute at home as an extension of the freedoms that recent media have brought us as viewers and listeners. Laura Mulvey believes that this transformation of the relationship between observer and medium that began in the 1970s with home video (and presumably earlier for sound technologies) has been expanded further by digital technologies.[66] The kind of access we have to a movie as individual spectators via pause, rewind and fast-forward means that it can be read with the freedom of a text and its 'film time' revealed.[67] Mulvey speaks about:

> … the opposition between 'film time', the inscription of an image onto the still frames of celluloid, and 'cinema time', the structure of significance and

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[63] From an interview with Douglas Gordon at the Hirshhorn Museum that can be found at http://www.youtube.com/watch?v=SjYb6EN0v8w.

[64] Whenever a new gallery showed the piece, they would only hire the Panasonic tape deck from Gordon. For copyright reasons, they would have to source their own copy of *Psycho* and do-it-themselves.

[65] See Appendix 4.

[66] Mulvey, *Death 24x a Second,* loc. 258-63.

[67] Mulvey, *Death 24x a Second,* loc. 348-57.

> flow that constitutes the temporal aesthetic of any movie, fiction or documentary. Usually, the second conceals the first, but when the forward movement is halted the balance changes. The time of the film's original moment of registration can suddenly burst through its narrative time.[68]

The fact that we can dismantle a film to reveal its basic building blocks or negotiate our own path through a work, distorting its original timeline, humbles the artwork. The formal integrity of a piece and the context in which it is received is not subject to the control of the artist in the age of home media. Writing about the changes brought about by sound technology, Jonathan Kramer claims that music reproduction media have "liberated listeners from the completeness of musical form."[69] Indeed, on a purely autobiographical note, the habit of formally reconfiguring other people's music began for me a long time ago, years before the advent of digital technology — I fast-forwarded through the boring bits, looped the passages I loved and rarely left the original structure of the piece intact. Opportunities for audience creativity also exist in the more formal surroundings of an installation. Given the length *of 24 Hour Psycho* and *9 Beet Stretch*, it is not surprising that they are set up in a manner that allows visitors to come and go freely, move in the space (you can also see the back of the projection screen in *24 Hour Psycho*) and even lie down comfortably.[70] In this case then the audience is certainly responsible for setting the temporal limits of their experience simply by deciding how much of it they sample and if they will sample it more than once. The process of lengthening the source material, as I have mentioned in the previous section, has all but erased the narrative and formal drive of these sources in the case of both installations. The works are very long and appear to evolve only very slowly. Within this context we could return to the idea of Jonathan Kramer's 'vertical music' that we looked at in the introduction. In addition to its characteristic ability to 'telescope' time, Kramer further defines vertical music as lacking in hierarchies, suspense and signposting, while not ever leaving the limited

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[68] Mulvey, *Death 24x a Second,* loc. 399-403.

[69] Jonathan Kramer, *The Time of Music: New Meanings, New Temporalities, New Listening Strategies* (New York: Schirmer Books, 1988), 69.

[70] Beds and hammocks have been provided in some of the installations of *9 Beet Stretch*. When I heard the piece at the Brussels Kaaitheater in 2006, many audience members were lying on benches.

area of activity that it has carefully cordoned off for itself.[71] Following this definition, I think that *9 Beet Stretch* and *24 Hour Psycho* could be considered respectively 'vertical music' and 'vertical film'. *Model for a Timeless Garden* and *The place you can see and hear* as well as many of the other works discussed in this thesis might also qualify as vertical pieces. For Kramer, one of the most important aspects of vertical work is that it challenges the spectator to make something out of the work through his or her own changing attention, to be active rather than passive in order to avoid boredom. Kramer states:

> He or she must chunk it, according to individual criteria (since the music lacks unequivocal cues) He or she must create hierarchies. He or she must provide contrast by focussing on different aspects. The listener can thus become more important than the composer.[72]

In fact this is just another facet of the idea of spectator as co-author of the work that we talked about in relation to Olafur Eliasson, but in this case it is the configuration of our attention rather than our raw senses, that are the focus of the co-creation.

2.15 Conclusion to Chapter 2

In Chapter 2 we have begun to cover many of the main issues outlined at the beginning of the thesis. As we have just seen, the availability of media for consuming artworks, and perhaps more importantly the technology for making things with media, has vastly increased in recent decades leading to the possibility of 'D.I.Y' approaches for both spectator and artist. In some ways increased access to audio and film editing software might close the gap between spectator and artist, or even between artists working in different disciplines (more on this in Chapter 3). Some works, like the four installations we have looked at in this chapter, invite a certain amount of audience participation inasmuch as a visitor may shape their experience of the piece by walking in or out of that piece, or focusing their attention as they wish.

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[71] Kramer, *The Time of Music*, 384.

[72] Kramer, *The Time of Music*, 384.

In fact, we may shape any piece we hear through the fluctuations of our attention, even in the more traditional context of the concert hall. However, perhaps a more important source of participation in relation to our subject matter is the physiological co-authorship that occurs when elements are present in a work which rely in their effect on the way our senses react to them. Jonathan Crary believes that in having his or her senses stimulated in an extreme way, a spectator may in turn be inclined to question the nature of the sights and sounds that they come across in real life. More precisely, an encounter with, for instance, the limitless temporal and spatial resolution of a live camera obscura image, may remind the observer of the way 'normal' media function. Ubiquitous, sample-based media will be the focus of the following chapter and as we shall see, they are still reliant on audience participation, albeit of a more low-key variety.

Media may also engage with us in terms of being able to tell us something about the world. In contrast to the long-exposures photographs we saw in the first chapter, snapshots, especially high-speed photography, can be useful and reveal things that pass too quickly to be apprehended (what Walter Benjamin refers to as the "optical unconscious"). The audio-freeze is a slightly uncomfortable sonic equivalent to the photograph — and the way that it is made (or 'faked') by digital signal processing casts doubt on its evidentiary value. However, it does provide a useful tool for the composer wishing to squeeze latent harmony and timbre out of the complexity of a sound recording, and just like the photograph, its apparent suspension of time can generate poignancy, and an underlining of the nature of experienced time with regards to our feelings about past, present and future. Slowing down recorded events rather than just freezing them, also offers promises of discovery. However, in Douglas Gordon's *24 Hour Psycho* this slowness leads to a confrontation with the limits of the recording technology itself, and film's relatively low temporal resolution of 24 frames per second. Slowing down audio while maintaining pitch is also problematic if not more so, and the way that Lief Inge's *9 Beet Stretch* achieves time-stretching, with its tiny multiplied grains of sound, casts doubt not only on the idea of revealing aspects of the source recordings, but perhaps more importantly on any

notion of simple audio-visual equivalences. These two works underline the differences in how sound and image are recorded and manipulated, but regardless of this, they also both provide rich experiences for the spectator due to the interplay of memory and slowness with familiar material. Memory and media will be of key importance in the following chapter, and the adaptation of existing material will be further explored in Chapter 4 in relation to orchestra works by myself and Peter Ablinger.

We have also seen how the idea of loss may manifest itself when we are dealing with sampling media. The black-outs between fountain snap-shots, the flattened temporalities of photographs, and the held chords of the live audio-freeze represent moments when information is missing or lost. We might think of the loss incurred by these discrete forms as the flip-side of the opportunities for discovering the transient that they offer. This issue of loss will be examined in detail in the next chapter where we will cover media forms that consist of a string of discrete samples. In fact, Chapter 3 will take us away from the temporal science fiction of freezing and slowing down that we have been exploring here in Chapter 2, back towards reality and the frictional space between it, and the not-quite-sameness offered by time-based indexical media.

Chapter 3

SAMPLING MEDIA: GAPS, NOSTALGIA AND MEMORY

3.1 Introduction

The French filmmaker Jean-Luc Godard is frequently quoted describing cinema as "truth 24 times per second".[1] I would like to transpose Godard's statement and apply it to digital audio as well, which at a standard CD sampling rate might be said to be a kind of truth (if indeed a voltage reading constitutes 'truth') 44,100 times per second. Sound-media traversed Kittler's categories over three decades ago, leaving behind the continuous formats of gramophone and magnetic tape, and entering into the realm of the digital and therefore the discrete. The idea of 'sampling' as being common to both film[2] and digital audio serves as the starting point of this chapter and allows us the opportunity to make another rather odd intermedial comparison between seemingly disjunct forms.

Godard's statement contains an implicit criticism of the medium in question, one which might prompt us to modify the original citation and state instead that "cinema is truth *only* 24 times per second." Why could it not be truth 240 or 2400 times per second, or even truth for the whole continuous duration of that second? What about those in-between moments, short as they are, when the rotating 180º shutter of the movie-camera is closed and whatever it is that happens during this 48th of a second fails to register on film? The notion that film and digital audio 'lie by omission' is of central importance here, and we will begin this chapter by looking at the ways in which fooling the eye and the ear with only a partial rendering of reality came about, and how this was facilitated by the nature of our own physiology.

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[1] The quote comes from Godard's 1963 film *Le Petit Soldat*. Laura Mulvey, *Death 24x a Second: Stillness and the Moving Image* (London: Reaktion Books, 2011), Kindle edition, loc.156-159.

[2] When I talk about film in this chapter, I generally mean traditional celluloid film, though many of the points that I make also apply to digital film, since it also consists of discrete frames. Of course digital film is (more easily) comparable to digital audio and we will talk about the ease of adaptation afforded by the digital format later on in this thesis.

Throughout the chapter we will examine artistic work that has chosen to unpack the mechanisms of illusion machines. John Smith's film *Leading Light* foregrounds the inherent gappiness of film by exaggerating these very gaps via time-lapse photography, a process that often reveals more than it omits, while 'flicker' film focuses on underlining (rather than disguising) the medium's inherent 24 times per second rhythm. In glitch music, however, the digital format is taken apart not so much by revealing the individual sample, but by showing what happens when one overrides the mechanism of a CD player and highlights the detachment between what we think of as the original sound and its digital encoding.

In the last part of the chapter, we will talk about what kind of art might lie beyond this understanding of how things work and try to imagine the beginnings of a 'poetics of sampling' with reference to my own film *The Grand Tour* and *Little Dog for Roger* by Malcolm Le Grice. In his theoretical writings, Le Grice has described the macro-gaps that are created by the time that elapses between the capturing, editing and showing of material, and that allow for extra-technological elements such as nostalgia to slip into the work. Finally, we will consider the idea that autobiographical memory might be a sort of human equivalent of the machines that we have discovered are imperfect: in the end no one or no thing is capable of truly recording reality as it happens.

3.2 Some important developments

Before exploring the art of recording by sampling, and indeed art that foregrounds the process of recording by sampling, it is worth looking at the elements that came together over the course of the nineteenth century and led to the development of devices that captured the world in this way. 'Sampling' such as that carried out by a movie camera, requires machinery capable of making precise movements several times per second. Such a mechanism incorporates both speed and the division of the time continuum into discrete parts, and can be seen to reflect technological advances such as the invention of the railway and the pocket watch, as well as a change in

attitude towards the nature of work. Sean Cubitt links the development of the movie camera to a new mechanistic type of work environment:

> The splitting of human action into mechanically discrete movements, the atomization of economic and bureaucratic flows into distinct and quasi-autonomous, even meaningless key- strokes on the adding machine and typewriter, the Taylorization of work at Ford's River Rouge plant all spring from the same imagining of time as a discrete series of steps.[3]

Advancing hand in hand with the mechanical, dehumanizing and repetitive was a seemingly contradictory development in other areas of science away from the 'pure' study of the physics of light and sound towards an interest in the human physiology and the nature of its reception of these phenomena. However, as we shall see, far from being at odds with each other, these two contrasting scientific directions were complimentary with regards to the invention of sampling machines, and indeed film might be seen as the conquering of the newly understood human perceptual system by machines moving fast enough to fool this system.

Jonathan Crary and Jonathan Sterne, within their respective fields of visual art and sound studies, have traced the pre-history of audio and visual technologies back to the scientific focus on human physiology as a location for knowledge in the nineteenth century. Crary places the investigation of the afterimage, carried out by figures such as Goethe, Belgian physicist Joseph Plateau, and the Czech anatomist Jan Purkinje at the centre of this new development. What is of particular interest in these studies is the experimenter's use of his own body as the subject of experimentation (Plateau in fact went blind as a result of staring at the sun), and the observation that afterimages had duration and in fact changed over time. Through the exploration of afterimages, vision, which had previously been considered instantaneous, was lent a new temporal dimension.[4] As Crary states:

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[3] Sean Cubitt, *The Cinema Effect* (Cambridge: MIT Press, 2004), 6.

[4] Jonathan Crary, "Techniques of the Observer," *October* 45 (1988): 19.

> But as observation is increasingly tied to the body in the early nineteenth century, temporality and vision become inseparable. The shifting processes of one's own subjectivity experienced in time became synonymous with the act of seeing.[5]

However, alongside the focus on subjective physiological experience, was a growing realization of the extent of the subjectivity involved — that indeed we do not register the world exactly like it is and that perception is not only biased by the way our ears and eyes function, but also open to manipulation. Peter Mark Roget's 1825 paper describing the optical illusion that took place when he watched the wheels of a moving train through the slats in a fence[6] is evidence of the interest science had developed in the disclosure of "an increasing divergence between appearances and their external causes."[7]

The discovery of the electro-magnetic spectrum and of the fact that the light we can register only forms a small section of this spectrum, was further proof of the significant limits of human perception with regards to the range of phenomena in the world at large. The human ear is similarly constrained in its functioning and sound itself, according to Jonathan Sterne, should be defined accordingly as those vibrations that are "sympathetically produced – by the functioning ear",[8] a definition which excludes a vast range of acoustic vibrations including those vibrations used by many of our fellow animals to communicate. Moreover, the vibrating membrane that is such an important component of audio technology, takes the human eardrum as its model. Sterne refers to this anatomical borrowing as the "tympanic function"[9] and in fact sees the development of audio technology and the human hearing system as essentially intertwined, defining the ear itself as a technology of sorts, performing as it does the act of 'transduction' from media to media (in the ear's case from air to

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[5] Crary, "Techniques of the Observer," 10.

[6] Crary, "Techniques of the Observer," 17.

[7] Crary, "Techniques of the Observer," 19.

[8] Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction* (Durham NC: Duke University Press, 2003), 11.

[9] Sterne, *The Audible Past*, 23.

liquid) that characterizes all sound devices.[10] By bringing together the seemingly disparate elements that led up to the development of the kind of technologies we are concerned with, I wish to emphasise the way in which we are embodied in media. Film and audio recording devices are not simply machines, non-human and set apart from us, they represent the culmination of our own technological advancements, reflect changes in the way we live and work, and utilise the discoveries made concerning the functioning of our senses. It is for this very reason, the inherent humanness of film and audio recording, that we can begin to think in terms of developing a poetics of sampling media.

3.3 The extent of our own participation in audio and visual technologies

The investigation of afterimages, as well as being symptomatic of the newfound importance of human perceptual systems, also revealed something further about these systems — that they were in fact 'creative'. Mary Ann Doane considers the afterimage, just like a photograph, phonograph or footprint, to be a kind of index by virtue of its delayed effect in relation to its subject, and because it could also be viewed as a kind of 'trace', almost as if the retina were producing a temporary photograph.[11] Crary, on the other hand prefers to stress the idea that the existence of afterimages proved to nineteenth century theorists the possibility that we as observers can create our own images:[12]

> the privileging of the afterimage allowed the thought of sensory perception cut from any necessary link with an external referent. The afterimage- the presence of sensation in the absence of a stimulus- and its subsequent modulations posed a theoretical and empirical demonstration of autonomous

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[10] Sterne, *The Audible Past*, 22.

[11] Mary Ann Doane, *The Emergence of Cinematic Time: Modernity, Contingency, The Archive* (Cambridge: Harvard University Press, 2002), 70.

[12] A small anecdote: when I was bored as a child I would spend, what seemed like hours, producing my own private experimental cinema by putting pressure on my closed eyes with my fists. I now know that what I saw are called phosphenes. This particular habit was ended by my mother who was worried by the effect it might have on my eyesight — she may have been right since I developed late-onset myopia not long after.

> vision, of an optical experience that was produced by and within the subject.[13]

The notion that afterimages were fundamental to the illusion of film was the central principle of 'persistence of vision'. This theory has more recently been dismissed in favour of one downgrading the importance of persistence of vision in favour of critical flicker fusion and the phi phenomenon.[14] In fact the existence of persistence of vision (positive afterimages) means that we do not see the in-between black frames in a traditional cinema projection. The flicker fusion threshold, the rate at which we see an intermittent source of flashing light as stable, is for humans around 50 or 60 Hertz depending on how tired the viewer is and the relative brightness of light source and location. The addition of the shutter mechanism to a movie projector allows the film to be pulled down without it being seen, and the frame to be repeated two or three times in order to increase the rate of flicker of the movie to 48 or 72 Hertz, thus equalling or going beyond the flicker fusion threshold (which is in any case lower in a darkened space). The phi phenomenon is perhaps the most important theory here as it is the one involving the creation of implied motion between two still images. It was first discovered by Gestalt psychologist Max Wertheimer in 1812 and states that if two images of the same object in different places are alternated rapidly enough, the viewer will infer motion. The speed at which this happens is quite low and begins at around ten images per second.

Of course we are also capable of manufacturing our own audio content such as combination tones and missing fundamentals, but for Jonathan Sterne, the nature of our creativity with relation to sound technologies is of a different order. He has created the term 'audile techniques' to describe the way in which users of early sound technologies developed listening skills specially adapted to those technologies, and that allowed them to sift the message from the noise.[15] Kittler also talks about this process of separating message from noise, of having faith in the technologically

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[13] Crary, "Techniques of the Observer," 9.
[14] Doane, *The Emergence of Cinematic Time*, 71.
[15] Sterne, *The Audible Past*, 259.

mediated sound as a kind of suspension of disbelief akin to the one encountered at the theatre, where one filters out the artificial context and focuses on the drama.[16] Moreover, according to Sterne, sound technologies were to a certain extent nurtured in the early stages of their development by a certain kind of human complicity. In the desire for the telephone and phonograph to be seen to work, the language that was used for tests was often predictable or easy to decode.

> The use of highly conventional and therefore easily imitated language helped lower the threshold at which reproduced sound became comprehensible and still proved the possibility of mechanical reproduction of all language.[17]

Deception, or even self-deception it seems lies at the heart of our relationship with technology — as Mary Ann Doane reminds us, Phenakistoscope (the name of a nineteenth century optical toy) actually means 'deceptive view'.[18] People wanted early technologies to work and so they were willing to overlook the flickering in a film, the crackling noise on a phone line and the tiny bandwidth that the voice itself occupied. Laura Mulvey, talking about film and early optical technologies, has tried to unpack our dualistic position regarding technologies a little more. She describes a viewer who is 'uncertain', caught between the knowledge of how a thing works and a fear of the irrational, of ghosts and magic, that sits at the back of our minds and is prompted by the illusion enacted by technologies.[19] After all, does not every small child, in the years before they learn about science, believe that there really are tiny people inside the television and radio? The fantastic somehow seems to be the most likely explanation to those uninitiated in the workings of the modern world and one could imagine that a remnant of this sense of wonder is retained into adulthood, albeit buried under knowledge, and our own familiarity with these technologies. Mulvey also makes a distinction between the fooling of the senses (the technology is moving too fast for our perception and therefore an illusion is produced) and fooling

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[16] Friedrich A. Kittler, *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young and Michael Wutz (Palo Alto: Stanford University Press, 1999), 45.
[17] Sterne, *The Audible Past*, 255.
[18] Doane, *The Emergence of Cinematic Time*, 71.
[19] Mulvey, *Death 24x a Second,* loc. 583-593.

the mind (we believe it is magic). We are all susceptible to the first of these of course, but it is the ambiguity of our relation to the second that actually produces enjoyment.

> This is an uncertainty of secular materialism that takes pleasure in the culture of illusions and the uncanny and prefigures later forms of mass entertainment. Pleasure in the material relation between illusion and optics and between illusion and momentary credulity, playing with the mind's susceptibility to trickery, all involve various successive phases of exchange between the eye and the mind, belief, doubt, curiosity…[20]

Crary, on the other hand, also sees a certain kind of democratization in the proliferation of optical technologies that lent them more of a do-it-yourself aspect. He sees the viewer as "simultaneously the magician and the deceived."[21]

It is difficult to compare audio and visual technologies when we are discussing the element of deception and illusion, or even to pinpoint exactly what it means to be tricked. Certainly film can be viewed as an illusion since it involves the creation of perceived movement from a stream of static pictures. Sound technologies, however, do not exactly trick per se, but they do require a certain kind of physiological involvement to improve the sound, be it imagining the missing frequencies of a transistor radio or listening through the noisiness of an old record. In fact the extent of our participation in terms of making sound media work, seems to have increased rather than decreased in recent years. In his excellent article on the mp3, Jonathan Sterne asserts that this particular technology is the most extreme embodiment and application of our knowledge of psychoacoustics and modelling of media based on the human ear.[22] The mp3 leaves out the stuff we would not hear anyway and predicts the kind of noisy environments in which we might be listening, and that

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[20] Mulvey, *Death 24x a Second,* loc. 578-581.
[21] Crary, "Techniques of the Observer," 35.
[22] Jonathan Sterne, "The mp3 as cultural artifact," *New Media & Society* 8 (2006): 836.

make hi-fidelity redundant. We even have to make some effort (unbeknown to ourselves) to make the whole system function. As Sterne says:

> the mp3 is a medium which, in most practical contexts, gives the full experience of listening to a recording while only offering a fraction of the information and allowing listeners' bodies to do the rest of the work. The mp3 plays its listener. Built into every mp3 is an attempt to mimic and, to some degree preempt, the embodied and unconscious dimensions of human perception in the noisy, mixed-media environments of everyday life.[23]

I wonder though, if participating in one's own media experience is a positive thing if you are unaware of it. These kinds of participation or physiological co-authorship are essentially different in kind to the ones we encountered in the work of Olafur Eliasson in the previous chapter, because of this lack of awareness. As we shall soon see, a media that disguises the way that it works may well be considered an ideological one. Sterne himself sits somewhere on the fence regarding the status of the mp3 which might equally be considered "a cruel exploitation of the limits of auditory perception"[24] or an "instrumentalization and celebration of the limits of the human ear."[25] Whether it consists of being fooled or fooling ourselves, our relationship with audio and image technology seems to be characterized by a certain amount of getting used to the way things sound and look, until we forget about the difference between the real and the recorded. This is perhaps another aspect of the frictional space between reality and media, that it changes over time (or at least it appears to). We will leave this matter for the time-being in order to concentrate on another intermedial comparison, this time between the way sampled audio and sampled image function. Knowledge of the basic differences between them, but also the locations of tenuous correspondences, are essential to any artist wishing to work in a creatively intermedial fashion.

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[23] Sterne, "The mp3 as cultural artifact," 835.

[24] Sterne, "The mp3 as cultural artifact," 838.

[25] Sterne, "The mp3 as cultural artifact," 838.

3.4 The problem with stringing samples together

In his article describing Eadweard Muybridge's unique position as an artist, perched between photography and film, Tom Gunning makes much use of words such, as 'interval', 'gap' and 'interstice'.[26] The last of these synonyms is of particular interest to us since amongst other meanings, it can be defined as follows:

> interstice — a small or narrow space or interval between things or parts, especially when one of a series of alternating uniform spaces and parts: *the interstices between the slats of a fence*.[27]

It is these very specific types of gaps, small and regularly spaced amid the non-gaps, that seem to characterize many of the technologies we are concerned with in this chapter. In terms of film, there seem to be interstices at every stage of the process: every other 48th of a second when the rotating shutter is closed while the camera is rolling, between the frames on a printed film strip, and in the form of the black-outs that take place during the projection event. We might even think about interstices with regards to those intervals between voltage meter readings that occur when converting analogue audio to digital. What seems to be whole and continuous, is in fact fractured by tiny, machine-made gaps in information that we fail to notice, either because we have learnt to ignore them, or because they lie below the threshold of human perception.

The relationship between apparent unity and actual bittiness is a subject that pervades film theory. In the article mentioned above, Gunning places the origin of this paradox at the feet of Eadweard Muybridge — inventor of both high-speed photography and the zoopraxiscope, one of the first optical toys to simulate motion:

> His art employs almost contradictory energies, seizing and parsing out motion into still images, then accumulating these individual images at such a rate of

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[26] Tom Gunning, "Never seen this picture before: Muybridge in multiplicity," in *The Cinematic: Documents of Contemporary Art*, ed. David Campany (London: Whitechapel Gallery, 2007), 20.

[27] http://dictionary.reference.com/browse/interstice

> speed that they seem once more to move. There is something obsessive about this circular fascination, something that almost recalls Penelope weaving and unweaving her tapestry.[28]

Sean Cubitt, on the other hand, has difficulty with the idea of a cinematic moving image, since it is not an image at all, but the optical effect caused by a rapid series of pictures.[29] In fact Cubitt chooses to refer to the film frame as a temporal 'pixel',[30] and indeed his renaming appears to more accurately convey the real nature of the frame — as a tiny and invisible component that only has significance when functioning as part of film's apparent continuity. As a result, he posits that film's meaning resides not in the faithfulness of its image, but in the idea that it represents the world through pure animation: "The only truth of cinema is its movement, its ephemeral occupation of the present."[31] Of course, such a conceptualization reminds us that like sound, film is a time-based media where there is no fixed object as such, only what is produced by constant motion, be it the flickering between photographs or the undulations of a sound wave.

3.5 What is lost in digital audio

It is now time for us to consider digital audio in relation to analogue film. It is not difficult to make a casual association between the two built around the common idea of the 'loss' that is inevitably encountered when you break down the continuity of reality into little bits. In his critique of digital audio entitled *Sound Ideas: Music, Machines, and Experience*, Aden Evens compares the analogue to digital converter, making its series of discrete pressure measurements, to a movie camera capturing frames.[32] He even refers to the mechanism taking the pressure readings as a "shutter", a comparison that underlines the fact that its readings are partial and non-

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[28] Gunning, "Muybridge in multiplicity," 23.

[29] Sean Cubitt, *The Cinema Effect* (Cambridge: MIT Press, 2004), 5.

[30] Cubitt, *The Cinema Effect*, 3.

[31] Cubitt, *The Cinema Effect*, 22.

[32] Aden Evens, *Sound Ideas: Music, Machines, and Experience* (Minneapolis: University of Minnesota Press, 2005), Kindle edition, loc. 280-284.

continuous. As alluring as this resemblance may be though, it is worth mentioning two essential ways in which digital audio is not like film. Firstly, although digital audio is based on a sampling of a soundwave which however fast it is, will always fail to capture the original in its entirety, the sound produced by digital audio, and that comes through the speakers is itself continuous. It is a soundwave like any other, reconstituted from the points on the curve that was sampled. Although it may differ essentially (although not necessarily audibly) from what was captured by the microphone in the first place, both soundwaves, original and digital recreation, are still exactly that: soundwaves. Film, on the other hand is a thing in and of itself: the frames are snapped by the movie camera and are then played back in such away as to create an optical illusion of movement. Film is radically different from the continuous image it is trying to capture, but we have become used to this difference and have accepted the way film looks, only occasionally conflating it with the distant original subject.

Connected to this is the idea that film is obliged to function the way it does by slicing the image into a series of frames. It is bitty and incomplete because it has no other choice — we are yet to develop the necessary technology that can record a moving image in a continuous way. Audio recording, on the other hand, used to involve the direct capturing of a sound wave, it was a continuous media. But now we have chosen for the most part (and for various reasons) to use sampling techniques instead. I sometimes wonder what kind of continuous audio technologies might have been developed if Sony and Phillips had not decided to go down the digital road in the late 1970s. The fact that vinyl culture has in no way disappeared though, is an indication of a not inconsiderable resistance to digital audio, the reasons for which we will discuss below.

So, what is the problem with digital audio? According to Eric Rothenbuhler and John Peters digital audio is inherently fake and inauthentic because it has broken the indexical chain linking it to the original signal. They argue that the physical imprint of sound that is still present in the gramophone record or magnetic tape is gone from

a CD, which "holds no analog of either the original recorded signal or the resulting playback."[33] The fact that a CD essentially contains no imprint of sound, only a set of data from which sound can be reconstituted, is a fact that is for Rothenbuhler and Peters "rich with implications."[34] The authors echo a widely-held notion that has at its core the belief that indexicality is essential for fidelity, and that a gramophone record somehow manages to retain "the otherness of past time".[35] It seems that we are nostalgic about older forms of media, idealize them even, and that distrust of newer digital forms is born of their computer-generated abstractness, and the difficulty we have understanding the nitty-gritty of their workings. Jonathan Sterne, however, believes that we should be aware that ideas of fidelity as they pertain to all media are problematic. According to Sterne, we are perhaps asking the wrong questions about reproduction and he suggests that notions of fidelity, original and copy are themselves deeply flawed.

> Within a philosophy of mediation, sound fidelity offers a kind of gold standard: it is the measure of sound-reproduction technologies' product against a fictitious external reality.[36]

The history of recording things is littered with examples of the things in question being changed in order to make these recordings 'better' — be it the exaggerated vibrato on early phonographic recordings of violinists,[37] or Dorothy's shoes in *The Wizard of Oz*, which had to be coloured burgundy in order to appear ruby red on Technicolor film. Not only are things fundamentally altered by media of all kinds, we alter them *for* media.

Perhaps the greatest source of distrust concerning digital audio, and the digital in general lies in the way it embodies certain principles of capitalist economics

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[33] Eric W. Rothenbuhler and John Durham Peters, "Defining Phonography: An Experiment in Theory," *Musical Quarterly* 81 no.2 (1997): 245.

[34] Rothenbuhler and Peters, "Defining Phonography," 252.

[35] Rothenbuhler and Peters, "Defining Phonography," 254.

[36] Sterne, *The Audible Past*, 218.

[37] See "Aesthetics out of exigency" from Mark Katz, *Capturing Sound*: *How Technology has Changed Music* (Berkley: University of California Press, 2010).

regarding ease of exchange and standardization of product. Furthermore, Rothenbuhler and Peters claim that the CD format was itself compromised by the commercial interests of Sony and Phillips and their desire to make a product small enough to be played in a car stereo system, but large enough to hold Beethoven's Ninth Symphony.[38] It is for this reason that the bit-depth of a CD is only 16, rather than the professional standard of 24.[39] However, maybe the standardized format of the digital is problematic in ways that go beyond culture and economics. Digital formats simply do not correspond to the way things actually are — while the digital has a finite amount of precision, set thresholds and of course an inherent binary 'it is either this or that' (1s or 0s) about it, the world we live in possesses unlimited detail and continuously changing qualities. Transforming the world into digital, regardless to which degree of resolution, is fundamentally like forcing a round peg into a square hole. For Aden Evens this basic incompatibility between the digital and reality manifests itself in the digital's inability to capture the singularity of the events that we hear (and see) in the world:

> Actuality always exceeds its form, for it moves along lines that connect singularities; the actual is not a neat sequence of frozen or static moments but an irreducible complex process that cannot be cleanly articulated in time or space…Whereas form is definite and can always be re-presented, the actual can be copied but can never happen again. Purely formal, the digital grasps only form and so falls ever short of actuality.[40]

These arguments, though compelling, are essentially theoretical. It is important to question the extent to which we are actually aware of digital audio's formal limitations, after all the 44.1 kHz sampling frequency for CDs was decided upon in part because it allowed for the reproduction of all the frequencies within human

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[38] There are competing theories for the reason why the CD evolved the way it did. I have also read that the CD format of 44.1 kHz/16 bits is a result of early methods of storing the data on PAL videotape. We will further discuss the relationship between capitalism and the digital at the end of this thesis.

[39] Rothenbuhler and Peters, "Defining Phonography," 250.

[40] Evens, *Sound Ideas*, loc. 1026-2.

hearing with a little headroom to spare. Our cats and dogs may miss the very highest partials of Beethoven's Ninth on CD, but it is generally thought that we are unaware of what has been lost. However, Evens argues that although tests have shown that human audition is no finer than that of CD audio, we may still miss ultrasonic frequencies, and are affected by them even if we do not consciously hear them.[41] There are also the artefacts caused by imperfections in the sampling process itself such as aliasing and jitter, but these are more associated with the earlier days of digital technology and we are not so concerned with them here. Perhaps the most interesting and controversial issue relating to digital audio is that of noise — the unwanted noise that is generated by an audio system, but also the low level of noise that permeates the world of real sound and is thus a characteristic of it. As I have mentioned before, we have the capacity ('audile technique') to listen beyond the noise produced by sound media and concentrate on the signal itself. It might we worth considering, however, the extent to which we have come to hear this noise as an essential part of the media to which it is related, rather than something to be ignored. The sense of nostalgia with which we regard tape hiss, or the sound of a stylus on vinyl though, is of course very much a product of the current age and our relationship with older, disappearing technologies. Like film, analogue sound technologies reproduce a quality of signal that is heavily marked by the way the media itself functions. Here, Caleb Kelly talks about the sound of the gramophone record:

> Even though it has come to be filled with the noise inherent in the media—its many ticks and pops and the haze of ingrained dust—we continue to listen to it. In fact we forgive vinyl media for this flaw and even hear these noises with a sense of nostalgia, as they are marks created from listening to the record and remind us of times in the past when we played the music.[42]

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[41] Evens, *Sound Ideas*, loc. 297-302.

[42] Caleb Kelly, *Cracked Media: the sound of malfunction* (Cambridge: MIT Press, 2009), 82.

In fact, there are many popular plug-ins for audio-editing programs designed to add hiss, crackle and rumble to digital sound files to make them sound, I suppose, like old media.[43] Digital audio, though generally associated with a 'clean' sound, is not free from noisy artefacts either, though they are of a different quality. One could even speculate as to whether we might, in coming decades (or in fact that we already do) regard the glitching of a CD or quantization noise with nostalgia.

One of Aden Evens's main objections to digital technology is its elimination of 'background noise' caused by the limitations of sampling rate and bit-depth. Evens's notion of background noise is that of a sound at the edges of perception that fundamentally influences other sound and "serves as a medium, a baseline, a plane of relief against which signal stands out."[44] Real noise, with its 'uncontractability' (more on this later) and lack of repetition, is for Evens an example of the singular sound event that is characteristic of non-digital actuality. There is something rather romantic in all this, since Evens's noise to a large extent consists of the (practically) inaudible but still theoretically existing sound that is an accumulation of extremely low-amplitude vibrations of old sound events that are still bouncing between surfaces[45] — as he says "every sound masks an entire history of sound, a cacophony of silence."[46] It is a seductive idea of course, and one that gives us a different perspective on sound, lending it a sense of gravity and endurance, rather than ephemerality and intangibility.[47]

However, as I have suggested, the problem with much of the critique of digital sound is that it is theoretical in nature. I cannot hear the difference between a 48 and a 96 kHz sampling rate the way I can see the difference between a frame rate of 24 and 48

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[43] The one in my editing program is called the 'grungelizer' and even has an interface reminiscent of the knobs and buttons of vintage sound technology.

[44] Evens, *Sound Ideas*, loc. 327-30.

[45] Evens, *Sound Ideas*, loc. 320-23.

[46] Evens, *Sound Ideas*, loc. 323.

[47] Friedrich Kittler reproduces Salomo Friedländer's "Goethe Speaks into the Phonograph" (1916) in *Gramophone, Film, Typewriter*. This highly amusing short story concerns the exploits of a professor attempting to record the sound of Goethe's voice by capturing the kind of low-amplitude 'historical' sound vibrations that Evens is referring to, in Goethe's former study. In the book the professor succeeds, but I for one would be quite excited if someone managed to achieve this in real life.

in film. I am not an audio engineer and perhaps some training would improve the fineness of my ear. What then, does it mean if I used the highest quality of audio format available to me on my equipment[48] (96 kHz/24 bits) to record the sounds that form the basis of *Trains* (2014)[49] for cello and tape? Higher sampling rates at the point of recording of course become useful when you slow sound down (with the equivalent drop in pitch), and in fact the seven recordings of trains form an ascending 'scale' of sorts, with the first train pitched down 11 semitones and the final one played at its real pitch. Perhaps we could see this melodic minor scale of transpositions as a move between an altered, heightened reality towards something closer to the way things are. Certainly the larger transpositions at the beginning, because they were originally recorded at 96 kHz, bring some ultra-sound into the range of human hearing. I also wonder what it means to hear transposed ultrasound — we fundamentally change the sounds by transposing them and what we have left is a distortion of what the ultrasound must really be like (to our cats and dogs).

I am also inclined to be wary of the digital from a cultural and political perspective. I find myself unable to love a medium that appears to be on the side of consumer-capitalism and that celebrates sameness and standardization. On the other hand, I work in digital as do most composers I know using electronic sound. The reverse side of the standardization afforded by the digital, is greater access to audio technology and software for anyone who might want to use it. The formats are of course set, but the ability to make ones own electronic music, even at home, has never been greater. It is worth remembering that the much nostalgized gramophone player was a read-only technology for the most part, and its content dictated by record companies. I wonder what it would mean if I decided to work in a purely analogue setting. My music would certainly become harder and more expensive to make, far more difficult to distribute and perform, and I am sure I would develop a very different attitude towards my materials — which might in the end be quite positive, or at least revealing of my compositional process.

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[48] I work with a Tascam DR-100mkII.

[49] See Appendix 5.

3.6 What is gained

The type of distortion known as ‘aliasing’ is an artefact common to both film and digital audio. Aliasing occurs when whatever is being recorded is too fast for the means being used to record it, producing a distortion of the original signal and inadvertently exposing the limits of the sampling rate in question. Olafur Eliasson’s installation *Model for a Timeless Garden*, which we looked at in Chapter 2, employs a kind of aliasing. The non-continuous strobe lighting, which effectively creates seven ‘frames’ per second, produces a visual illusion of frozen water fountains that does not correspond to the unstrobe-lit reality. However, for the most part aliasing effects are a nuisance — they are something to be got rid of either by filtering off sound that is above the Nyquist frequency in digital audio, or blurring rotating objects such as propellers and wheels in film.

Fig. 3.1 Jean Comandon — still from *La Croissance des végétaux* (1929)

Sampling media cannot deal with things that are moving too fast for them (or more specifically things moving faster than the relevant Nyquist frequency). Where sampling media do come into their own though, and their limitations become useful, is when the thing being recorded is changing extremely slowly, such as a growing plant or the moon moving across the night sky. Time-lapse film is when an action or

process is recorded at a slower rate than the one it will eventually be projected back at. Time-lapse speeds things up of course, and this can be comic, but perhaps more importantly it allows us to see the patterns in processes that are too slow to be understood by the naked eye. Time-lapse in many ways is an exaggeration of the way film functions — the shutter this time is not closed for a 48th of a second between frames, but for one whole second, an hour or even a day. We do not see these gaps of course, as is usual with film they are smoothed over, but it is the essential gappiness of the footage that allows us to observe the extremely slow movement of the subject. I will expand on the idea that gaps can be useful and even essential to the creation of sense, later on in this chapter in relation to human memory.

It is probably not surprising that time-lapse has been employed a great deal in scientific film. The 1929 film by the French biologist Jean Comandon entitled *La Croissance des végétaux* (the growth of plants) is a very beautiful and fairly early example of the genre (see video example 3.1 and Fig. 3.1). The film is revealing of something hidden of course: the usually imperceptibly slow movement of plants in relation to a changing light source. *La Croissance des végétaux* has something in common with high-speed photography and Benjamin's optical unconscious, even if the means of revelation is of a fundamentally different type. In a way, it is a case of reducing or compressing the data in order to be able to see the bigger picture, in this instance showing movement at a rate that is neither too fast nor too slow for the human observer. Comandon's 'reduction' not only allows us to see patterns of plant growth that are interesting from the perspective of biology, it also inadvertently produces a plant dance, a strange poignant, sometimes comic swaying and climbing — a kind of plant art that we would be able to observe ourselves if we were only patient enough (and able to make these kind of large-scale contractions in our heads).

So what might the musical equivalent of time-lapse be? Firstly, my mind turns to highlights recordings of famous (and long) pieces of classical music such as the *St Matthew's Passion*. I wonder though if leaving out most of the recitative, as these kinds of recordings inevitably do, really constitutes time-lapse in the same way as

films of plant growth, rather than just being a way of skipping what might be considered by some to be the 'boring bits'. A true time-lapse sound/music work would involve the revelation of large-scale patterns of some kind, be it the underlying I-V-I of a long symphonic work, or the change in character of the sounds of a city street over a period of 24 hours. An interesting comparison to time-lapse though, might be seen to lie in Aden Evens's idea of sound contraction. In this case, it is not about shortening the length of a sound, but about the notion of a reduction or simplification of data that occurs as a result of the limitations of human perception. Evens explains that the regular change in air pressure that constitutes a pitched sound for instance, is reduced by the listener to a sound possessing apparently stable qualities.

> What hearing contributes to sound, therefore, is a contraction. Hearing takes a series of compressions and rarefactions and contracts them, hears them as a single quality, a sound. Or, rather, hearing contracts this wave of compression and rarefaction into a number of qualities that together determine a singular sound.[50]

Of course Evens is simply talking about the fusion that we perform when we hear pitches over 20 Hz or so. By casting it in this particular light though, he makes clear the usefulness of condensing data to the workings of human hearing. Imagine if we could in fact attend to the 440 fluctuations per second of a concert A as exactly that. We would perhaps feel overwhelmed by the detail of incoming information and music would be hard to make sense of, or at least it might make a completely different type of sense that we can hardly conceive of.

3.7 John Smith — *Leading Light*

> I saw the moon spinning swiftly through her quarters from new to full, and had a faint glimpse of the circling stars. Presently, as I went on, still gaining

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[50] Evens, *Sound Ideas*, loc. 133-35.

> velocity, the palpitation of night and day merged into one continuous greyness; the sky took on a wonderful deepness of blue, a splendid luminous colour like that of early twilight; the jerking sun became a streak of fire, a brilliant arch, in space; the moon a fainter fluctuating band; and I could see nothing of the stars, save now and then a brighter circle flickering in the blue.[51]

This passage from H.G. Wells's 1895 novella *The Time Machine*, where the traveller hurtles forwards through days and weeks, is widely considered to be remarkable in its anticipation of cinematic vision and in particular that of time-lapse film.[52] The text is also striking because of the way that time's passage takes on a new character, due to it having been sped-up. Far from being invisible to the naked eye, longer time frames are made visual, spatial even, as the movement of celestial bodies appears to trace shapes in the sky. A similar spatialization of a long passage of time occurs in John Smith's eleven-minute film from 1975, *Leading Light*. The first half of the film, recorded in one day and edited on the camera (video example 3.2, 0:00), follows the patch of light cast by the sun around a room using a mixture of time-lapse and normal speed photography. The idea of passing time being represented by shape, light and movement reminds us of a sundial — we are thrown back on the time-keeping methods of our ancestors because we can no longer trust the movie camera's usually regular mechanical ticking. The tempo of the film is pulled around in a semi-improvisatory, rubato manner during the course of eleven minutes, while changes in lens and aperture size cause sudden shifts in light that imprint a further layer of non-linearity onto the supposedly linear proceedings.

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[51] H.G. Wells, *The Time Machine* (New York: Atria, 2011), 22.

[52] Keith Williams in his book *H.G. Wells: Modernity and the movies* (Liverpool: Liverpool University Press, 2007), claims that Wells had not encountered either the Lumière's Cinematograph or Edison's Kinetoscope before publishing the *Time Machine*. Williams does state, however, that Wells might have read about these inventions and that there are certain resemblances between the mechanism of the Kinetoscope and the traveller's time machine. It is interesting to consider that these scenes in the novella might have been the result of H. G. Wells' speculations about emerging technologies of the day and their possible developments.

The art historian A. L. Rees says of *Leading Light* that it shows "how many rooms the camera can create from just one."[53] Indeed, as the camera slowly pans around the room following the patch of light, and as the lighting conditions themselves change throughout the course of the work, we have the impression of a certain kind of multiplicity of ways in which we could possibly see this room. This multiplicity of aspect, however, is not just a succession of camera tricks: *Leading Light* articulates, and exaggerates through its use of time-lapse compression, that feeling we have about the spaces we inhabit, that they change and become different places at 4 o'clock in the morning, when it begins to rain, when we turn a light on, or come back to them after a long trip. On a larger scale, the shot of the tower blocks during the evening with their patterns of lights turning on and off (7:58), is brought into sharp focus by the contraction of time afforded by the time-lapse. The turning on and off of lights truncated in this manner, does indeed appear to be a 'pattern' rather than the random acts of a hundred or so people — it is given the aspect of being non-accidental by being squeezed into a 30-second time frame.

John Smith, although not generally regarded as a structuralist, says that he was very influenced by structuralist film when he made *Leading Light*.[54] As with other structuralist films, one of the motivations behind the creation of *Leading Light* is to expose the artifice of film to the viewer. Smith achieves this in his revelation of the discrete frame, and of how the rate of exposures per second when filming can be used to speed up time when played back. As with all time-lapse film, the moments we do not see in the playback, when the shutter was closed, are all the more apparent for being longer than usual. However, somehow it seems that something else running very contrary to structuralist principles has crept into the aura of the film since it was made 39 years ago. Smith himself cannot help but be reminded of what it was like to live in such a small space and to have such few possessions,[55] while I as a viewer am brought back to the London of the 1970s, and of the times when I watched tower

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[53] http://www.johnsmithfilms.com/texts/sf2.html

[54] John Smith, interview with the author, conducted on February 26, 2014, in Hackney, London.

[55] Smith, interview with the author.

Fig. 3.2 John Smith — still from *Leading Light* (1975)

blocks from our kitchen window. I am confronted by my own slightly irrational belief that this is what life looked like back then when I was a child — that it looked tangibly different from how it does now, and that something has disappeared. Ian Bourn, in his essay on Smith's films, states that "Much of John Smith's work is an exploration of how things change and the feelings of loss we sometimes experience when these changes occur."[56] I will argue, later on in this chapter, that nostalgia is an almost unavoidable by-product of mechanically captured reality, that it lodges itself into the gap that continues to open up between recording and playback, and that this nostalgia could be one of the elements that characterizes a poetics of sampling.

The only truly real-time continuous aspect of the work is the short excerpt of folk song that appears towards the middle of the film during the otherwise silent soundtrack. It is diegetic inasmuch as it appears to be the song that is being spun on

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[56] Ian Bourn, "The Sound of Loss," in *John Smith – Film and Video works 1972-2002*, ed. Mark Cosgrove and Josephine Lanyon (Bristol: Picture This Moving Image/Watershed Media Centre Publication, 2002), 35.

the record player, but it does not follow the time-lapse pattern of the accompanying film and is instead subject to another rule — its volume is raised or lowered according to the proximity of the camera. Smith's structuralist tamperings cannot even begin to erase the nostalgia generated by this type of music being played on this particular type of media device. Bourn describes the feelings evoked by the inclusion of the folk song:

> Maybe a memory of a time when the record was played? On that record deck. In this room. In days like these. Softly. As if not in the room at all. As if coming through the walls. The memory of someone who used to live next door? Who used to play that record, whose lyrics one could never really grasp? Or maybe not. Just that it was a folk song. And in sunny days like this it could be heard. In this room.[57]

3.8 The importance of remembering how it works: the flicker film

As I have suggested, time-lapse film reminds us how film functions because the gaps between frames made during the filming process are lengthened. However, generally speaking, with *Leading Light* being an exception, the revelation of 'how film works' is not the aim of time-lapse — the exaggeration of film's inherent gappiness is a by-product of time-lapse processes. In fact the practice of film, from shooting, to printing and finally to projection is, according to Jean-Louis Baudry, a succession of acts of concealment:

> Projector and screen restore the light lost in the shooting process, and transform a succession of separate images into an unrolling which also restores, but according to another scansion, the movement seized from "objective reality."[58]

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[57] Bourn, "The Sound of Loss," 34-5.

[58] Jean-Louis Baudry, "Effects of the Basic Cinematographic Apparatus," trans. Alan Williams, *Film Quarterly* 28 (1974): 40.

It is interesting that Baudry uses the word 'scansion' — it reminds us that film has a kind of metre, and a metre that is altered at different stages of the process. At the time of shooting, a second of 'reality' is divided into 48 alternating moments of open and closed shutter, while on the printed strip we see only a succession of 24 frames — and the gaps have seemingly been erased. The projection event itself is even more complicated: the 24 film frames are interspersed with black-outs produced by a shutter in order to advance the film and repeat the frame (reducing flicker). The projection event thus effectively consists of a rhythm of 48 or 72 frames divided by moments of black. Baudry goes on to remind us that film, like photography, has it seems unquestioningly inherited elements of the Renaissance pictorial tradition such as its rectangular format and monocular perspective.[59] For Baudry film is ideological because of its format, the way that it transforms itself, changes its own internal metre, covers up the original loss incurred during the filming process, and of course smoothes over the fact that it is composed of discrete units. This definition is taken from Althusser, who described ideology as something that operates by concealing the way in which it is made.[60] According such a definition then, it certainly seems that film is indeed ideological, if only in a very theoretical sense. The technical operations of film have never been a state secret — I am fairly sure that I learnt about the basics at school and then just let this knowledge slip to the back of my mind. In the end, and as I have suggested before, we enjoy the illusion of film too much to constantly bother ourselves about the particulars of its production.

So it seems then that we might need the avant-garde to come to our rescue, not in order to open our eyes to the ideological as much as to wake us up from our lazy slumber of forgetting how it works. Such a rescue might be thought of as an opening up, a re-clarifying of the space between reality and media, and a recalibration of our vision of the kind we observed in Eliasson's *Model for a timeless garden*. Douglas Gordon's *24 Hour Psycho* slows down a famous feature film and effectively exposes the temporal resolution of 24 fps and thus the ease with which we are fooled by the

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[59] Baudry, "Effects of the Basic Cinematographic Apparatus," 41.

[60] Baudry, "Effects of the Basic Cinematographic Apparatus," 40-41.

illusion of continuity. Other film-makers, however, have chosen instead to underline the 24 fps of film by extremely rapid editing, using the frame itself as the basic 'rhythmic' unit. The flicker movies of the 1960s and 70s, made by artists such as Peter Kubelka, Tony Conrad and Paul Sharits, stripped back film to basic materials of black, white or coloured frames. Kubelka's *Arnulf Rainer* from 1960 (video example 3.3), for example, consists of only four elements, lit (white) frames, blank (black) frames, and white noise or silence (which is of course not silence at all but the sound of the projector and whatever else can be heard during a screening). Kubelka claims a certain type of musicality for this film, a musicality which I suppose is intrinsic to all flicker films inasmuch as they have a 24 frames per second tempo. It is probably not surprising then, that Kubelka is himself a competent classical musician, and that Conrad was as well-known for his involvement in experimental music as he was for his visual art. By 'un-smoothing' the illusion of film, the flicker film-makers not only revealed the basic discrete component of the frame, they found a different way of connecting it to sound/music, far-removed from the aesthetics of the traditional movie score. I will touch on this matter again, later in the chapter in relation to my own film project.

3.9 The importance of remembering what it is like when it does not work: glitch music

> What counts are not the messages or the content with which they equip so called souls for the duration of a technological era, but rather (and in strict accordance with McLuhan) their circuits, the very schematism of perceptibility. Whosoever is able to hear or see the circuits in the synthesized sound of CDs or in the laser storms of a disco finds happiness.[61]

It is relatively easy to understand how film works. In fact it is relatively easy to understand how most analogue technology works, from cameras to gramophones, although perhaps tape, with its tiny patterns of magnetization, seems a little more

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[61] Kittler, *Gramophone, Film, Typewriter*, xl-xli.

abstract. In any case, that is the point about analogue technology, that this direct indexical connection between signal and recording, the 'analogue' itself, suggests a certain medial transparency. Film of course has the added advantage of possessing a sampling rate that lies within the range of what we can perceive and what we can conceive of — and it is worth reiterating that we can see the flicker at 24 frames per second as well as notice the increased smoothness when the frame rate rises. Digital audio is not like this. Though we might well be able to comprehend the basics of the sampling process itself, the actual workings of an analogue to digital to converter, and the way in which all the necessary data is stored on a CD is quite complex.[62] In fact, in terms of digital audio, we would do well (as Kittler suggests in the quotation above) to acquaint ourselves with the detailed circuitry of the media in question in order to be able to truly understand it. CD digital audio is quite opaque as a media. As mentioned in section 2.5, the indexical connection to the signal has been severed, and in fact the encoded data, the series of pits representing 0s and 1s, is not visible to the naked eye. In addition, audio sampling rates are so fast as to be somehow intangible, and lowering them only serves to filter out high frequencies. Although it is not necessarily intuitive for us to associate high frequencies with 'more data', it is this increase in data that is effectively required to encode them. What I am trying to say here, is that the subject of the audio sampling rate itself or of the complex processes involved in turning analogue audio into digital and back again, are not necessarily as full of potential for the artist wishing to expose the workings of the media we take for granted as something like analogue film — a different kind of approach is required.

Jonathan Sterne has talked about the passive nature of a great deal of audio technology that it is most often 'read only' and designed "to enhance or promote certain activities and discourage others."[63] Caleb Kelly, on the other hand,

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[62] On a personal note, I have been reading my way through Ken C. Pohlmann's *Principles of Digital Audio* (2011), an 800-page doorstop of a textbook. I can honestly say that trying to internalize the various aspects of the way digital audio works is quite a job, and the task of 'understanding how it works' in truth is no small undertaking and not something that I suspect can be conveyed directly by an artwork, though I would be happy to be proved wrong.

[63] Sterne, *The Audible Past*, 8.

emphasizes the fact that media design is not something imposed on people per se, but is the result of a complex to and fro between consumers and media engineers. He says:

> Statements such as "technology changes the way we see" miss the social and cultural significance of technologies and the way the social and the cultural shape the manner in which we use the technologies themselves.[64]

If the functioning of much audio media is limited and does not require the user to take an active role, we are in part responsible for this state of affairs. An act of rebellion for Kelly then, might involve the 'cracking' of media, which he defines as putting the technology to a use for which it was not originally intended and sees as a kind of parallel to the deployment of extended techniques in instrumental music.[65]

The Glitch music produced by a malfunctioning CD is just such an example of cracked media. Rather than exposing the component parts of the media in question like the flicker film, it is a music that reveals what happens when the technology ceases to work as it is supposed to. One of the most well-known practitioners of glitch music is the veteran Japanese experimental musician Yasunao Tone, who began manipulating CD systems in the early 1980s, only shortly after the technology became commercially available. Tone 'wounds' CDs by preparing them with small pieces of pinpricked sellotape, causing the system to misread the data on the disk. When the error level is too big, error correction cannot deal with it, and the CD system releases a 'false sound' not related to the music that is supposed to be on the CD. Wounded CDs remind us that there is no real music[66] on a CD, only digital data representing the audio and tracking information. For the most part Tone's practice has involved live performance — in fact he cannot predict what will come out of his set-up, and so the emerging music is a result of Tone improvising with the chance

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[64] Kelly, *Cracked Media,* 37.

[65] Kelly, *Cracked Media*, 29.

[66] I wonder of we can really consider the analogue imprints of sound found on records and magnetic tape to be 'real music'. Anti-digitalists like Rothenbuhler and Peters would probably think so, but maybe this all goes back to the larger question of where sound/music really resides.

error emissions of the CD system. However, in 1997 he did release a CD entitled *Solo for Wounded CD,* which was itself based on a previous CD release, *Musica Iconologies* from 1993. Of course there is something quite ironic about making a functioning CD for people to listen to normally that is created from the sounds of a malfunctioning CD. Perhaps ideally, one might imagine that listeners would in turn themselves become practitioners, engage in a two-way relationship with their CD system, and wound Tone's release in order to produce their own glitch music. The pieces on *Solo for Wounded CD* (audio example 3.1) are quite stark, although the type of distorted digital sounds that we hear do have a certain familiarity, and might remind us of early computer games, modems as well as a kind of electronic heavy metal. The music on *Solo for Wounded CD*, in its relentless stream of different sounds, makes me think of John Cage's *Williams Mix* (1951-53). But whereas *Williams Mix* might suggest the beginnings of a catalogue of every possible sound, Tone's 'everything' is limited to a finite (though very large) array of digital noises.

Fig. 3.3 A wounded CD

There are some constants in the music, there is a beat of sorts (that I suppose is related to the speed of a spinning CD) at around 545 bpm, and even a reference frequency corresponding to a slightly sharp G2. However, the silences are perhaps even more revealing of the source of the music since they are digital and consist of the absence of sound, the contrary in fact of a Cageian silence. By forcing the CDs to error then, perhaps Tone shows us that behind the façade of the advertised impeccable audio quality, lies a mechanistic, a-musical digital robot. Kim Cascone has suggested that glitch music is driven by an aesthetics of failure and reminds us "that our control of technology is an illusion".[67] Certainly if we cannot be the master of digital technology, the next best thing might be to see what happens when we break it.

3.10 *Little Dog for Roger* and going beyond remembering how it works.

In his article from 1978 entitled "Material, Materiality, Materialism",[68] the British film-maker and theorist Malcolm Le Grice sets out five areas of potential activity for the artist wanting to foreground the materiality of film in his or her work. The first area of activity involves working with the physical substance of film (the plastic strip itself with its sprocket holes and dust particles), the second, what Le Grice calls "mechanical and physio-chemical processes",[69] concerns the manipulation of the film in terms of exposure, colour and speed as it is captured, printed and projected, and the third area is optic functioning — the exploration of the frame-rate as a rhythm (a process that we have already discussed in section 3.8). His final two categories, the use of "duration as a concrete direction", and "the projection situation as material event"[70] are not concerned so much with the materiality of the film itself, but with exposing what Laura Mulvey calls the "cinematic detour"[71] by separating the acts of filming, editing and screening for the audience, and refusing to tie them

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[67] Kim Cascone, "The Aesthetics of Failure: Post-Digital tendencies in Contemporary Computer Music," *Computer Music Journal* 24 (Winter 2002): 12-18.

[68] Malcolm Le Grice, "Material, Materiality, Materialism," in *Experimental Cinema in the Digital Age* (London: British Film Institute, 2001), 164-171.

[69] Le Grice, "Material, Materiality, Materialism," 165.

[70] Le Grice, "Material, Materiality, Materialism," 166-67.

[71] Mulvey, *Death 24x a Second,* loc. 207-10.

together into an illusory whole. We will return to this subject later on in the section. Le Grice's own film *Little Dog for Roger*, made in 1967, explores all the categories set out above to varying extents. In fact to say that the film was 'made' in 1967 is not entirely accurate: the video version[72] that I have watched is a recent adaptation made by Le Grice of his original 16mm work. The footage that provides the actual 'subject' of *Little Dog,* was rediscovered by Le Grice at his family home in Devon. It had been captured in 1950 on 9.5mm film by Le Grice's father and shows the family playing with their small terrier dog. 9.5mm was a popular amateur format that was introduced by Pathé in 1922, and recognisable by a single centrally-placed sprocket hole, but by 1967 the format had become obsolete and Le Grice had to transfer the 9.5mm footage onto 16mm film using an old projector that he converted himself.[73] He claims that the centrality of the celluloid strip itself to the film, its sprocket holes and scratches, was as much a result of the difficulty he had converting the format, as it was an expression of his interest in exploring the materiality of the medium.[74] The original version of the film was a work for two projectors and two screens, with one print of the material being screened at 24 fps and the other at 16. When the work was later adapted to digital, this double projection element was kept and condensed into a single video. Throughout *Little Dog*, Le Grice plays with the synchronization and desychronization of the material on the two reels and the superimposition of micro-rhythm afforded by the different film speeds.[75] At no point in *Little Dog for Roger* are we able to forget that we are watching a film of a film, the footage of the family day out is always shown at one remove from the viewer. In fact the subject of the footage is revealed slowly — the first minute of the film (video example 3.4) consists of abstract speckled patterns interspersed with black or white-outs (which continue as a kind of articulatory device throughout the piece), and the polyrhythmic

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[72] It can be streamed at http://www.ubu.com/film/legrice_dog.html

[73] Malcolm Le Grice, "Real TIME/SPACE," in *Experimental Cinema in the Digital Age* (London: British Film Institute, 2001), 158.

[74] Le Grice, "Real TIME/SPACE," 158.

[75] Le Grice removed sections of the 16fps print in order to create more moments of almost-synchronization with the 24 fps version. He also had access to projectors where the manipulation of speed was possible. Malcolm Le Grice, e-mail message to the author, May 8, 2014.

Fig. 3.4 Malcolm Le Grice — still from *Little Dog for Roger* (1967)

fluttering of the passing frames. For the rest of the work, a few fragments of footage are repeated over and over again, while other elements are varied, such as the placement of the 9.5mm filmstrips within the frame, their speed and level of exposure. At times it appears that the sprocket holes, rather than the dog and family, are the focus of the film (at 4:18 they even seem to be the subject of a close-up), and at others Le Grice creates a kind of ballet from the overlapping of the shifting strips of film (4:30). Other parts of the work show Le Grice manipulating his materials in order to foreground the mechanism of the moving image itself, the individual static frame bursting into life, and more confusingly perhaps, creating the illusion that each frame contains its own animation, through the superimposition of the strips (7:57).

The formalism of the work is both questioned and enhanced by the use of sound. This soundtrack consists of three distinct elements: various songs from the 1940s

including “Pedro the Fisherman”,[76] the slightly ominous buzz of what one assumes to be a projector, and at the very end of the film, digital silence.[77] Snippets of music alternate with the projector buzz, providing a kind of sonic equivalent of the visual binary of footage next to black/white-outs. However, Le Grice refrains from manipulating the sound through superimposition the way he has with the image, and in fact only the 24 fps reel contains any audio. Perhaps his decision is related to a desire to maintain a certain amount of sonic clarity — the music is already fairly distorted due to it having been transferred between formats several times.[78] The quality of the sound and the fact that the music is roughly contemporary with the family footage, serves to compound *Little Dog's* latent nostalgia — both elements remind us of another era, of Britain during and after the second world war, of the need to keep ones spirits up in times of adversity with cheerful music, of childhoods that have passed and sweet little dogs. The sonic and visual materials appear to be on the verge of disintegration, and Le Grice's work performing multiple adaptations in order to preserve the things that they have captured, seems almost futile. Le Grice has stated that *Little Dog for Roger* deals with “the deterioration of records like memories”.[79]

Le Grice has written a great deal about the temporal relationship between the shooting, printing/editing and projection stages of a film, and of the way that ‘retrospective materials’ are treated.[80] He believes that a traditional feature film tries to erase the different stages of the film-making process and the temporal gaps between them, drawing the audience into an illusory now, as if the story is unfolding in front of them in some kind of magical real time.

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[76] In fact Le Grice's parents were members of a small concert party during the 1940s, and the music used in *Little Dog for Roger* is selected from their repertoire. Malcolm Le Grice, e-mail message to the author, May 8, 2014.

[77] It is probably important to reiterate here that I am referring to Le Grice's adaptation of the film onto video, and not the 16mm double projector event which I have unfortunately never seen.

[78] From old records, to ¼-inch magnetic tape, to film sound-strip and then to digital audio. Le Grice, e-mail message to the author, May 8, 2014.

[79] http://www.ubu.com/film/legrice_dog.html

[80] Le Grice, “Real TIME/SPACE,” 159-60.

> The techniques of film have been primarily developed to 'manipulate' a recorded (picture and sound) 'reality' into structures and events which never happened in anything like the terms which the language tells us they happened, while presenting the result as a 'representation' of reality.[81]

I think that the manipulation that Le Grice is talking about here, is somehow of a greater magnitude and seriousness than the smoothing over of the lost moments between sampling that Baudry is concerned with (though arguably the latter is a sub-category of the former). Films that foreground the different stages of production, such as *Little Dog for Roger*, attempt to counter "the passive subjectivity to a pre-structured substitute and illusory reality which is the normal situation for the audience of the commercial film."[82] However, perhaps the revelation of these gaps between film-making stages has other consequences. It is important to remember that the length of the duration that elapses between the first and last of these stages is subject to an ongoing elongation. As we saw in Smith's *Leading Light*, nostalgia can creep in to occupy this particular type of macro-gap, and its presence is all the more striking for occurring in an avant-garde context. Le Grice is well aware of this phenomenon and how it can change the effect of a film for maker and audience alike:

> This time difference, which was not particularly significant to me when I made *Little Dog*, becomes increasingly part of the meaning for the work now that it is half a century away. This photographic 'time-bomb' is even more disturbing with the animation of the moving image. Though my conscious concerns at the time I made it were with the medium and material, my choice of material and particularly of the sound show my unconscious engagement with the subject and its sentimental attachments.[83]

What exactly do we mean by 'nostalgia'? The word primarily suggests a kind of sentimentality, mawkishness even, a sadness concerning the passing of things or else

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[81] Le Grice, "Real TIME/SPACE," 156.
[82] Le Grice, "Real TIME/SPACE," 156.
[83] http://www.stuk.be/en/little-dog-roger

the fetishiztion of old media and equipment (see section 3.5). Augoyard and Torgue in their book *Sonic Experience: a guide to everyday sounds*, describe a phenomena that they call "anamnesis"[84] as "an effect of reminiscence in which a past situation or atmosphere is brought back to the listener's consciousness, provoked by a particular signal or sonic context."[85] They go on to characterize this effect as mostly involuntary on the one hand, but entirely created by the listener and his or her own history on the other. Although Augoyard and Torgue consider anamnesis to function in the same way regardless of the length of the gap it spans, they do concede that "the more distant and unexpected the reference, the more the emotion may overwhelm the listener."[86] What I like about their definition is the way that it emphasizes both the composite nature of the effect (which is formed by sound, hearing and memory) and its dependence on the connection-making activities (either voluntary or involuntary) of the affectee.[87] However, the question still remains as to whether nostalgia/anamnesis can be incorporated in a meaningful way within the context of contemporary art practices. Jonathan Sterne, refers to Benjamin's *The Work of Art in the Age of Mechanical Reproduction* in relation to his own investigation into the notions of original and copy. He proposes that Benjamin's 'aura', that certain something possessed by the original and lost during the process of reproduction, is a quality attributed to material retroactively and that only exists because reproduction has taken place. Sterne defines aura as follows:

> …something that is an artifact of reproducibility, rather than a side effect or an inherent quality of self-presence. Aura is the object of a nostalgia that accompanies reproduction.[88]

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[84] Considering the definition that they give, and the fact that they use the word nostalgia almost synonymously, I would say that for the most part anamnesis = nostalgia. The only place that anamnesis might differ from our commonly held ideas of nostalgia is in its ability to act over very short as well as long spans of time, and that it might refer to negative as well as positive feelings.

[85] Jean-François Augoyard and Henry Torgue, *Sonic Experience: A guide to everyday sounds,* trans. Andra McCartney and David Paquette (Montreal: McGill-Queen's University Press, 2005), 21.

[86] Augoyard and Torgue, *Sonic Experience,* 21.

[87] Augoyard and Torgue, *Sonic Experience,* 21

[88] Sterne, *The Audible Past*, 220.

If nostalgia is an unavoidable outcome of the recording and playback of sound and image, of the act of reproducing an original event at a later time, artists who employ these recorded materials should perhaps acknowledge, incorporate or subvert this quality within their work. In her book *The Future of Nostalgia*, Svetlana Boym proposes a kind of aesthetic position built around nostalgia. As distinct from "restorative nostalgia" employed by reactionary political movements[89], Boym defines "reflective nostalgia" as a tendency characterized by yearning, loss and ambivalence,[90] and one that is adopted by artists that the author refers to as "off-modernists".[91] For Boym, the aim of the project of off-modernism and the type of nostalgia that it deploys is to:

> revisit this unfinished critical project of modernity, based on an alternative understanding of temporality, not as a teleology of progress or transcendence but as a superimposition and coexistence of heterogeneous times.[92]

The nostalgia of off-modernism can sometimes be ironic or critical, but perhaps most importantly it is seen to dwell in the impossible spaces generated by "the repetition of the unrepeatable, materialization of the immaterial"[93] — an idea that can be clearly related to Sterne's interpretation of the Benjaminian aura. Boym goes on to state that an artist engaging in an act of reflective nostalgia "instead of aspiring for the universal and progressive… looks backward and yearns for the particular."[94] Being 'particular' is of course an inescapable property of indexical media and perhaps the source of their potency when employed in an artistic context. Le Grice's strange juxtaposition of formalism, materiality and nostalgia in *Little Dog* would

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[89] The concept of restorative nostalgia and its deployment by populist right-wing movements has been recently parodied in the twentieth season of the American animation series *South Park*. The consumption of sinister super fruits called "member berries" by the adult population is seen to contribute quite considerably to the election of a Trump-like president. The member berries numb the critical faculties by muttering a mixture of benign and reactionary nostalgic reminiscences of a bygone era to the eater. I do not know if the show's writers have read Boym.

[90] Svetlana Boym, *The Future of Nostalgia* (New York: Basic Books, 2001), 41.

[91] Boym, *The Future of Nostalgia*, xvi.

[92] Boym, *The Future of Nostalgia*, 30.

[93] Boym, *The Future of Nostalgia*, xvii.

[94] Boym, *The Future of Nostalgia*, 11.

certainly seem to qualify as a manifestation of off-modernism, as would my own work (with perhaps the exception of *The place you can see and hear*).[95]

3.11 Human memory and recorded media.

Friedrich Kittler speculated that the development of recording media is bringing about a corresponding decline in the human ability to remember things.[96] Even if mechanical/electronic memory and human memory are not quite as intrinsically connected as Kittler suggests, it is certainly the case that one has often been viewed through the lens of the other. Our understanding of the way human memory functions, like everything else concerning the mind, is very far from complete and the author Alison Winter, in her book on the recent history of memory studies, has observed that theories on the subject have in general vacillated between ideas of remembering as 'stable authenticity' and as reconstruction.[97] We could imagine that the first of these theoretical tendencies sees human memory as somehow akin to indexical analogue recording media, where the memory of an event is laid down directly in the brain as a kind of trace, and that this trace (just like a photograph for instance) is thus causally related to the event in question.[98] This is of course quite an intuitive notion of memory, and one that Winter sees as having been regularly deployed by those selling recording media of all kinds. Mid-century amateur film cameras, for instance, were advertised as an "external form of family memory" that allowed its users to "relive special experiences over and over again."[99] Furthermore, medical observations, such as those made by the Canadian neurosurgeon Wilder Penfield during operations to treat epilepsy, also implied that the memory/media comparison ran both ways. When an electrode was drawn over various parts of their brains, Penfield's patients would experience past events vividly, suggesting that this electrode was behaving like a playback head and that the brain stored memories like

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[95] If Le Grice and I are off-modernists, according to Boym we would join the likes of Benjamin, Stravinsky, Kundera, Proust, Baudelaire and Nabokov.

[96] Kittler, *Gramophone, Film, Typewriter*, 10.

[97] Alison Winter, *Memory: Fragments of a Modern History* (Chicago: University of Chicago Press, 2012), Kindle edition, loc. 4665-69.

[98] Martin and Deutscher wrote about the causal theory of memory in their 1966 paper "Remembering," *Philosophical Review* 75:161-96.

[99] Winter, *Memory*, loc. 1787-9.

a reel of tape.[100] It is especially tempting to think of the minds of people with an exceptional autobiographical memory (such as those with the rare condition hyperthymesia)[101] as resembling recording devices. A 1942 fantasy short story by Borges entitled *Funes the Memorious*, introduces us to a young man, Funes, who following a riding accident has utterly perfect recall.[102]

> We, at one glance, can perceive three glasses on a table; Funes, all the leaves and tendrils and fruit that make up a grape vine. He knew by heart the forms of the southern clouds at dawn on 30 April 1882, and could compare them in his memory with the mottled streaks on a book in Spanish binding he had seen only once and with the outlines of the foam raised by an oar in the Rio Negro the night before the Quebracho uprising.[103]

It is perhaps not by chance that Borges set the story in the late nineteenth century, a period that witnessed the development of many different types of mechanical recording devices, and in fact Funes's powers of detailed cross-analysis also invite comparison to the computer-based technologies of our own times. Funes's memory is so perfect that it takes him one full day to remember one day, and it appears that he lacks the ability to abridge the things he has recorded for the sake of usefulness. Borges goes on to suggest that Funes is unable to draw conclusions and make generalizations based on what he has remembered — to a certain extent he is just a dumb machine:

> He was, let us not forget, almost incapable of ideas of a general, Platonic sort. Not only was it difficult for him to comprehend that the generic symbol *dog* embraces so many unlike individuals of diverse size and form; it bothered

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[100] See Winter, *Memory*, chapter 4.

[101] See Elisabeth Parker et al, "A Case of Unusual Autobiographical Remembering," *Neurocase* 12 (2006): 35-49.

[102] Borges, according to Janet Coleman, may have based the character of Funes on Solomon Veniaminovich Shereshevsky, the subject of Alexander Luria's psychological case study entitled *The Mind of a Mnemonist*.

[103] Jorge Luis Borges, "Funes the Memorious," in *Labyrinths: Selected Stories and Other Writings*, ed. Donald A. Yates and James E. Irby (London: Penguin Books, 1964), 91-92.

> him that the dog at three fourteen (seen from the side) should have the same name as the dog at three fifteen (seen from the front). His own face in the mirror, his own hands, surprised him every time he saw them.[104]

The point of course is that Funes and his perfect memory are a fantasy. Borges is proposing that the incompleteness of normal human memory is essential for the production of sense — rather like time-lapse film, the presence of gaps helps us to see the bigger picture.

I think that the complex interweaving of comparison between human memory and media is indicative of the relationship that we have with this technology on a broader scale. To rephrase Caleb Kelly's very important point from earlier in the chapter, the development, reception and use of these media is a layered two-way process. From the willingness to ignore the flaws of early technology or conversely to 'crack' seemingly impenetrable media, through to the more passive physiological participation when 'filling in the gaps' of a film or mp3, it seems that people and media are fundamentally intertwined.

3.12 *The Grand Tour*

For a moment we should go back to the second of Alison Winter's models for human remembering: memory as reconstruction. Important work was carried out on this subject during the early part of the twentieth century by the British psychologist Frederic Bartlett. In a famous experiment, Bartlett gave the participants of the experiment a native American story called "War of the Ghosts" to read, which they then had to retell at a later occasion. He found that not only were the retellings inaccurate with regards to the details of the original, but that they had also become shorter and more 'coherent' in adherence with the norms of the Western (as opposed to native American) tradition of story-telling. Bartlett concluded that the process of remembering was not simply a case of 'playing back'[105] a memory, but that it was an

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[104] Borges, "Funes the Memorious," 93-4.

[105] My words, not his.

act of unconsciously creative reconstruction based on the remembered thing and influenced by the rememberer's own ideas and cultural background.[106] The act of reconstitution involved in this theory of memory might remind us to a certain extent of the way that a digital medium encodes and reconstructs a signal, changing that signal to correspond to its own format and severing the indexical link to the original in the process. Perhaps memory reconstruction could also be compared to sampled media in general, where a seemingly continuous whole is recreated from an event that has been incompletely recorded.

The Grand Tour[107] is a short film that deals with issues of memory, reconstruction and sampling media. The starting point for the film is a box of old photos of my late father's trips to various summer language schools in Europe at the beginning of the 1960s — photographs that were taken in Berlin, Vienna, Barcelona and Tuscany. At the heart of the project lies the idea of unrecoverable loss: the loss of my father and the knowledge he possessed about what happened on these trips, as well as the loss of information that is the result of 'poor sampling'. The box of photos goes far beyond a traditionally captured film, or even a time-lapse film in terms of its gappiness, and we might imagine that the irregular spans of time that lie between each photo are filled with whole undocumented chunks of my father's story. Much of the film is concerned with making a futile attempt to reconstitute a whole from this sparse set of samples.

The Grand Tour also represents the expanded (and expanding) nature of my practice as a composer, the contextualization of which serves as an impetus behind this thesis. Although there is a visual component to *The place you can see and hear*, and indeed the camera obscura is the starting point of the piece, my work as a 'visual' artist here was restricted to trying to find the best available view and frame it through the placement of the screen. Clearly the image work in *The Grand Tour* is much more extensive, as is the set of relationships that are made between the pictures and sound.

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[106] See Jonathan K. Foster, *Memory: A Very Short Introduction* (Oxford: Oxford University Press, 2008).

[107] See Appendix 6.

In order to tackle this piece I tried to make use of two things: the set of transferable skills I have developed as a composer of instrumental and electronic music, and the knowledge of audio and visual media I have gained during my doctoral research. My skills as a composer that might transfer to the making of a film include being able to manage time-based forms in a variety of ways, and control material both vertically and horizontally (learnt while studying harmony and counterpoint). On a more technical level, familiarity with editing audio on a computer was extremely helpful when dealing with software for video. Once we enter the realm of digital technology, differences between disciplines are ironed out a little. We can see similarities in the interfaces of audio and video software: zoomable timelines, choices of formats, bins filled with material, cross-fades and cross-dissolves. These similarities further facilitate the D.I.Y. approaches to art-making we discussed in Chapter 2, in particular a type of software-oriented intermedial practice that might be adopted by the artist wishing to engage with media other than their 'own'. I wonder if I would have been so enthusiastic about making a film if I had been required to do it the old-fashioned way by cutting and splicing celluloid. Digital film-editing software offered me the possibility of experimenting with another media at a relatively low financial cost and without having to spend too much time learning new skills. As is often the case though, there is another side to this democratization of media technology. Digital platforms standardize things,[108] and in making a video-editing program so easy to use for a composer accustomed to editing sound on a computer, software designers could be thought of as bringing the audio and visual a little too close together. These narrow spaces between sound and image technologies (or indeed between media and reality) should not be closed, however, and it is up to the artist to keep them open by both acknowledging differences and making unexpected connections between audio and visual elements. This is what I have tried to do in *The Grand Tour* through turning some of the things I have learnt about sampling media into compositional/

[108] I feel that Apple, on whose computers and software I am unfortunately reliant, are great offenders in this regard. The new version of Final Cut, in order to bring it into line with the nomenclature of other applications, no longer allows you to export films, you have to 'share' them. Logic audio does something even worse, the two options for the timeline display are either bars and beats, or seconds subdivided into film frames (there is no option to subdivide seconds into tenths and hundredths of a second). I find this kind of standardization rather worrying: Logic assumes that its users either want to make pop music or film soundtracks and no other usage of the program seems to be worth accommodating. We will discuss the problem of the digital in the concluding chapter.

film-making techniques. In many ways *The Grand Tour* is the work from my portfolio that most embodies the theoretical research I have done and it might even be seen as constituting a summary in artistic form of Chapter 3.

The various techniques I used to put together the images and audio are in certain respects important 'materials' in themselves, and as such are repeated and developed throughout the course of the film. Most of the techniques took shape when editing the visual element of the work and are echoed, and even rather bluntly mimicked in the audio. Most of the voice-over however, is left 'intact' as I wanted to make sure that it was always intelligible. I will try to summarize the most important techniques below.

Flickering:

The flickering scenes in the film are inspired by the techniques of flicker film-makers such at Peter Kubelka and Paul Sharits. However, instead of using blank black, white or coloured frame, these sequences use the 58 photographs roughly ordered into a 'chronology' of sorts. In the first main flickering sequence each photograph has a duration of one frame and as such cannot be identified except when it is pulled out of the flux by a system that is determined by the rhythm of the Johann Strauss waltz *Wiener Blut* (see the paragraph on silent music below). In fact Strauss waltzes and Vienna permeate a great deal of the film — they are not in any way the subject matter of the work, but they do serve as a kind of cultural reference point, unifying elements of the film on a relatively superficial level. The flickering, like many of the techniques, is a strategy to add motion and tempo to the still photographs that form the core material of the piece. It is also an unsuccessful attempt at animation — the temporal gaps separating the capturing of each photo, and the physical differences between images are far too large to generate the illusion of a continuously moving image. The constant flux of images at 25 frames per second renders the photos abstract and attention is drawn to the unit of the frame itself. The first sequence also has an audio accompaniment that mimics the flickering of the visuals. Each photograph is assigned a sound (either a field recording or a

piece of music that could be ‘associated’ with that image), and these sounds are directly synchronized with their respective photos, lasting the duration of a frame and extended at moments when the image is pulled out of the flux.

Interstices:

Interstices or gaps (always black frames in the film) are used not only as an editing device in *The Grand Tour* but as a metaphor for missing information — either the tiny gaps during filming that are caused when the shutter is closed on the movie camera, or the long and irregular gaps of lapsed time between the photos in the series. Small frame-length gaps are used at several points in the film: at the ‘decoupage’ moments (the angel and the cat, the soldier and my father) to signify some event that might have been missed because the shutter was closed for a split-second, and also in the shortening and lengthening patterns of blank frames in the Tom and Jerry sequence to show the deconstruction of animation. These short interstices also occur in the sound at certain moments and are an attempt to make a kind of rough and rather obvious intermedial equivalent. During the angel and cat sequence for instance, tiny chunks of the waveform equal to the length of one frame are taken away from the sound. This causes a stuttering effect, but leaves the spoken text in an intelligible state. Longer gaps are present towards the end of the film during the ‘reconstruction’ of the Viennese scenes — here the unusually long gaps suggest the time that elapsed between the taking of each photo, and the inadequacy of the sampling process that the series of photographs represents.

Accelerating and decelerating:

Accelerating and decelerating patterns occur with some regularity during the film as well as in the other works that constitute my creative portfolio. These patterns (that can be found in some of the close-up, panning, flickering and cartoon deconstruction sequences) were made as an attempt to create animation from the still photos and provide much needed variation in visual tempi. As with other works in the portfolio, the accelerating and decelerating also reveal how our perception of certain materials changes with speed. For instance, the speeding-up into the sequence of Tom playing

the piano from the 1953 *Tom and Jerry* cartoon, "Johann Mouse" (video example 3.5, 3:28),[109] shows us how animation works by accelerating from a series of still frames past the threshold of where our eye is fooled and the illusion of motion created. The sequence that I have chosen to dismantle links very closely to the rest of my film since it is set in Vienna and is concerned with waltzes on the one hand, and on the other shows Tom learning to play *The Blue Danube* by placing one note after the other — in effect demonstrating the functioning of discrete media by stringing samples together in order to make a convincing whole. The sequence employs the following text:

> Stringing one separate thing after the other, as quickly as we can until we reach a semblance of continuity, is all we can do in the end. A kind of faking by necessity and one which only works if the separate things are only a little different from one another. Too much difference, too large a gap between the different things and we just end up with flickering confusion.[110]

Compositing:

The compositing moments in the film occur when some alien element is brought into the photos. In conjunction with the interstices and accelerations they provide an element of 'animation' to the proceedings. In order to achieve this effect I digitally cut out various pictures from their original backgrounds in GIMP and pasted them into my father's photos. In the final sequence where Jerry mouse waltzes in the Great hall of the Schloss Schönbrunn, 90 frames from the original cartoon were subject to this cutting-out process and then re-animated on the new background.

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[109] This Metro-Goldwyn-Mayer cartoon has a running time of eight minutes. It was directed by William Hanna and Joseph Barbera, and produced by Fred Quimby. The setting is 19th century Vienna and Tom is the pet cat of Johann Strauss II. Tom notices that Jerry comes out of the mouse hole to dance every time his master plays a waltz on the piano. Not surprisingly, the only reason Tom learns to play The Blue Danube is so that he can lure Jerry out of his mouse hole in order to catch him.

[110] The full text for the film can be found in Appendix 6.

Pixelation:

The pixelation technique is rooted in the idea of the digital picture and its limited resolution. Pixelation is manifested on a visual level when extreme close-ups of the photographs occur and we see that it is impossible to derive any more information from the document. Interestingly enough, I had to fabricate the pixelated effect using a filter in GIMP, as both GIMP and Final Cut employ algorithms to smooth over pixilation when it crops up in extreme close-ups. The altered version of Johann Strauss's *Geschichten aus dem Wienerwald* that accompanies waltzing Jerry, is a sonic, time-based equivalent of the image pixelation. This sequence uses the same technique as the third movement of my orchestra piece (see Chapter 4 and Appendix 8), but in a simpler electronic form. Short freezes were extracted from a recording of the waltz every 0.5 seconds, and then arranged into a waltz-like rhythm. The resulting audio seems like a kind of stumbling through the original music — details of the melody and orchestration disappear as a result of the 'poor sampling' technique that has been employed.

Silent Music:

Perhaps the most intermedial technique used in the film is that of silent music — an idea adapted from flicker films suggesting that the succession of frames that constitutes a moving image is inherently musical. The rhythmic pattern of *Wiener Blut* provides the framework for the first flickering sequence, and later in the film, a series of close-ups from a photograph of a Viennese palace garden is cut to the rhythm of *Geschichten aus dem Wienerwald*. Although the identity of the music that provides these two durational frameworks may not be apparent to a viewer, the aim is that a sense of music or at least of a specific type of temporal cohesion, is conveyed during these sequences.

Fig. 3.5 Joanna Bailie — still from *The Grand Tour* (2013/14)

Fig. 3.6 Joanna Bailie — still from the first “Johann Mouse” sequence of *The Grand Tour* (2013/14)

3.13 Conclusion to Chapter 3

During the course of this chapter on sampling in media, we have examined the micro-gaps (interstices) inherent to these media, and the macro-gaps that result from the time that elapses between recording, processing[111] and playback, and which are a property of recorded media in general. Both types of gap entail the idea of loss, albeit in very different ways. The micro-gaps represent tiny and extremely regular losses of information, machine-made and for the most part either not perceived, or ignored through habit by the listener or viewer. Macro-gaps are related to the passing of time, to history, and are of various durations that are subject to continual prolongation. We certainly notice macro-gaps. These macro-gaps are manmade: they are not directly about the media technology itself, but are a by-product of the particular ways in which people have made and used recorded materials. It appears that gaps of both kinds can be useful to us. Time-lapse, which involves the expansion of the tiny spaces between samples, allows us to observe things that move too slowly for us to comprehend. The generalisation or reduction resulting from time-lapse techniques reminds us a little of how we ourselves remember — unlike Funes the Memorious it does not take us one whole day to remember a day. Macro-gaps are evidence of the ways in which our own histories are entwined with media. They are a testament to the transitory nature of life, of the loss of things that have passed, the acknowledgement of which is often manifested as nostalgia. I believe that it is through an understanding and acceptance of both types of gaps, that artists can begin to develop a poetics of sampling as I have attempted to do in *The Grand Tour*. This term is intended to outline an approach to art-making that is rooted in drawing unexpected connections between the personal/particular and technology, while simultaneously alerting us to their differences. It is one of the ways in which an artist can inhabit the frictional space between reality and the media we use to preserve it.

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[111] Processing/editing is not necessarily a separate stage (if it is carried out at all). *Leading Light* was edited on the camera during shooting and one can of course imagine a situation where a recording might be played back during an artistic event without having been worked on in any way. In "Real TIME/SPACE" Le Grice refers to some of the works of Michael Snow and Andy Warhol that employ continuous unedited takes, and how these works exhibit a much greater correlation between shooting time and playback time in comparison to commercial movies.

We have also continued the comparison of visual and audio media in order to expand our understanding of intermedial possibilities, this time in relation to the way that digital audio and film use sampling in order to record. The vast divergence in sampling rates used for sound and image have led film-makers and musicians to employ different strategies for revealing the workings of their respective mediums. Whereas the flicker film makers were able to draw attention to the length and frequency of the sample itself by alternating different coloured frames, sound artists like Yasunao Tone were obliged to find another way, deciding instead to use digital audio technologies in an unusual manner and showing us what happens when media do not work. The matter of digital technology in general has also arisen during the course of this chapter, most importantly in relation to the way it has changed the capturing and storing of sound. The limited resolution of digital audio, whether perceivable or not, is a problem for writers like Aden Evens as is the loss of background noise and the fundamental difference between the binary nature of the digital and the continuous values that constitute reality. Of course the problems entailed in the digital constitute a large part of the issue of discrete and continuous lying at the heart of this research. However, it is important to acknowledge the way that digital media have been, and are being developed with regards to standardization of formats and interfaces, and how this might cast current technologies in a more sinister light compared to older discrete media such as analogue film.

Finally, in *The Grand Tour* I have attempted to use various strategies gained from my investigation into audio and visual sampling in order to find unexpected ways of using sound and image together in film. The next chapter will build on this research by examining four important sets of relationships between the audio and visual that exist independently of recorded media but which might be relevant to the intermedially-minded artist. We will compare and contrast the limits of what we can see and hear in terms of our raw senses, investigate the idea of using synesthesia as a possible model for intermedial art, and look at how synchronization between sound and image works in various contexts. In the last part of the chapter we will approach

the most intangible type of intermediality — that which involves conceptualising audio through image and imaginary visual spaces.

Chapter 4

SOUND AND IMAGE TOGETHER: FILM SYNCHRONIZATION, MUSIC MADE VISIBLE AND VISUALIZING TO MAKE MUSIC.

4.1 Introduction

It is time to bring sound and image together in a different way. The first part of this chapter is not so much about intermedial comparisons (though they will inevitably occur), but is concerned with what happens when we bring sonic and visual media together in order to make 'one thing' out of them. I am talking of course about sound film and all its relatives: television, analogue video and digital video. As a medial form it is ubiquitous and in this ubiquity (as is often the case) only rarely considered by those experiencing it for what it really is: an elaborate contrivance where sound and image are put together in such a way as to appear a unity. Starting with a short overview of our own audio and visual capabilities (and limitations), I will go on to consider the phenomenon of synesthesia in both its real and culturally appropriated forms, and how it might relate to the idea of an intermedial nexus. The central focus of the first half of the chapter is synchronization and the role it plays in welding sound and image together into a viable perceptual whole. We will explore whether the use of synchronization constitutes what Kevin Donnelly would refer to as "an occult practice"[1] and yet another instance of media covering the tracks of its own construction, or on the other hand, if it might be considered the location of both perceptual and artistic creativity. I will end this section by re-examining some of my own works through the lens of synchronization in a more general sense, and by looking at Oskar Fischinger's *Motion Painting No.1* — a work from the middle of the last century rich in audio-visual relationships, both in terms of synchronization and in the way it matches music to image.

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[1] Kevin Donnelly, *Occult Aesthetics: Synchronization in Sound Film* (New York: Oxford University Press USA, 2014).

The second half of the chapter brings us back to music again, but music that has some kind of process of visualization as its starting point. It will be my contention that imagining sound as an image, and taking this process to its extremes, opens up an exciting creative space beyond the more traditional quasi-visual conceptions of music. I will talk about the relationship between sound and the "jagged phonographic line"[2] in the time domain, and in turn about plotting sound in the two-dimensional space afforded by the Fourier Transform. This two-dimensional space brings up other issues: the idea of a regulated, gridded arena, the possibility of thinking about recorded sound as consisting of 'pixels', and what these pixels or grids might mean in terms of resolution and adaptation, especially when basing a work on a pre-existing piece of music or other cultural artefact. Peter Ablinger's *Quadraturen* series and the way in which it adapts recordings of speech and music to other sound media provides the central point of focus for this section, alongside my own orchestral piece, *To be beside the seaside*.

4.2 Comparing the senses

> Visual and auditory perception are of much more disparate natures than one might think. The reason we are only dimly aware of this is that these two perceptions mutually influence each other in the audiovisual contract, lending each other their respective properties by contamination and projection.[3]

It is important to remember that sound and light are not terribly similar phenomena. Granted, they are both waves,[4] but one is extremely earthbound, moving longitudinally, only through matter and at a speed that we can conceive of (and even overtake if we desire), while the other is a little more mysterious (if that is the right word), has no need for a medium, is part of a spectrum of radiation some of which is very useful and/or dangerous, and which represents the very limit of velocity as we

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[2] Douglas Kahn, *Noise Water Meat: A History of Sound in the Arts* (Cambridge: The MIT Press, 1999), 71.

[3] Michel Chion, *Audio-Vision: Sound on Screen*, trans. Claudia Gorbman (New York: Columbia University Press, 1994), 9.

[4] Well even this is not necessarily true in the case of light.

understand it. In fact, we perhaps would not associate sound with light at all if it were not for the fact that our two primary perceptual apparatuses and our brains have evolved to be able to process them. Sound and light are united inside us — this fact alone provides the reason for the existence of the audio, visual and audio-visual media we have been studying throughout this thesis.

It is perhaps worth briefly comparing what we know of these two perceptual apparatuses and how the information they receive is processed by our cognitive systems. What our vision and hearing have in common, first and foremost, is that they do not apprehend the world as it really is, but according to the nature of the systems themselves which have developed in response to various needs throughout human evolution. We do not have the ability to see infrared or hear above 20 kHz, most probably because we have never really needed to. We are also subject, not only to limitations, but to biases and illusions, some of which we will look at later.

In contrast to the distinct limitations that demarcate visible light from the rest of the EM-spectrum, and audible from inaudible frequencies, it seems that both ear and eye are similarly equipped to detect what seems to be a very wide range of intensities. The span of luminance perceivable by the eye is 1: 10 000 000 000,[5] while for loudness it is 1: 10 000 000 000 000 [6] — the limits in both cases being defined by the threshold of visibility/audibility at one end, and the point where physiological pain or damage is experienced at the other. It is interesting to note that as with speed (which we mentioned in Chapter 2), avant-garde art can often be seen exploring the extremes, and particularly the lower limits of certain phenomena. For example, in Bill Viola's installation *Tiny Deaths*, the work of French choreographer Brice Leroux, as well as in my own piece *The place you can see and hear*, the level of luminescence hovers only just above darkness, whereas the music of composer Evan Johnson, or we could imagine say, a performance of *4'33"* in a particularly quiet auditorium, might test our apprehension of sounds nearer the threshold of

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[5] Robert Snowdon, Peter Thompson and Tom Troscianko, *Basic Vision: an introduction to visual perception* (Oxford: Oxford University Press, 2006), 24.

[6] No wonder we need the decibel scale.

inaudibility. Works like these demand something of us. This something is not necessarily the physiological co-authorship arising from involuntary reactions that we have talked about with regards to the work of Olafur Eliasson. What they do ask for is our attention, our patience even, as we recalibrate our senses to a lower magnitude of audio and visual signal than we might normally encounter in other types of art or commercial entertainment. Dark or quiet pieces (or even dark and quiet pieces) can be strangely rewarding for the spectators who are, I hope, happy to be reminded of the extent of their own vision and hearing. Naturally these kinds of works can also be extremely fragile, dependent as they are on the co-operation of other spectators, and an accommodating space in which to encounter them.

Discounting intensity levels, we do, as is often the case, tend towards the middle inasmuch as we hear and see things better that are in the centre of certain ranges. Two not quite comparable measures of acuity from vision and audition are contrast sensitivity and the equal loudness curve. Figure 4.1 shows a set of sinusoidal gratings varying in width and contrast, while Figure 4.2 represents the corresponding function. We see medium width gratings better by definition, because we can still see them at a lower contrast. The function is not so dissimilar from the equal loudness curve, if we invert it so that the areas of perceivability are in the same place in each graph. They are not the same thing, but I cannot help but see one as a rough transposition of the other, as showing equivalent hotspots of perceptual sensitivity. I could imagine that this equivalence might be something to be investigated within an artistic context. Instead of exploring the edges of seeing and hearing as the avant-garde are often inclined to do, the middle of perception could be knowingly foregrounded, the commercial forms that usually inhabit this perceptual space subverted, and a new kind of audio-visual parity found.

However, it is generally thought that eyes and ears differ greatly (and even counterbalance each other) in terms of spatial and temporal acuity. Localization of

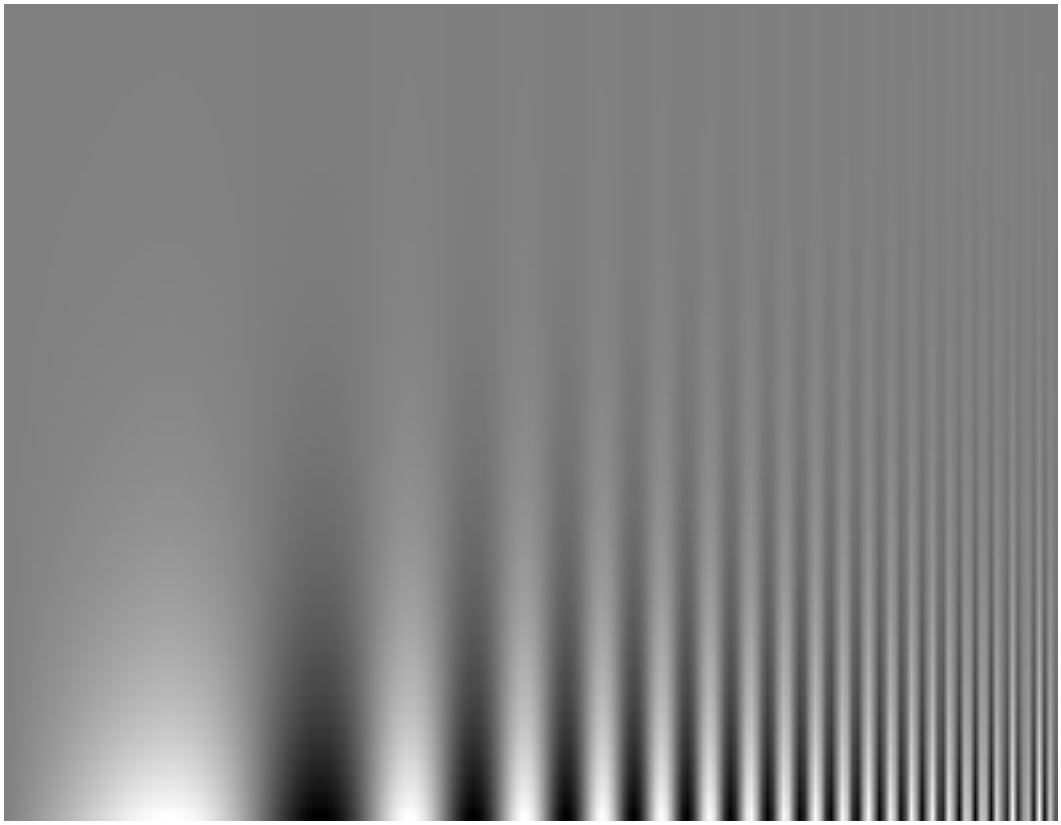

Fig. 4.1 Image showing contrast sensitivity gratings

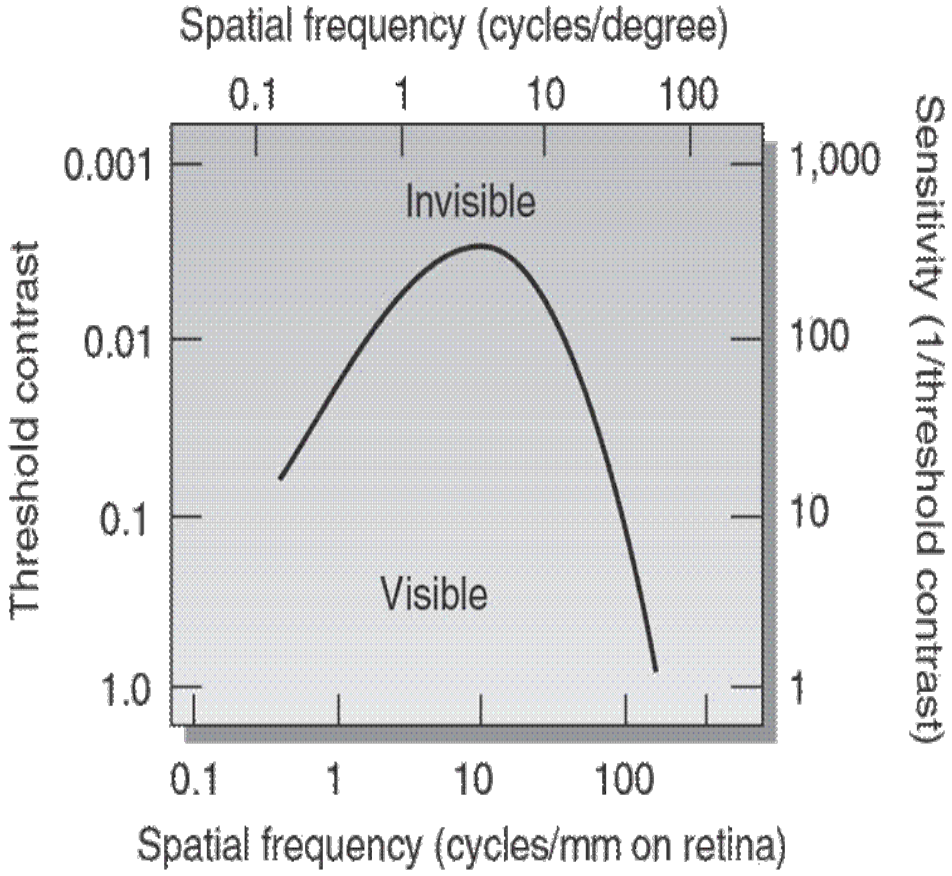

Fig. 4.2 Contrast Sensitivity Function (corresponding to Fig. 4.1)

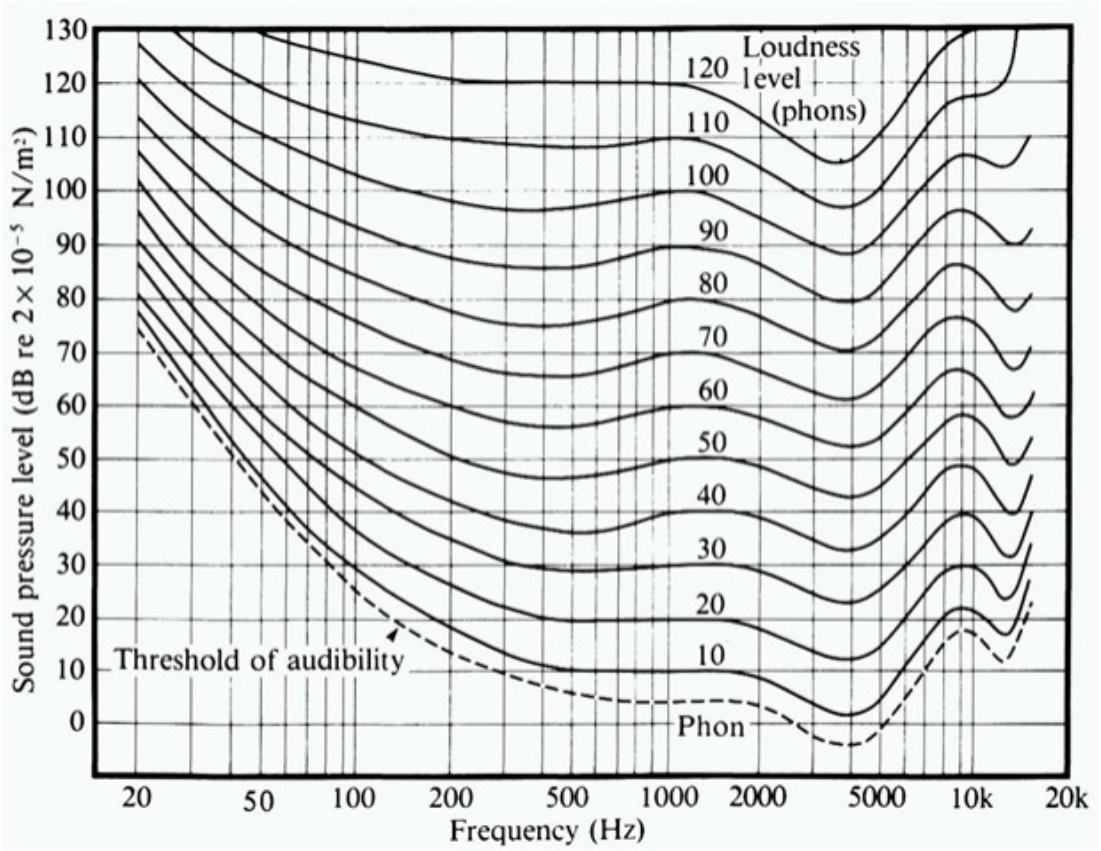

Fig. 4.3 The equal loudness curve

sound sources on the horizontal plane is better than that on the vertical,[7] but considered together these capabilities do not constitute anything like the spatial resolution found in vision. Conversely our ears work much faster than our eyes:

> Take a rapid visual movement — a hand gesture — and compare it to an abrupt sound trajectory of the same duration. The fast visual movement will not form a distinct figure, its trajectory will not enter the memory in a precise picture. In the same length of time the sound trajectory will succeed in outlining a clear and definite form, individuated, recognizable, distinguishable from others.[8]

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[7] Everest F. Alton and Ken C. Pohlmann, *Master Handbook of Acoustics*, 5th edition (New York: McGraw-Hill, 2009), Kindle edition, loc. 1350-61.

[8] Chion, *Audio-Vision,* 11.

Our ears have to be this temporally adept of course to deal with speech, which involves the processing of a dense amount of sonic information. As we know, event fusion happens in hearing at around 16-20 Hz, but beyond that, as the events become blurred together, we reach a different perceptual category within which we can still detect changes in the number of events per second, but where these changes are perceived as alterations in pitch. The critical flicker fusion threshold (if it really is an 'equivalent' of audio event fusion), is higher at about 50 to 60 Hz, but there is no perceptual category above this comparable to our apprehension of pitch. Studies of the 'window of simultaneity' for sound and vision have also pointed to hearing's superior temporal acuity, two audio clicks two milliseconds apart will still be heard as successive events, whereas two visual events need to be spaced at between 30 and 40 milliseconds to not be perceived as happening at the same time.[9] What is interesting is that although hearing and vision's strengths and weaknesses could be thought to balance each other out, it is vision's superior spatial acuity that takes up all the brain space — 50 percent of the cortex is used for processing visual information while just 10 percent is devoted to hearing (the other 40% is divided between the other senses and motor functions).[10] An intriguing parallel to the way our brain space is allocated might be found in the construction of audio-visual media. As Friedrich Kitttler points out, visuals, unlike sound, require the use of two rather than just one variable in order to be captured, and "the amount of information to be processed is raised to the second power",[11] a fact which he believes is directly reflected in the way the image dominates the usable area of a strip of sound film celluloid.[12]

4.3 Synesthesia: making connections and metaphor

The last paragraph, illustrates my own predisposition (and the general tendency of this thesis) to make comparisons and forge links, however clumsily, between things that are not directly connected. In many ways I might consider myself a 'wannabe-

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[9] Bob Snyder, *Music and Memory: an introduction* (Cambridge: The MIT Press, 2001), 33.

[10] Snowdon, Thompson and Troscianko, *Basic Vision*, 13.

[11] Friedrich Kittler, *Optical Media: Berlin Lectures 1999*, trans. Anthony Enns (Cambridge: Polity Press, 2010), 198.

[12] Kittler, *Optical Media,* 199.

synesthete'[13] — I have always longed to have synesthesia, perhaps because there are certain aspects of the condition that resemble a kind of creativity crystallized in neurological form, if indeed we believe that both synesthesia and art are characterized by or at least involve a "generalized hyperconnectivity" and "the ability to see the similar in the dissimilar".[14] Synesthesia is of interest to both neurologists, and art and media theorists alike not by virtue of its exoticism, but because, on the contrary, it represents certain ideas about creativity, the subjectivity of perception, and multisensory integration writ large. I am going to look at a few aspects of synesthesia which might be of interest to us here — the facts have been mostly gathered from Cytowic and Eagleman's comprehensive yet accessible book on the subject entitled *Wednesday is indigo blue*.

Though each case of synesthesia seems to be idiosyncratic in terms of what exactly is mapped to what, these mappings nearly always have a clear logic, such as the very commonly encountered association of low pitches with dark colours and high ones with lighter colours. In fact Cytowic and Eagleman say that this orderly aspect of synesthesia is to be expected in light of the logical structure of certain parts of the brain such as the tonotopic in the hearing area, where the neurons that deal with pitch information are laid-out in sequence from low to high.[15] I was surprised to learn, and perhaps this is one of the most important aspects in our current understanding of the condition, that most cases of synesthesia are considered to be of a higher order, and are more conceptual rather than perceptual in nature. An example of this can be found when studying grapheme to colour synesthesia, where it seems only a minority of those experiencing the condition will have their mappings affected by the actual details of appearance (such as the font and size of the letter or number), whereas for the majority it is a more generalized idea of the grapheme that links to specific

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[13] According to Cytowic and Eagleman I am not the first composer to be this. For them, evidence points to the fact that Alexander Scriabin probably did not possess synesthesia. His pitch-colour mappings seem a little forced, and it is most likely that his work was a response to the prevailing artistic tendencies of the time, rather than his own perceptual system. See Richard E. Cytowic and David M. Eagleman, *Wednesday is indigo blue: discovering the brain of synesthesia* (Cambridge: The MIT Press, 2011), 190-2.

[14] Cytowic and Eagleman, *Wednesday is indigo blue*, 164.

[15] Cytowic and Eagleman, *Wednesday is indigo blue,* 90.

colours.[16] One of the most common kinds of synesthesia, that known as 'coloured hearing' often involves music-based (cultural) concepts such as key signatures or out-of-tuneness, and it appears that mappings can change over the lifetime of a synesthete, in response to their own experiences, in particular their education.[17] In fact studies have shown that in general terms synesthetes and non-synesthetes make very similar associations between the senses, though these mappings are more absolute and detailed in the cases of those with the condition.[18] The conclusion that Cytowic and Eagleman come to in the end, is that synesthesia is the result of an enhancement of neurological wiring that is common to all:

> We pursue the view that synesthetes use network pathways that ordinarily underlie the normal integration of multisensory input. An extension or exaggeration of existing pathways eliminates the need for synethetes to have wholly novel neural structures compared to nonsynesthetic individuals.[19]

They go on to explain how synesthesia might be part of a "cognitive continuum"[20] starting with these involuntary mappings at one end and developing eventually into metaphor, and metaphorical idioms at the other.

As one might imagine, synesthesia has been appropriated with great enthusiasm by those writing about intermedia — and perhaps this appropriation seems quite relevant in light of the way synesthesia is connected to all of us, both neurologically and culturally. For Kevin Donnelly the condition provides a different lens through which to look at audiovisual media, where the forging of intermedial connections is seen to occur at a fundamental level. He says of synesthesia that it:

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[16] Cytowic and Eagleman, *Wednesday is indigo blue,* 75-77.
[17] Cytowic and Eagleman, *Wednesday is indigo blue,* 98.
[18] Cytowic and Eagleman, *Wednesday is indigo blue,* 103-4.
[19] Cytowic and Eagleman, *Wednesday is indigo blue,* 108.
[20] Cytowic and Eagleman, *Wednesday is indigo blue,* 166.

> … emphasizes the bodily (perceptual-cognitive) aspects of sound and image relations, where the effect is physical rather than simply analogous or metaphorical. The concept of synaesthesia tells us something: that there is an agreement of the possibility of equivalence between sound and image.[21]

In more general terms, it might be a kind of synesthesia that characterizes the 'natural' state of art, the primordial goo, out of which monomedias have arisen over the course of history. Jens Schröter states that the formation of monomedias is "the result of purposeful and institutionally caused blockades, incisions, and mechanisms of exclusion",[22] whereas Allen S. Weiss describes "an implicit nexus of synaesthesia and heterogeneity in all arts, such that every art form has correspondences with, explicitly or implicitly, all other art forms",[23] one in which "formal transpositions are possible between all art forms."[24] For both authors, cultural synesthesia represents a liberation of sorts that allows creators and spectators to make their own connections between things, perhaps in highly idiosyncratic ways, but certainly ignoring the demarcations between forms that have traditionally defined Western art. Weiss's idea of an unending potential for formal transposition between the arts is particularly appealing — we have already touched on this in previous chapters, and will return to it both later on in the current chapter and in the conclusion.

In sections 4.2 and 4.3 we have furthered our understanding of both audio-visual intermedial issues and the role that we ourselves could potentially play in intermedial art through comparing and contrasting the senses, and looking at synesthesia. If previous developments in media (such as film or the mp3) could be seen to have capitalised on the limitations of human physiology, maybe we could envision instead an art that makes the most of our perceptual hotspots or celebrates the extents to which we can see and hear things. An examination of synesthesia produces a further

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[21] Donnelly, *Occult Aesthetics,* 96.

[22] Jens Schröter, "Four Models of Intermediality," in *Travels in Intermedia[lity]: ReBlurring the Boundaries,* ed. Bernd Herzogenrath (Lebanon: University Press of New England, 2012), Kindle edition, loc. 766-69.

[23] Allen S. Weiss, *Varieties of Audio Mimesis: Musical Evocations of Landscape* (Berlin: Errant Bodies Press, 2008), 11.

[24] Weiss, *Varieties of Audio Mimesis*, 12.

set of possible (and positive) strategies for creativity with a hyper, unbounded connectivity at its core, as well as providing us with a model for thinking about intermedial art. Next, we will turn our attention to audio-visual synchronization, which has been associated with aspects of standardization, convention and even subterfuge within the realm of sound film. I would like to show how synchronization also possesses the potential for its own creative redemption.

4.4 Synchronization

> We never see the same thing when we also hear; we don't hear the same thing when we see as well.[25]

I look out of the window and observe how sonic and visual information come together in real life. In fact the first thing to notice is that they do not come together in acts of appreciable synchronization terribly frequently. A noticeable exception is the sound, in the lower reaches of audibility, of myself writing what I observe in my notebook — a perfect moment of self-activated synchronization. The rustling of some foliage on a balcony opposite is another, though admittedly, the synchronization is a bit fuzzy and general in nature — I cannot tell exactly which movement of which leaves creates any one grain of noise. A comparable situation arises when I see two older gentlemen speaking in Arabic, or at least I think I do. I am unable to see their lip movements and whether they correspond exactly to what I hear because they are too far away, but my sense of sound localization and the fact that they are dressed in a more traditional North African way, makes me fairly certain that it is them that I hear. Some expressive hand gestures on the part of one man at what sounds like a heated moment in the conversation confirms the match. A rare point of punchy synchronization occurs when a little girl running flat-footed down the street and making a resonant slapping sound on the pavement, suddenly drops the baguettes she is carrying and a dull thud is emitted. For the most part though, sound and image either do not hook up at all, or at the very most, they barely graze each

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[25] Chion, *Audio-Vision,* xxvii.

other. The sound of the cars that I see passing at the T-junction 150 metres down the street is almost entirely masked by cars that are nearer by. A man carrying his shopping seems to make almost no sound at all, except for one or two footfalls from his soft-soled shoes. The loud sound of close-by cars is ubiquitous, but at the angle I am sitting I cannot really see them, except for the brief moment they are reflected in a mirrored door on the other side of the road. In any case the link again seems fuzzy, and if it were a film I could certainly imagine a time lag of a second or two between sound and image still providing us with the necessary conditions for a believable synch-point, or even the sound of a completely different car being used, or the image of another vehicle. In fact this universe seems to be full of things that I cannot see but I can hear: the slam of a door somewhere in my building, the braking of a car and the tweeting of some birds, and of the opposite phenomena — strangely silent people and things.

My experience of the real world seems like an avant-garde film in comparison to the carefully constructed arrangements of synchronization to be found in mainstream movies, and that are explored by both Michel Chion and Kevin Donnelly in their books on film sound. For Donnelly, it is clear that acknowledging its drive towards simplicity is the key to understanding the way that the brain responds to audio-visual input, and he uses aspects of Gestalt psychology to support his ideas. Gestalt psychology proposes a model of human perception where the different senses process their input in parallel, and perceived items are organized into coherent patterns in order to form whole percepts, which are somehow different to (or more than) the sum of their parts. The mind desires clarity over the complexity that constitutes the real world and "we attempt to order the stimuli we perceive in as simple and regular form as possible".[26] Donnelly links this tendency of perception as described by Gestalt psychology, to the relative simplicity provided by the "limited repertoire of standardized shots in standardized relationships, with highly focused and structured sound"[27] found in mainstream film. It is as if cinema of this kind

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[26] Donnelly, *Occult Aesthetics,* 20.

[27] Donnelly, *Occult Aesthetics*, 23.

hands us the 'good gestalt' on a plate, and as such explains the reason why "representational cinema seems like reality. We ask no further questions of it."[28] There is something inherently problematic about the fact that we are so easily duped by cinema, that we do not notice when we stop doing the work we normally do when apprehending the real world. Taken within this context, Marshall McLuhan's designation of film as a 'hot medium' quite clearly makes sense in terms of the low level of participation required of its audience (more on this later).[29]

Fig. 4.4 a scene from "The Duelling Cavalier"

In a well-known scene from the 1952 Hollywood musical *Singin' in the Rain*, we are reminded of what can happen when soundtrack and image are badly matched, and the mind's ability to make good gestalts, obstructed. During a screening of "The Duelling Cavalier" (the film within the film, video example 4.1) we observe the

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[28] Donnelly, *Occult Aesthetics,* 23.

[29] See Marshall McLuhan, *Understanding Media: The extensions of man* (London: Routledge, 1964).

historical romance being turned unwittingly into a comedy by its use of inappropriately loud sound effects, poorly-miked dialogue, and Lina's inability to suppress her broad American accent. Later on in the screening, the sound becomes desynchronized from the image, women's voices are accidentally attached to images of male actors speaking, and the cinematic illusion is broken entirely for the audience who find the experience hilarious and the film ridiculous. The sequence is an illustration of the idea that synchronization in sound film is only something we notice when it goes wrong. The way that sound and image are carefully knitted together is referred to by Michel Chion as "added value". Its successful functioning is dependent on the audience neither apprehending nor appreciating its importance:

> Added value is what gives the (eminently incorrect) impression that sound is unnecessary, that sound merely duplicates a meaning which in reality it brings about, either all on its own or by discrepancies between it and the image.[30]

Kevin Donnelly goes one stage further by referring to the synching of sound and image as an occult practice, not only because its workings are kept secret from the audience, but by virtue of the process's technical wizardry "where two radically different media can be fused in perception, generating something that is infinitely more than the sum of its parts."[31] Though less overtly political, both Chion's and Donnelly's positions bring to mind Jean-Louis Baudry's writing on film that we looked at in Chapter 3. The fusion of soundtrack and image in film "that appears to render a perceptual reality",[32] might also be considered 'an act of concealment' tantamount to the ideological, in the same way as the illusion of motion produced by 24 frames of still pictures per second. In fact Donnelly certainly sees his book as an attempt to reveal what has been covered up, and hopes that an "awareness of the illusion of cinema ought to lead us to be concerned with perception and artifice."[33]

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[30] Chion, *Audio-Vision,* 5.
[31] Donnelly, *Occult Aesthetics*, 3.
[32] Donnelly, *Occult Aesthetics*, 7.
[33] Donnelly, *Occult Aesthetics,* 7.

However, I would say that the practice of adding sound to film is a far more sophisticated, technically complex affair than the production of a simple moving image, and as such it forms part of the bigger cinematic deception that we looked at back in 3.10 in relation to the writings of Malcolm Le Grice. For instance, in mainstream cinema, especially American cinema,[34] a great deal of the sound that is used in the film is not directly recorded along with the accompanying image. Dialogue is re-recorded in a studio and sound effects created to synchronize with acts that in reality may not have produced much sound at all ("In real life a punch does not necessarily make noise, even if it hurts someone").[35] The use of nondiegetic music is of course overtly artificial, but even this filmic convention is seemingly unquestioned by audiences and has worked in more or less the same way since the advent of sound film. The work of the American experimental film-maker James Benning could be seen to lie at the extreme end of a panoply of audio-visual dishonesty. A film such at *Ten Skies* (2004), appears to be the ultimate in unmediated recordings of life, in this case ten, ten-minute fixed-camera shots of different scenes (video example 4.2). However, even if the long shots have not been edited, Benning has admitted that more often than not the accompanying sound (which appears to consist of uncut field recordings) was not captured at the same time as the image.[36] In filming sky, however, he frees up the sonic possibilities of the work, not least because with the exception of planes and birds, when we observe the sky in real life we usually do not see what we hear. According to Michael Pisaro, far from performing an exercise in audio-visual veracity, Benning "opens us an area of play between vision and hearing so complex that it can only be provisionally networked during a viewing".[37] The sound and image gel together even if there are no synch-points, and another, more expansive idea of synchronization is achieved.

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[34] Donnelly makes the point that in other film traditions, in particular the French one, the use of direct sound is less unusual. He points to film-makers such as Goddard, and Straub and Huillet — though we might well attribute this use of sound to them being non-mainstream, rather than to their Frenchness.

[35] Chion, *Audio-Vision,* 60.

[36] Michael Pisaro, "James Benning, musician," *in James Benning*, ed. Barbara Pichler and Claudia Slanar (Vienna: SYNEMA, 2007), 233.

[37] Pisaro, "James Benning, musician," 234.

In terms of technology, the process of getting image and sound into a consistent state of synchronization, from the invention of the click track for musicians performing for the sound track, to the design of the classic film projector, has a long and involved history.[38] It is interesting to note that the degree of synchronization that is deemed acceptable in film is a little more flexible than one might imagine. Chion speaks of the difference between lip-synching in French and Italian films as constituting national styles, with the French preferring a more exact synchronization and the Italians something more relaxed that might be off by as much as a tenth of a second.[39] As we saw in section 4.2, there is a margin of error for synchronization given the limits of time resolution in both ear and eye, and a delay between sound and image of below 20 milliseconds[40] will be experienced as synchrony.[41]

As well as being a necessary condition for creating the illusion of pseudo-cinematic reality, the knitting together of sound and image in film is a source of a different kind of creative potential that may not be directly apprehended by the viewer, whose attention is taken up by the 'main' content of that film. For both Chion and Donnelly, moments of strong audio-visual synchronization are what fix the image to the sound in film, and these moments offer "a form of repose, moments of comfort in a potentially threatening environment that is overwrought with sound and image stimuli."[42] Around these points of attachment, exists asynchrony, and with it a sense of chaos, and unease, that somehow needs to be resolved. Beginning with Sergei Eisenstein, musical metaphors had always abounded when talking about the intricacies of the relationship between sound and image and it is not surprising to read Donnelly referring to the movement from asynchrony to synchrony as an "audiovisual cadence".[43] Chion, takes the potential metaphors in a different direction,

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[38] One that I will not recount here. Kevin Donnelly gives a good overview of this subject, as does David L. Morton in his book *Sound recording: The Life Story of a Technology* (Baltimore: The John Hopkins University Press, 2004).

[39] Chion, *Audio-Vision,* 65.

[40] I wonder in fact (and this really is just speculation) if this figure of 20 milliseconds might be an 'average' of the window of simultaneity in the ear (2 milliseconds) and eye (30 to 40 milliseconds) that I mention towards the end of section 4.2.

[41] Donnelly, *Occult Aesthetics*, 42.

[42] Donnelly, *Occult Aesthetics,* 8.

[43] Donnelly, *Occult Aesthetics,* 113.

when talks about the function of points of synchronization in a complex action sequence as if they were pins holding together a carefully draped garment:

> … this point of hooking auditory continuity to visual continuity, is what allows the time around it to swell, fold, puff up, tighten, stretch or, on the contrary, to gape or hang loose like fabric.[44]

The art of combining audio and visual is, as I have already implied, for the most part a hidden one — examples of these techniques being foregrounded, as usual being most commonly found beyond the mainstream (we will discuss Oskar Fischinger's *Motion Painting No.1* in section 4.6). Audio-visual media such as cinema and television drama are huge machines consisting of technologies and techniques quietly serving the creation of a filmic illusion that appears to the spectator to be all about people and stories. I cannot emphasize enough the importance of the yawning gap separating how these media are made and their perceived content. In this context we should of course think about McLuhan's famous notion of the medium being the real message, and not just in terms of it as a statement of fact, but as a warning of sorts and a call for observer vigilance. As he says, "the 'content'[45] of a medium is like the juicy piece of meat carried by the burglar to distract the watchdog of the mind".[46]

Studies have shown that a synchronized bang and flash produce a response in the brain that goes beyond what might be predicted by simply adding together the activity that would be produced separately by these sensory inputs.[47] These findings correspond to the central tenet of Gestalt psychology — that the whole is more than (or different from) the sum of it parts — as do illusions such as the McGurk and the bouncing ball effect. I have certainly tried to resist the McGurk effect and cannot — it always works even after reading the explanations and bracing oneself before

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[44] Chion, *Audio-Vision,* 62.

[45] Just to clarify, McLuhan means perceived content here (like the story in a film), not the actual content.

[46] McLuhan, *Understanding Media, 19.*

[47] Cytowic and Eagleman, *Wednesday is indigo blue,* 106.

watching/hearing it. The McGurk effect is evidence of the existence of some involuntary connections between what we see and hear that probably operate on a more fundamental perceptual level than something like synesthesia, which as we saw in section 4.3 is mainly connected with higher cognitive processes and can be influenced by life experience. Donnelly believes that such phenomena show us that "there is no such thing as 'pure music' or a pure visual discourse" and that audiovisual culture itself is "a radical object… a mixture of the exploitation of cross-referencing and the synergy of the human senses."[48] I like the idea that there might be some redemption after all for audiovisual culture, and that beyond its manifold acts of concealment, it is also capable of providing the space for a bit of perceptual magic and potential creativity. Chion has given a name to instances of audio-visual magic: he calls it synchresis and defines it as "the spontaneous and irresistible weld produced between a particular auditory phenomenon and visual phenomenon when they occur at the same time."[49] What I also find appealing is the potentially huge number of audio-visual objects that could be made, some more convincing than others or funnier (like the too-loud sound effects of "The Duelling Cavalier"), or stranger. According to Chion, even within the 'convincing' category, there are more sonic accompaniments to an image than might be expected, that would be believable to an audience.[50] In the end synchresis, like synesthesia and creativity, is about making connections between things. Granted, the connections are a bit of a *fait accompli* on the part of the sound editor — by presenting a synchronized sound and image he or she taps directly into the involuntary magic-making, multi-sensory mechanisms of the spectator's mind. However, perhaps we as viewers of audio-visual media have a choice, once we understand the nature of the perceptual forces and technical artistry that we are confronted with, to perceive film using a different kind of attention, one that focuses on the nature and variety of objects produced by synchresis.

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[48] Donnelly, *Occult Aesthetics,* 6.

[49] Chion, *Audio-Vision,* 63.

[50] Chion, *Audio-Vision,* 63.

4.5 My own works and synchronization

I had never really thought about synchronization in any particular depth before embarking on the research for this chapter, thus validating to a certain extent the idea we encountered in the previous section, that synchronization is a hidden and under-appreciated art. As a musician, one takes the idea of synchronization for granted — it is built into the system of traditionally notated scores, which more often than not also involve a dramaturgy of things either happening or not happening at the same time. Of course rhythmic unison is not the same as the synching of a sound effect to the image of someone putting a coffee cup on a table — music is not essentially audio-visual in nature and has no obligation to try to imitate the cause and effect relationships of reality. However, I am intrigued by the idea that there might also be a music-on-music version of Chion's synchresis — and that having things happen at the same time in music produces something that exceeds the sum of its parts.

It is quite revealing to look back at the creative component of my thesis through the lens of synchronization, either perceived or composed. The audio-visual camera obscura installation *The place you can see and hear* (2012-2014) is quite notable for its lack of 'synch-points', a lack that augments the polarization of image and sound already apparent in the extreme continuity of movement of one, and the stuttering, pixelated quality of the other. The scarcity of audio-visual correspondences is due in part to the freezes, the prolongation of which may well obscure potential synch-points, but also to the fact that real life simply does not abound in the punchy alignments of sound and image so often found in film. The installation uses a streaming of reality as its subject matter, and like the description of the scene from my window at the beginning of section 4.4, it is subject to the workings of this reality where you cannot always hear what you see and you often do not see what you hear. The perceived separation of audio and visual is so strong, that many visitors coming into the installation are unaware that the sound they hear is taken live from the same environment that they see on the screens, and believe it instead to be a pre-composed soundscape. It is interesting that people are so easily thrown by the relatively small amount of sonic mediation produced by the freezing patch (though I do suppose it

sounds a little ‘unnatural’), but may well be willing to accept the highly constructed audio-visual environment of cinema without a second thought.

The Grand Tour (2015), more obviously takes on the issue of audio-visual synchronization, and even though I was not thinking about this issue explicitly while I was planning the film, or during the process of knitting the images and sound together, in many ways it became the dominant parameter of the work. I certainly noticed how just by changing the alignment of audio and image by only a fraction of a second, and increasing the level of togetherness, I could create an audio-visual event where there had been none before. Like the model for film soundtrack design described by Kevin Donnelly, the piece moves between areas of synchrony and asynchrony. The opening flickering prologue is micro-synchronized (down to a frame, so 0.04 seconds), as are the sequences where tiny interstices appear both in the image and the sound. There is even synchronization (if it can be called that) to things that are not there — the prologue is synchronized to an unheard rendition of *Wiener Blut*, and the scanning of the picture of Viennese palace gardens to *Geschichten aus dem Wienerwald*. Other passages, especially the ones featuring voice-over, have a more relaxed synchronization, with occasional synch-points between the beginning of key sentences and images or black frames. The penultimate sequence in the film, however, brings us back to the issue of soundtrack fakery so commonly encountered in cinema. I never went to the locations in the photographs (and certainly not in 1962), nor do I know what was said by my father or anyone else at the moments the photographs were taken. To a certain extent I am testing to see what I can get away with in terms of plausibility: matching sounds from my collection of (recent) field recordings to the images, and mixing in the studio-recorded dialogues at the lowest level I possibly can, so that they do not stick out too much. Perhaps the point though is that I am not fooling (or indeed trying to fool) anyone, and it is very clear from the context of the rest of the film that the sequence is a futile attempt to recreate something that has been lost to us. There is another issue of synchronization here that brings us back to the time paradox we discussed in relation to photography in the first two chapters. Each photograph in the sequence

captured only a very short amount of whatever it was that happened, but is held up on screen for ten seconds or more along with its accompanying soundtrack. How can we think about synchronization with a still photograph? It is as if each image is a sitting duck, waiting for that split second when the imaginary correspondence with sound takes place. It is a fake sync-point hidden amongst asynchrony, or a sync-point stretched out in time, corresponding to the strange temporality of the photographs themselves.

The two pieces in the thesis for pre-recorded sound and live instruments demonstrate a different kind of synchronization of a 'sound-on-sound' kind. *Artificial Environments Nos.9a-d* (2013) uses a click track to align electronics and musicians, while *Trains* (2014) employs a stopwatch video. Both pieces, although also featuring temporal synch-points between electronics and live players, mainly use pitch resemblances (that may not necessarily be temporally aligned) as a means of connecting the two together. In *Trains* there is quite an elastic relationship between the tape part and the cello. For instance, only a starting timecode and traditionally-notated music (with a metronome marking) is given in the score for the second section of the piece (audio example 4.1). The cello melody comprises the pitches that mark the outer extremities of the two siren glissandi of the tape. Although the sequence of pitches is always the same, the possible synchronous moments between cello and tape are determined only in the tiny details of tempo of the performance, and a different set of correspondences is made on each occasion.

4.6 *Motion Painting No.1* (1947)

Oskar Fischinger's *Motion Painting No.1* (video example 4.3) is from 1947, making it the oldest work that I will talk about in depth during the course of this thesis. Indeed, it was created only 20 years after the advent of sound film, and perhaps the 'freshness' of approach I attribute to it, rests to a certain extent on the fact that it is a work exploring a medium still in its infancy. I have chosen it because I find it moving and delightful, and having just finished my own film I have some sympathy

Fig. 4.5 A still from Oskar Fischinger's *Motion Painting No.1*

with Fischinger and a little knowledge of what it is to assemble a piece frame by frame over a long period of time. *Motion Painting No.1* also unites many of the themes in this chapter. I cannot, for instance, watch the film without thinking about the way that some sound-to-image synesthetes describe their experiences of the condition as a being like a transparency covered in coloured shapes laid over their normal vision.[51] The piece can also be looked at as an exercise in synchrony, asynchrony and the creation of synchresis, as well as an example of Allen S. Weiss's "formal transposition" between art forms — in this case with the original (music) still attached.[52]

Fischinger made the piece by applying oil paint to acrylic glass, and filming every single brushstroke as a separate shot. It is then, a stop-motion animation film of sorts, and the painstaking process took him nine months to complete. Though he was

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[51] Cytowic and Eagleman, *Wednesday is indigo blue*, 88.

[52] Weiss, *Varieties of Audio Mimesis*, 12.

musically-trained, and certainly interested in composition (as his experiments with optical soundtrack technology show),[53] as far as I can tell *Motion Painting No.1* is not based on, or at least does not appear to incorporate, a traditional analysis of Bach's *Brandenburg Concerto No.3*. Instead, Fischinger seems to have been concerned with making a sort of flexible relationship between the music and the animation, exploring different degrees of audio-visual synchronization and connectedness. He uses a rather bucolic metaphor to describe this relationship:

> The film is in some parts perfectly synchronized with the music, but in other parts it runs free - without caring much about the music - it is like a pleasant walk on the side of a river - If the river springs, we on the side do not necessarily spring to it - but go our own free way - sometimes we even go a little bit away from the river and later come back to it and love it so much more - because we were away from it. …the river is the music of Bach. And what we see are the fields.[54]

I like the way that Fischinger describes the music as resembling a line (a meandering river) and the visuals as a plane (a field) — reminding us again of the format of the filmstrip, and Kittler's distinction between one-dimensional and two-dimensional signals. The levels of synchronization though, are sometimes quite difficult to analyze via the naked eye (and ear). Certainly the music and images graze each other in a pleasing way — there are temporal connections between the two, but these are rarely repeated (the lack of repetition of audio-visual objects being a feature of the work). The emergence of visual figures often accompanies the musical entries, though importantly many major formal divisions in the Bach are not articulated on screen. The music already starts playing during the opening titles of the film, and the beginnings of new musical sections at 2:40 and 6:52, and indeed of the third movement of the concerto, occur in the middle of a tableau and do not elicit the

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[53] See Joseph Hyde, "Oskar Fischinger's Synthetic Sound Machine," in *Oskar Fischinger 1900-1967: Experiments in Cinematic Abstraction*, ed. Cindy Keefer and Jaap Guldemond (Amsterdam: EYE Filmmuseum, 2012), 145-7.

[54] From Oskar Fischinger's writings on *Motion Painting No.1*, found at http://www.centerforvisualmusic.org/Fischinger/OFFilmnotes.htm

introduction of any new visual elements. Synching of music and image does appear to happen at a finer level on some occasions, such as during the large inwardly accelerating spirals at 3:30, and the splatterings of small rectangles at 5:02. I have the impression that each stroke is aligned to the semi-quavers in the Bach, but then again I am not sure, and it is in this fuzzy place between synchrony and asynchrony that the subtlety of the work often lies — as if the sonic and visual never quite stick themselves completely together. In this place of borderline asynchrony (which according to Kevin Donnelly might make me feel uneasy — it does not), it is difficult to talk about synchresis or good gestalts. However, there are occasions when audio-visual welds are made, such as the rising coil at 0:58 which accompanies an ascending musical sequence in almost-synchrony to produce a one-on-one musical illustration, or rather more strangely, the big black spiraling figures at 3:30, which are almost the opposite of the kind of images one would imagine going with the high violin motif.

There is in general a feeling of affinity between the music and animation, despite (or perhaps because of) the lack of genuine mickey-mousing. In fact Fischinger's three-minute film from 1936 *Allegretto*, which contains a lot of tight audio-visual synchronization and stronger associations between individual images and musical materials, though charming, is somehow less compelling than *Motion Painting No.1*. It certainly could not be any longer than it is — I imagine that after three minutes the mickey-mousing might become tiring and the constant cascades of synchonizations would lose their punch. Balancing asynchrony and synchrony, as Donnelly says, seems to be essential for the creation of a certain kind of in audio-visual dramaturgy. The *Brandenburg concerto No.3* is also a work famed for its ceaseless energy, and the musical seamlessness found in the constant grouping and regrouping of voices and drawing out of musical lines. While James Tobias feels that the spiraling images that dominate the first half of the film function "as the visual complement of the concerto's *ritornello*",[55] I would take this association a little further and suggest that

[55] James Tobias, "Essay without Words: Motion Painting No.1, Insight, and the Ornament," in *Oskar Fischinger 1900-1967*, 155.

these images are in fact intended as a graphic representation of the idea of 'fortspinnung' (spinning forth),[56] often used to describe the kind of organic motivic development found in the Bach. The spiral-ritornello is probably the strongest and most consistently exploited audio-visual relationship in the film, and its reference to musicological concept the only instance of something from outside infiltrating the frame of the work itself. The qualities of the *Brandenburg* are also reflected in the continual coming into being of Fischinger's overlapping images, that never pause, and that fill up the screen creating a visual density that reflects the accumulation of instrumental lines and lets us imagine what these lines could look like if they lingered a little, as they do in our musical memory. Perhaps these dense build-ups even remind us of James's expanded, specious present, or of the long-exposure photographs accruing information and approaching illegibility that we encountered in the introduction. At a few points in the film, however, I am slightly perplexed by Fischinger's response to the music. I do not understand why he refrains from articulating the darkest, most dramatic modulating sequence in the music at 6:14, and the final visual climax, containing animation on a scale and at a speed we have not seen before, seems a little over-wrought, and even too romantic for the restrained emotional temperature of the concerto's ending. On the other hand, it is these incongruities that in part give the work the 'freshness' that I spoke about above, and they may well be the result of historical gaps — between the eighteenth century and the 1940s, and in turn between the 1940s and our present age.

It certainly seems that in some ways *Motion Painting No.1* does make the third *Brandenburg concerto* visible, though I am not sure whether this was Fischinger's main intent. From his writings it appears that music functions for him as a kind of jumping-off point, a model on which to base his newly invented art form of motion painting. He insists that his visuals are not intended to be "translated music, because

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[56] 'Fortspinnung' is a term coined by the German musicologist Wilhelm Fischer in the early twentieth century to describe the process of developing a basic melodic cell through the use of sequence and intervallic transformation. This seamless spinning out of material was applied in particular to music from the Baroque period and was exemplified in the work of Bach.

music doesn't need to be translated",[57] but instead that he uses the stop-motion camera technique "to discover the hidden element of the music-like quality which goes with or is produced by paintings in motion - if they are of a creative nature."[58] It is clear to me though, that the success *Motion Painting No.1* is dependent on the symbiotic relationship between music and animation. It is a different kind of symbiosis from that described by Chion and Donnelly in the context of more mainstream narrative movies, the audio-visual layers in the Fischinger slip over each other, and occasionally join up in unpredictable ways — but this is its quality, its texture as an audio-visual experience. I have tried watching *Motion Painting No.1* with the sound off, and to misquote Chion, "we do not see the same thing when we do not hear". I feel a fast pulse running through the visuals, but it is in fact the music that adds much needed formal articulation, phrasing and rhythmic variety to the animation. The film falls a little flat without the *Brandenburg*.

4.7 Making music visible/imagining music through the visual

For the remainder of this chapter I am going to talk about a different meeting-point between sound and image. Rather than being concerned about what happens when they are deliberately put together in a sound film, I would like to focus instead on the idea of transforming sound into image (and vice-versa) through the use of analogue processes, and by imagining one through the lens of the other. As always, it is my intention to think about approaches to art that might reinvigorate creative practices and forge new kinds of links between disciplines. Relationships between the audio and visual extend far beyond the things we have discussed so far, and to reiterate what I mentioned in the introduction, this thesis is in no way intended to be an exhaustive account of these relationships. Some of these connections are related to cultural practices — the score for instance, is a visual medium that nearly always accompanies Western art music, as is the sight of the performers playing that music in a concert situation. In the schizophonic context of electronically reproduced sound

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[57] I would reply to Fischinger that no, music does not have to be translated, but maybe it is quite interesting to try.

[58] From Oskar Fischinger's writings about *Motion Painting No.1*, found at http://www.centerforvisualmusic.org/Fischinger/OFFilmnotes.htm

there is always something to look at, arguably even when we have our eyes closed — it simply may not have any causal or composed relationship to the object of our listening. Certainly beyond synesthesia, we are all capable of giving music a visual dimension in our minds. In his book *Music and memory*,[59] Bob Synder talks about "image schemas", cognitive structures that form the basis of the metaphorical mappings we apply to sound as well as to other perceptual phenomena. He defines them as follows:

> Image-schemas are thought to be derived from commonalities in different experiences that seem related; as such, they are believed to form a basis for our conceptual systems, indeed to connect our perceptual experience and concepts. Image schemas represent the most stable constancies and structures we all share as human beings, derived from dynamic patterns of interaction with our environment.[60]

Snyder specifies musical metaphors such as the up and down of pitch, tension, and centrality as having originated in a more generalized conception of the way the world is — though some image schemas may well be culturally specific.[61] Furthermore, despite being called 'image schemas', these cognitive structures are not entirely visual in nature, they exist "somewhere between concrete, specific visual images and abstract concepts" often incorporating "a kinesthetic component."[62] Perhaps it would be better to speak of a kind of mental space which we might imagine sound or music to occupy — different entirely from the way that sound inhabits an actual space, as a bunch of invisible vibrating air molecules bouncing off objects and walls in complex ways.

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[59] I would like to credit the composer Simon Katan, whose lecture alerted me to Snyder's book and his ideas about image schemas. Katan's own audio-visual works such as *Cube with Magic Ribbons* (2012) would have been an interesting addition to this thesis, if there had been more room.

[60] Snyder, *Music and Memory,* 108.

[61] Snyder, *Music and Memory,* 110-111.

[62] Snyder, *Music and Memory,* 108.

> I soon found that there was a limit to my possible movement up and down the scale. At a point many octaves below my normal situation I began to feel oppressed and sluggish. As I toiled downwards my discomfort increased, until, in a sort of swoon, I floated up again to my native musical plane. Ascending far above this plane, I felt at first exhilaration; but after many octaves a sort of light-headedness and vertigo overtook me, and presently I sank reeling to the few octaves of my normal habitat.[63]

In a short story entitled *A World of Sound*, the British science-fiction author and philosopher William Olaf Stapledon describes the dream of a man who falls asleep during a concert. In this dream, the man enters another world, the dimensions of which are formed by musical parameters. This world resembles the image schemas and mental spaces we have for imagining music in many ways. Higher pitches are found above and lower ones below, a complex sound is described as a "thicket", and sparse musical passages are manifested as perches that need to be jumped between. However, more than anything else, it is the fact that the dreamer's mapping is made between music and a universe that is hard to quantify that brings to mind the image schema, "this world had no true space, such as we perceive by sight and touch, yet it did have a sort of space."[64]

In contrast to the inner musical world, lying partway between image and concept, the sonic also meets the visible more concretely in the line representing the pressure fluctuations over time of a sound source. The invention of audio recording technologies in the nineteenth century made this line accessible, and with this accessibility a new world of ideas about sound and music was opened up. Douglas Kahn points out that along with a new way of representing and re-producing sound, came a kind of democratization of the sonic universe, where noise and information found an equal footing by virtue of being so hard to separate:

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[63] William Olaf Stapledon, *A world of sound*, 1936. http://www.feedbooks.com/book/2036/a-world-of-sound

[64] Stapledon, *A world of sound* http://www.feedbooks.com/book/2036/a-world-of-sound

> The line can also inhere the world of all sound, the most familiar instance being the intensification of the world packed into the jagged phonographic line, replaying what it has heard to make the world thicker with sound.[65]

The early days of audio-recording and the excitement generated by the possibilities of sound media have been well-documented by writers such as Kahn, Friedrich Kittler and Mark Katz. Both Rainer Maria Rilke and Moholy-Nagy speculated on the potential for creating sound using audio devices but without the need for real (sounding) acoustic input. While Rilke wrote about the idea of playing the grooves of a skull, extracting some kind of latent music from them as if they were equivalent to the undulating curve of an acoustic wave, Moholy-Nagy postulated starting from the bottom up by designing a "groove-script alphabet" that would form the basis of compositions that could be engraved directly into a gramophone record.[66] Their speculations of course are attractive, and again bring to mind the notion of an intermedial nexus uniting the arts and senses, and creating an ease of transposition between forms. However, these speculations also fail to come to terms with the full complexity of the relationship between what the acoustic line looks like and how it actually sounds. I have the feeling that Moholy-Nagy's groove-script alphabet, had it ever been realised, would have had an intriguing appearance, but resulted in a selection of dull crackles and thuds.[67] Using the sample editor in cubase, I tried a 2015 digital update of Moholy-Nagy's idea and was even able to make some periodic sounds by looping a section of waveform that I had doodled. Perhaps I could get a bit better at drawing waveforms with practice, but overall it did not appeal to me in the least as a compositional strategy. The audio waveform simply does not represent sound in the way that we need it to be represented in order for us to be able to grasp those things, such a pitch and tone colour, that we hold so dearly. The time domain is

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[65] Kahn, *Noise Water Meat*, 71.

[66] See Mark Katz, *Capturing Sound: How Technology has Changed Music* (Berkley: University of California Press, 2010), Kindle Edition, 115.

[67] The idea of engraving a gramophone was developed further by the German composer Hans Stuckenschmidt. He believed that very small wavy lines rather than graphic symbols might form a better basis for a script, and that a microscope could be a useful aid in the process. However, like Moholy-Nagy, he never realized his ideas. See Katz, *Capturing Sound*, 116.

absolutely adequate for recording and editing purposes, but in the end we are unable to observe (and thus to create from scratch) anything more than changes in amplitude, and, if we look quite closely, the simplest kind of periodic waves, like sines and squares.

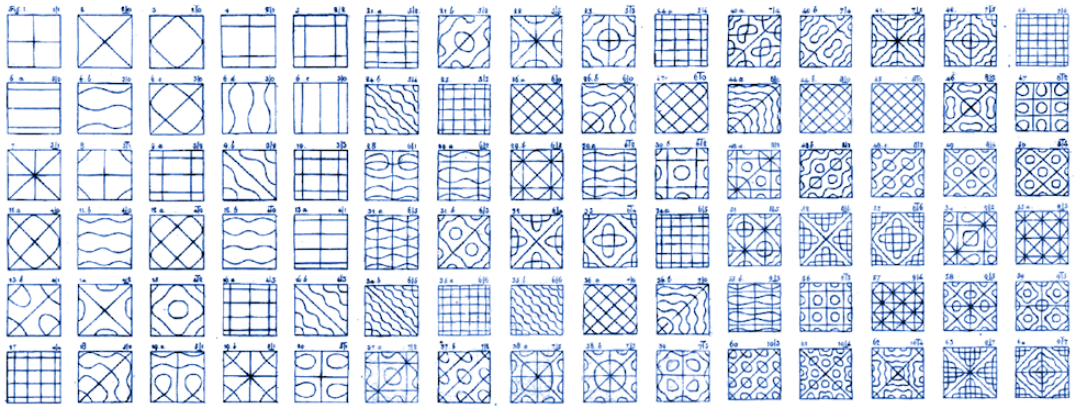

Fig. 4.6 Chladni patterns

To end this short summary of ideas and artistic approaches related to visualizing sound, and before we begin discussing the frequency domain, it is perhaps worth taking a moment to look at cymatics, and Alvin Lucier's *The Queen of the South* (1972). Cymatics involves the study of making sound visible by passing its vibrations through solid or liquid matter, and in the case of a Chladni plate, via a centrally mounted metal surface sprinkled with sand. The patterns that occur are nodal lines created by the modes of vibration passing through the material, and the devices used in cymatics are generally designed to vibrate symmetrically. The effect of the sound on a Chladni plate, especially the quality of movement in the patterns as that sound changes, is objectively very beautiful. The symmetry helps too — rather like a kaleidoscope, the complexity of the designs is given order by being reflected two-fold, four-fold or more. Lucier's piece, inspired by the work of Chladni and its revival in the twentieth century by the Swiss doctor Hans Jenny, is text-based and sets out instructions and suggestions for using cymatics to create an audio-visual performance. It begins with the following words:

> Sing, speak or play electronic or acoustic musical instruments in such a way as to activate metal plates, drumheads, sheets of glass or any wood, copper, steel, glass, cardboard, earthenware or other responsive surfaces upon which is strewn quartz sand, silver salt, iron filings, lycopodium, granulated sugar, pearled barley or grains of other kinds or other similar materials suitable for making visible the effects of sound.[68]

He goes on to recommend making a kind of feedback situation, where the sound that has been passed through the material is amplified again, and a close-circuit television used to display the patterns for both the audience, and so that the musicians may see the visible results of the sound they produce, and react to them. Admittedly, I have never seen a live performance of the work, only videos on the internet, and though there is an utterly direct analogue connection between sound and image, I do wonder if this is what I think making sound visible actually is. Chladni patterns are not so far away from the "jagged phonographic line", they are simply more compelling to look at after having been given an extra dimension and enhanced by symmetry. In the end though, I cannot tell what pitches are being played, or anything about the timbre of a sound by looking at the patterns, and ultimately I consider the discernibility of these parameters essential to the creation of 'visible music'. It is also worth noting, that though the players may be inspired by the close-circuit television feed of the emerging patterns, the direction of the process is from sound into image, and not the other way round.

4.8 The frequency domain

> "you'll think I'm crazy, Oed. But I can do the same thing in reverse. Listen to anything and take it apart again. Spectrum analysis, in my head. I can break down chords, and timbres, and words too into all the basic frequencies and

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[68] Alvin Lucier, *Reflections: Interviews, Scores, Writings = Reflexionen: Interviews, Notationen, Texte* (Cologne: Verlag MusikTexte, 1995), 109. See Appendix 7 for the full text.

harmonics, with all their different loudnesses, and listen to them, each pure tone, but all at once."[69]

In his LSD-addled mind, Thomas Pynchon's character Mucho Maas believes he can go beyond the capabilities of the ear and breakdown sound into its constituent frequencies and volumes in the manner and with the precision of a sound analysis program like the IRCAM-created Audiosculpt. We have already looked briefly at the frequency domain and the STFT analysis window in relation to freezing sound in Chapter 2, and it is not surprising that we come back to it again with regards to the idea of visualizing music. The sonogram is a two-dimensional representation of sound where time is indicated along the x-axis and frequency along the y. A third dimension/parameter, intensity, is often also presented by way of the darkness levels of the image. It is quite an intuitive way of representing sound — it corresponds in many respects to our 'image schemas', and also resembles to a certain extent the layout of a musical score (more about that in the next section).[70] Our ear does a similar job to a program like Audiosculpt inasmuch as it performs something like the Fourier transform in order to distinguish the different frequencies in a complex sound. Of course what a sonogram displays and what we hear are not exactly the same thing — the sonogram does not take into account how perceived volume changes with frequency in human hearing, the masking of sound, auditory fusion or the presence of phantom fundamentals. Once in the frequency domain, however, we can manipulate frequency and temporal data separately — for instance by freezing sound or slowing it down without changing its pitch. Although the extent to which

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[69] Thomas Pynchon, *The Crying of Lot 49* (New York: The Penguin Press, 2012), Kindle edition, loc. 1569-82.

[70] I do not wish to address the history of the development of technologies capable of producing sonogram analyses here other than to mention that I as a composer have benefited greatly from these technologies and perhaps take for granted the possibility of carrying out an analysis of a large sound file on my home computer very quickly. While I was at Columbia University studying orchestration with Tristan Murail, he told us about his experiences in the early 1970s of having to wait all night for a mainframe computer to produce a spectral analysis of a single sound. The composition of a piece like *To be beside the seaside* would be unthinkable without the aid of a program like Audiosculpt set up on my laptop and producing comprehensive analyses within a few seconds of pressing a button. Perhaps the easy availability of this technology corresponds to that of current digital film editing which I talked about in section 3.12, inasmuch as it has greatly expanded the number of artistic possibilities open to me without the need for expensive equipment or access to technologies housed at special institutions.

this can be done convincingly (or pleasingly) has improved greatly in recent decades, the fact that there are limitations in this ability to manipulate frequency and time, reminds us that they are not really independent variables at all, and the image on the sonogram a kind of fabrication. This interdependence can also be seen in the way that STFTs actually work, where an analysis window of shorter duration will give better temporal ('event') resolution and a longer window improved frequency resolution.[71] [72] As with the audio-freeze from Chapter 2, however, I am inclined to believe that the inherent fakeness of the the frequency domain is counter-balanced by the richness of what it can produce. It offers us the possibility of a two-dimensional representation of sound — an image essentially — and this opens up an interesting space for potential intermedial comparison and transposition.

4.9 Grids are bad

This ordered two-dimensional space, representing time against pitch and created by analysis windows and frequency bins cannot but help remind us of grids and graphs (and ultimately, if rather melodramatically, the bars of a cage). In her article from 1979, the critic and theorist Rosalind Krauss laments what she sees as the overrunning of the art world (via Cubism, Mondrian and Sol LeWitt) by the grid. She describes grid-art as follows:

> Flattened, geometricized, ordered, it is antinatural, antimimetic, antireal. It is what art looks like when it turns its back on nature.[73]

For Krauss it is the grid that connects art to science, for example in the guise of studies in optics or perspective from previous centuries. It has been used to help us understand what we see and serves as "a matrix of knowledge."[74] She proposes two

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[71] This having to chose between frequency or temporal precision can be alleviated somewhat by the process of oversampling — using overlapping analysis windows to gain better temporal resolution when a relatively long window is being used.

[72] Aden Evens discusses what he considers to be the fundamental problem with the FT, (namely the "dichotomy between time and frequency") in detail, and offers some alternatives to it in the third chapter of his book. See Aden Evens, *Sound Ideas: Music, Machines, and Experience* (Minneapolis: University of Minnesota Press, 2005), Kindle edition.

[73] Rosalind Krauss, "Grids," *October* 9 (1979): 50.

[74] Krauss, "Grids," 58.

possible readings of the grid, one "centrifugal" where a world beyond the artwork is suggested by the extension of the horizontal and vertical lines, and another "centripetal" or "within-the-frame" interpretation where in contrast, the gridded piece functions autonomously, separating itself from the world and looking inwards to its own content, which is concerned with "the conventional nature of art itself."[75]

Grids have also been apparent throughout the course of music history in a different manner to that of the visual arts. The composer Trevor Wishart though, shares Krauss's contempt for the grid, which he refers to as a "lattice". It is notation in particular that provides the focus for Wishart's critique, and he sees this lattice as being responsible for privileging a system consisting of four-square rhythm and twelve notes per octave over other aspects of music, and having helped form the central canon of composers "who employed a clearly, rationally codifiable (verbalisable) musical praxis."[76] He believes that "the conception of music as consisting of fixed-pitch, fixed-timbre entities called 'notes' is extremely persistent",[77] and amounts to a kind of ideology insofar as it excludes so much of what already exists in music and is available to be foregrounded — namely colour, microtones and inflections of all kinds. In fact the problem with the conventions of musical scores is twofold: not only do they dictate what "constitutes a valid musical object",[78] thus smothering creativity, they also fail to adequately represent music in all its complexity, even that music which adheres most closely to its regulations. Of course our relationship with the score is a little more complicated than that and the information presented by notation has always been supplemented by the prevailing performance practices of the day. I think that what Wishart wants us to confront is the way the score, which thanks in no small part to musicology, has been elevated to become a kind of ultimate embodiment of the music, rather than simply a tool for communication between composer and performer.

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[75] Krauss, "Grids," 62.
[76] Trevor Wishart, *On Sonic Art,* ed. Simon Emmerson (Amsterdam: Harwood Academic Publishers, 1996), 15.
[77] Wishart, *On Sonic Art,* 25.
[78] Wishart, *On Sonic Art,* 23.

> … all signs presage a revolution, and a next step toward that "eternal harmony." Let us once again call to mind, that in this latter the gradation of the octave is infinite, and let us strive to draw a little nearer to infinitude.[79]

Writing in 1907, the Italian composer Ferruccio Busoni reflected those tendencies of the time that called for the expansion of the range of musical possibilities beyond traditional notational and compositional practices, and at least a narrowing of the spaces between the lines of the grid, if not their abolition altogether. In particular it was the glissandi that symbolized a new step-free musical freedom in its continuity of pitch, and as Allen S. Weiss states, it represented "a comprehensive and infinitely fine universe" where "the gradient of all possible pitches was considered to be typical of the wealth of lived experience outside music."[80] Of course Busoni and Wishart's issues with traditional Western notation and practices are a musical manifestation of the discrete and continuous. It is interesting how readily they both consider being able to engage with the continuous sonic qualities of the real world as a kind of musical freedom, and I wonder if in their hankering for liberty they overlook some of the benefits of the discrete. Without the dividing of pitch into steps for instance, there would be no scales, tonic and dominant or tonal system. As someone writing in the early twenty-first century, and with the benefit of hindsight, I can see the advantages of both 'discrete' and 'continuous' musical practices, and ultimately I have no interest in choosing between Xenakis and Beethoven.

As I have already mentioned, the sound technologies invented towards the end of the nineteenth century, with their inaptitude in separating music or speech from noise, also unwittingly contributed to the expansion of the sonic universe, creating an equality countering the hierarchies that were maintained by the score. Douglas Kahn says of phonography "it foregrounded the parameters of a *sound* and *all sound*,

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[79] Ferruccio Busoni, *Sketch of a New Esthetic of Music*, trans. Theodore Baker (Salt Lake City: Gutenberg Project, 2010), Kindle edition, loc. 339-41.

[80] Weiss, *Varieties of Audio Mimesis*, 84.

presented the possibility of incorporating all sound into cultural forms".[81] Of course this democratization of the sonic world has in some senses been short-lived because of the introduction of the digital, which grids sound and music in new ways that are often hard to detect (see Chapter 3). I am somewhat surprised, I have to admit, that Trevor Wishart, after his uncompromising critique of the grid as manifested in traditional music practices, is so dismissive concerning the problematics of digital technology — it seems that he considers the digital grid just about fine enough for his needs:

> the discrete states can be made so close together, particularly in terms of time that the distinction between a discrete and a holistic representation ceases to be of importance.[82]

I am certainly not about to let the digital off the hook as Wishart has done. However, for the rest of the chapter I would like to see if the grid, in particular the digital grid and its complement the pixel, can be redeemed in some way. Linda Hutcheon believes that the grid has both a positive and negative side to it, that it "constrains and enables; it both limits and opens up new possibilities."[83] We will now consider grids and pixels with particular attention to the ways in which they facilitate processes of adaptation.

4.10 Pixels, resolution and adaptation

In June of 2015, *The Guardian* published an art quiz using pixelated images of famous paintings created by the graphic designer Alexis Poles.[84] The images are very low resolution — most of them consist of a grid of around 20 x 20 pixels, and yet for the most part we can identify them almost instantly if we are familiar enough with the original paintings. They are easier to recognise if looked at from a distance (and

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[81] Kahn, *Noise Water Meat*, 70.

[82] Wishart, *On Sonic Art,* 16.

[83] Linda Hutcheon, *A Theory of Adaptation* (New York: Routledge, 2006), 35.

[84] The text read: "Think you know your art? Alexis Poles makes maddening pixelated masterpieces that will test you to your limits. See how well you do!" http://www.theguardian.com/artanddesign/2015/jun/23/guess-artwork-pixellated-images-quiz

if one squints a little), and more than anything else it is the set of colours that is used and the general placement of these colours within the frame that help me to work out what the original must be. The identity is not in the details at all (because there are none), it is in the whole, the pixelated paintings form gestalts where the effect of 400 coloured squares seen together really is more than the sum of its parts.

As we already saw in Chapter 2 in relation to *24 Hour Psycho* and *9 Beet Stretch*, much of the success of works that adapt other works, especially ones that are already known to us, lies in what Linda Hutcheon describes as **"**repetition with variation, … the comfort of the ritual combined with the piquancy of surprise."[85] She also describes encountering an adaptation as a situation where the sources work might "oscillate in our memories with what we are experiencing" and that "in the process we inevitably fill any gaps in the adaptation with information from the adapted text."[86] I could in fact imagine that experiencing adaptation might be considered a creative act on the part of the spectator, if we take into account the connection-making and gap-filling that it requires. This process might be particularly demanding if, as in *The Guardian* quiz, or when listening to Peter Ablinger's *Quadraturan V*, the adaptation is of particularly low resolution — meaning that the format into which the new version is to be transferred does not allow for all the original information to be kept. Of course all adaptations to the digital[87] inevitably involve losses of information — continuous values can never be converted completely into discrete ones without encountering such loss.

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[85] Hutcheon, *A Theory of Adaptation*, 4.

[86] Hutcheon, *A Theory of Adaptation*, 121.

[87] In fact all the adaptations we are discussing involve this kind of transformation, even if the original source, whether it be an old painting or a performance in a recording studio, was made a long time ago and did not pass through the adapter's hands in this format.

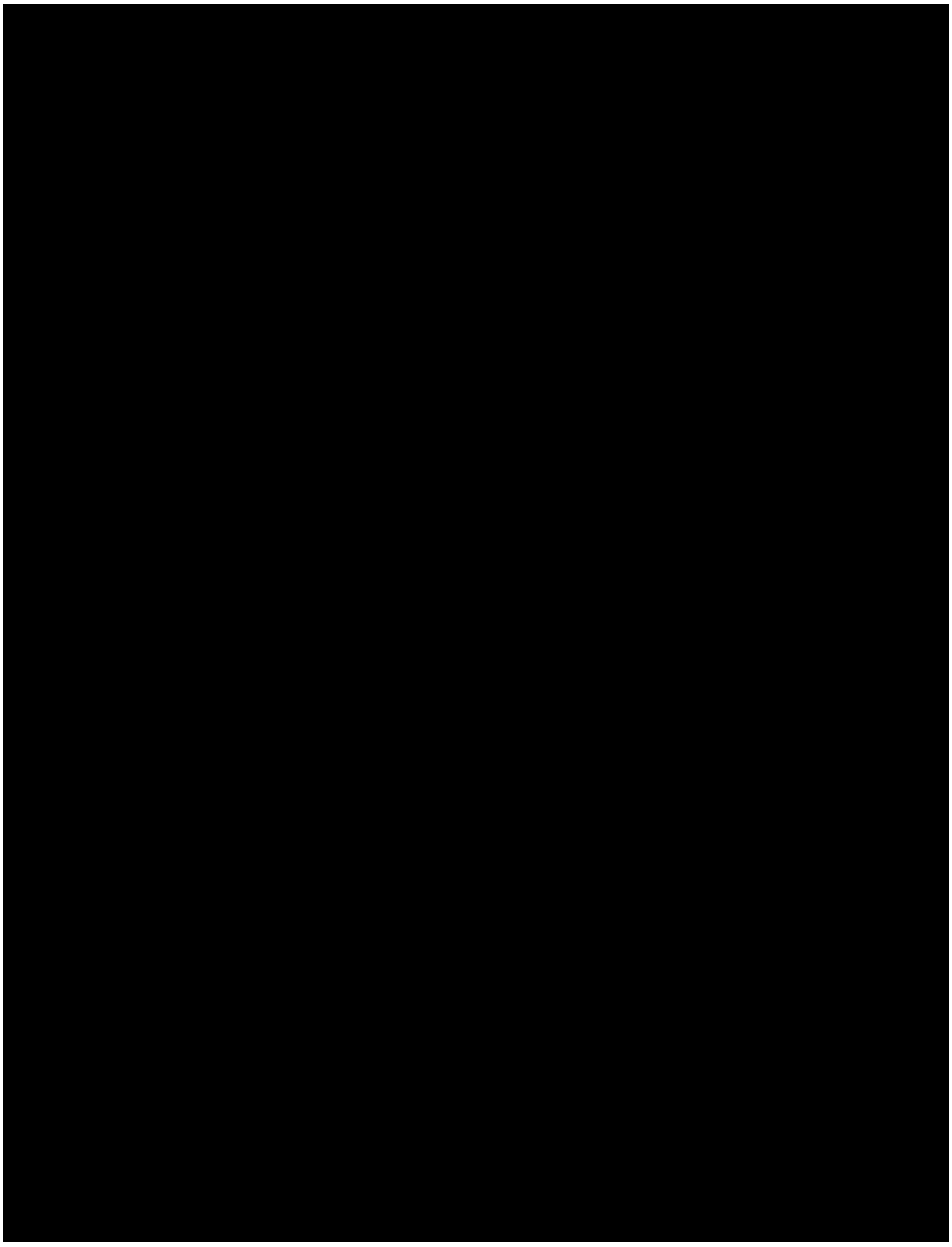

Fig. 4.7 Pixelated versions of da Vinci's *Mona Lisa*, Klimt's *The Kiss* and Picasso's *Les Demoiselles D'Avignon* created by Alexis Poles.

However, in the kind of adaptation I am talking about, the amount of loss incurred is well above the threshold of noticeability, above even the marked spatial aliasing of a badly-compressed computer image, or artefacts in an mp3. One might term this kind of transformation a 'pointless adaptation' inasmuch as it does not intend to add to or update the original in any way, it only takes away information and brings the source work to the verge of unrecognizability. I wonder if pointless adaptations fulfil the

criteria of a 'cold media'.[88] Though they do not strictly speaking constitute a medium in themselves, McLuhan would certainly have had to acknowledge the low resolution and high levels of audience participation they entail. Adaptation itself though, despite its potential to elicit gap-filling and cross-comparison, makes everything a bit easier, warming up the cold media by providing us with familiarity and some hints as to how to join up the dots/pixels.

Before we go on to discuss Ablinger's work, it is probably a good idea to talk about resolution in more detail and what this word might mean when applied to digital sound. We normally think of bit-depth as being equivalent to audio resolution, with low bit-depth effectively creating a less detailed and more 'pixelated' waveform leading to a lowering in signal-to-noise ratio, and dynamic range. Frequency response is not affected by changing the bit-depth. We might even liken audio bit-depth to colour depth and contrast in digital images.[89] In any case, audio bit-depth, along with sampling rate[90] represents audio resolution in the time domain. In the frequency domain, however, we could conceive of another, more artificial type of resolution corresponding to the pitch versus time dimensions of a sonogram. The pixels used in this type of resolution could be as big as we like,[91] effectively giving us a platform on which to perform adaptation and transformation in a way that imagines sound through the visual. In fact pixels of this type resemble more those of the images from *The Guardian* quiz, where it is less a case of colour-depth (though of course the range is diminished by virtue of there being so few pixels), and more the degree of roughness to which a two-dimensional surface is rendered.

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[88] See McLuhan, *Understanding Media*.

[89] Interestingly enough, an abundance of colour depth and contrast in images has not always been seen as a good thing. The Claude glass for instance, a popular tool amongst landscape painters in the eighteenth and nineteenth centuries, was a black mirror that effectively reduced the colour range of the reflected scene — the actual wide array of colours in the world, like the bright lime-green of grass did not correspond to the aesthetics of the time. For a fuller account of this, see E.H. Gombrich, *Art and Illusion: A study in the psychology of pictorial representation* (Oxford: Phaidon, 1959), 40.

[90] See Chapter 2 where, in relation to *9 Beet Stretch*, I talk about how lowering the sample rate is not a very exciting way of performing adaptation.

[91] Well in fact this is not entirely true. Because of the interdependence of time and pitch, every time you try to widen the analysis window length you end up with a finer set of frequency bins, and lowering the number of these bins in turn causes the analysis window to shorten. As I mentioned before, this issue of interdependence can be fudged by changing the rate of overlap between analysis windows.

4.11 Peter Ablinger — *Quadraturen IIIh* and *Quadraturen V*

It is not surprising that before moving on to music, the Austrian composer and sound artist Peter Ablinger trained as a graphic designer. The names of certain series of his works such as *Sehen und Hören* ('seeing and hearing'), and *Quadraturen* ('squarings') suggest an engagement with the visual world, the way in which this visual world might relate to the sounding one, and even how one world might be imagined through the other. A concept that Ablinger refers to as 'phonorealism' serves as the basis for the *Quadraturen* series. Phonorealism involves taking an 'acoustic photograph'[92] (an audio recording) which is then analyzed by a computer and "dissolved into a grid of squares"[93] the fineness of which is determined by Ablinger. The resulting analysis/score is then realized in another media — in the case of *Quadraturen IIIh* and *V* a computer-controlled player piano and an orchestra respectively. Ablinger compares this process directly to photo-realism in the visual arts (see Fig. 8), and has commented on the 300-year historical gap that exists between his own phonorealism, and the heyday of realism in painting that occurred in the seventeenth century.[94] He is right to alert us to this gap — with a few exceptions Western instrumental art music has generally not concerned itself with depicting the real sounding world.[95] Unlike a skilled painter, who might be able to 'transcribe reality' by eye (with the help of a carefully positioned, static subject and perhaps a camera obscura), we do not have the faculty to record the sound of the world by ear, which would involve being able to do on the spot detailed spectral analysis in our heads (rather like Pynchon's Mucho Maas). In fact it is interesting to note that visual artists managed to record the real world convincingly in brushstrokes

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[92] An attractive but misleading term which Kittler would have hated. The reasons why photographs and audio recordings are not similar, are discussed from different perspectives throughout this thesis. However, I do think Ablinger likes this term because it places audio recordings squarely in the frequency domain, ready to be imagined through visual concepts.

[93] Peter Ablinger, *Phonorealism: The reproduction of phonographs by instruments* at http://ablinger.mur.at/phonorealism.html

[94] Peter Ablinger in a public talk with the author, SPOR festival Denmark, May 2010.

[95] This is a subject discussed by Allen S. Weiss in his typology of music. The kind of work we are talking about would I suppose be covered by his categories "Notated/hyperreal/evocative" and "Notated/stylized/evocative". Weiss includes Messiaen's transcriptions of birdsong, the musical 'effects' found in Tchaikovsky's *1812 Overture* and Honegger's *Pacific 213* in the first, and Debussy's *La Mer* in the second. Ablinger's *Quadraturen* belong in the first, even though the computer-controlled piano music is not strictly speaking notated. It is significant that Weiss believes the last of his eight categories, "Notated/stylized/ambient", covers the vast majority of Western art music. See Weiss, *Varieties of Audio Mimesis*, 66-90.

before the technology was invented to capture it via photography. Ablinger's phonorealim, however, was developed some 100 years after the invention of audio recording, begging the question of why he should want to do it all. I think to a certain extent Ablinger is attracted to the reduction of real sound that is afforded by the grid (and indeed must be made in order to render the real world playable on acoustic instruments), because it somehow helps us make sense of the sonic complexity that characterizes the real world. Unlike Trevor Wishart, Ablinger is not so seduced by continuities of frequency and time. He describes white noise (the ultimate manifestation of these continuities) as follows:

> Rauschen [white noise]… is maximum density, maximum information. But it is also the opposite: no information, maximum redundancy. For me it is less than nothing, less than silence… The reason why we hear "less than nothing" is that we cannot connect to it by just listening. It is simply too much. We can't do anything with it.[96]

The way that Ablinger talks about noise reminds me of the Borges character Funes the Memorious whom we met in the last chapter. Funes cannot function normally because the completeness of his perception of the world, and of his memory renders him unable to generalize and to reduce his experiences to apprehendable forms. Funes's plight reminds us that we should be careful what we wish for though — in yearning for absolutely all information (and complete continuity), we risk being overwhelmed. The *Quadraturen* series reduces the sounding world for us and in doing so opens up an awareness of both the somewhat secretive operations of recording media, and of the way these operations complement our own perceptual and mental limitations. Evan Johnson describes this reduction as forming a kind of interface between ourselves and the noise of the world, a reduction he refers to as "a more "musical" surface… an externalization, a making concrete of the inward

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[96] Peter Ablinger, *Rauschen*, http://ablinger.mur.at/rauschen.html

Fig. 4.8 Willem Claeszoon Heda — *Still life with oysters, a rummer, a lemon and a silver bowl* (1634)

experience of hearing the unhearable."[97]

In terms of the *Quadraturen* series as a whole, *Quadraturen IIIh: Deus Cantando* from 2009 (video example 4.4) might be seen to lie at the extreme end of a scale representing how closely each transcription resembles its original object. Its accuracy is due in part to the fineness of the quantization of the sound source — the 'lines' of the grid are spaced a semitone apart on the 'vertical scale' and one sixteenth of a second apart on the 'horizontal'. Ablinger developed this technique for gridded reductions of audio recordings in conjunction with Thomas Musil at IEM Graz. The process involves making a series of static analyses, where the width of the frequency bins (bundled to form a logarithmic scale and corresponding to musical intervals), and the length of the analysis window can be set to create a grid of Ablinger's choosing. To a certain extent the operation resembles that of my freezing Max patch, though it also differs significantly in the flexibility afforded by having control over

[97] Evan Johnson, *"Like the Clear Blue Sky": Peter Ablinger's 33-127*, http://ablinger.mur.at/werk2000_1-127text.html

bin size and being able to correlate the bins to a set of equidistant pitch intervals. In the case of *Quadraturen IIIh*, the difficulty of performing this finely quantized transcription is handed over to a computer-controlled piano constructed by Winfried Ritsch, which is capable of executing the required maximum of 16 notes per second. The choice of piano is an interesting one with relation to the issues of the lattice/grid and of discrete versus continuous values, and for some it represents the embodiment of limitation and musical standardization. Aden Evens describes the instrument as having been designed "in complicity with Western musical notation"[98] and Trevor Wishart bemoans its inflexibility: "timbre is fixed; pitches are incapable of any sort of inflection".[99] *Quadraturen IIIh*, which lasts only a minute and forty seconds, is a transcription of a boy reading the *Declaration of the International Environmental Criminal Court* and I would like to think that the experience of it would possibly lead Wishart and Evens to revise their opinions about the piano. It is intended as an audio-visual piece — not only is there the spectacle of the piano itself, but also screened subtitles of the piano-rendered declaration, which is in some places not quite intelligible. It is a remarkable thing.[100] Although we would never confuse *Quadraturen IIIh* with an actual recording of a voice, the extent of its similarity to one, and the fact that both the timbre of the young boy's speech and the meaning of the text are conveyed, exceeds what I as a trained musician could have imagined was possible. The discrete attacks of the piano fuse to create the sound of a slightly robot-like boy speaking. Despite the fact that we can still hear these attacks stuttering within the general texture, the pitches have magically coalesced to form the voice. Hearing it is like squinting at a pixelated picture — our tendency is to want to blur the discrete elements into one whole thing. At the edges of the sound I become aware of a piano as opposed to a voice, through the wisps of material that have come loose from a fused centre. For instance, at times it is difficult not to hear the clusters and glissandi at the very top of the piano register as separated from the rest of the voice, as if not quite spectrally blended. At other times (for example the first "our mother

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[98] Evens, *Sound Ideas: Music, Machines,* loc. 1333-35.

[99] Wishart, *On Sonic Art,* 29.

[100] I hope this is not hyperbole. It is the only work in contemporary music/sound art I know of that can regularly produce gasps of amazement in people hearing it for the first time.

earth") there is clearly a piano figure in the middle register, like a stray excerpt from some other contemporary music piece.

> But the phonograph could not entirely shake the effect of anxiety or uncanny wonder this demonstration occasioned. Voices that speak without a body are the traditional mark of divine inspiration, demonic possession, or madness.[101]

Watching the piece brings to mind the ideas of the uncanny that Tom Gunning is speaking about in relation to the advent of the phonograph. We are now so well accustomed to disembodied recorded or broadcast voices, that perhaps we could see the role of Ablinger's speaking piano as one that gives us the opportunity to be spooked out once again by the possibilities of technology. The voice does of course have a piano-body, but there is a strange disconnection between sound and instrument even though we can see the movement of the piano keys corresponding to the almost-speech micro-rhythms that are heard. Pianos, in our general understanding of the world, produce the sound of Beethoven piano sonatas, not of speaking children, and I wonder if this strange audio-visual correlation between keys and voice could be considered as a moment of synchresis of a very distinctive and eerie kind.

Quadraturen V from 2000 (audio example 4.2) is an eighteen-minute work for symphony orchestra, divided into ten movements, all of which are constructed from analyses of various excerpts from recordings of Hanns Eisler's 1949 East German national anthem *Auferstanden aus Ruinen*[102] (audio example 4.3). Although employing the same principle of reducing an audio recording to values dictated by a grid of pitch against time, *Quadraturen V* is a very different piece from *IIIh*. The orchestral work certainly does not possess the same ability to wow, and it is the listener's job to get beyond the slightly 'dreary' surface of the music — to try to hear

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[101] Tom Gunning, "Doing for the eye what the Phonograph does for the ear," in *The Sounds of Early Cinema,* ed. Richard Abel and Rick Altman (Bloomington: Indiana University Press, 2001), 22.

[102] Translated as "Risen from the Ruins".

the ebb and flow of recognisability, the momentary coalescing of identifiable bits of tune amidst the flatness of the orchestra's texture. If the *Quadraturen* series were a microcosm of the world of media, *IIIh* would be the 'hottest' piece, and *V* the 'coldest'.

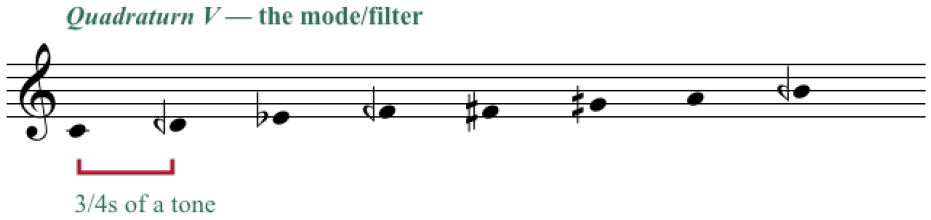

Fig. 4.9

The perceived flatness of the music is mostly the result of the pitch dimension of the grid — spanning six octaves and spaced at an interval of three-quarters of a tone, the grid remains constant for the entire duration of the work. Ablinger describes the mode formed by this interval as being "very close to the seven non-equidistant notes of the diatonic scale but also just far enough removed from it."[103] However, rather than hearing the notes as a slightly 'off' diatonic scale, my first sonic association is with Messiaen's modes of limited transposition, and in particular a kind of altered octatonic mode where the unevenness has been evened out. *Quadraturen V*'s mode is symmetrical and lacking the potential for differences or development that are facilitated by the asymmetry of the diatonic. There are no tonics and dominants, only two disjunct diminished triads, which carry with them their inherited sense of melancholy and gloom. Far from attempting to find some possibility for harmonic development in the piece, Ablinger emphasizes sameness by assigning each of the 48 string players a different 'horizontal' line of the six-octave grid for the duration of the piece. This grid is always present, though there are frequent 'holes' in it. The vertical lines of the grid that delineate the time resolution of the adaptation do not

[103] Peter Ablinger, http://ablinger.mur.at/docu11.html#qu5

remain consistent during the course of the work, and as such offer Ablinger the possibility of creating both variation (indeed there is something 'variation form-like' in the changes of meter that occur), and polyrhythm, when the orchestra is divided into two or more sections, each with its own basic temporal unit. In the first movement for instance, the vertical lines of the grid in the winds are spaced one quaver apart, compared to a dotted quaver in the strings creating an uncomfortable syncopation that only realigns itself at the beginning of phrases (or what correspond to phrases in the original recording). At other times, for instance in the middle of the second movement, the contrast between the size of the vertical line-spacings being used is far greater — a dotted minim in the winds and a triplet crotchet in the strings. Later on in the piece, in the seventh movement for example, the orchestra is subdivided even further and we get four layers of rhythm. It is always the strings that are subject to this additional subdivision, however, and the winds, who are 'carrying the tune' in a strange kind of hocketing, remain together unsplit.

The ten sections of *Quadraturen V* correspond to different excerpts that usually consist of whole verses of recordings of the anthem. These sections sometimes begin with a few isolated high sounds which I imagine are transcriptions of noise, and generally peter out at the end in a quasi-cadential manner. The metric changes that indicate a new vertical line-spacing mostly occur in the middle of sections, and the end of one section and the beginning of the next usually employ the same temporal grid. The fact that these metric changes do not coincide with section demarcations creates a large-scale formal syncopation of sorts, breaking up lingering traces of verse structure, and underlying the 'off-kilterness' of the piece as a whole. It is important to remember that *Quadraturen V* is adapted from recordings and not from a score and so small tempo fluctuations from the original performance are incorporated into the piece, as well as pitches extracted from the entire spectrum of the original choral-orchestral timbre. In fact, as in *Quadraturen IIIh*, the 'receiving' instruments are treated like sine-wave generators and their own spectra are not taken into account when allocating the notes of the analysis. The timbre of the performing instruments could be seen as adding an extra layer of noise to the proceedings, and

creating a further imbalance between original and adapted music, although according to Ablinger this factor is less significant than might be imagined.[104] The recognisability of the anthem is another issue, and Ablinger has stated that his aim is to have the tune "disappear as it comes into view",[105] but also that "the object must be well-known to be recalled."[106] I must admit that when I first listened to the piece I was not particularly familiar with the anthem, and failed to discern the tune — my listening experience was dominated by the grid, and I could not, so to speak, hear between the lines. Repeated listenings of the Eisler have altered my relationship with *Quadraturen V* significantly, and I now feel that I am highly aware of the melody of the anthem, even with its intervals altered and the music in fragments. As with the works we discussed at the end of Chapter 2, our knowledge of the source material is an unpredictable variable, mostly beyond the control of the artist, and one that can greatly affect our listening experiences.

As I think I have already implied though, we are in any case always cognizant of the dimensions of the grid when listening to the work, regardless of our familiarity with the anthem. The pitch lattice is slightly too wide for, and not quite aligned with the original tune and so melody notes slip through the net or appear microtonally-altered. All the rest of the stuff in the recorded sound beyond the notated anthem — the wash of noise and vocal or instrumental harmonics, is also filtered by the 48-note mode, thus drawing more attention to the net itself. In the rhythmic domain, when the grid is widely spaced, the melody is abridged, and when it is narrow (such as in the wind semi-quavers of the final movement), we become aware that the grid has been sampled too often and provided an excess of information, manifested in the subdivision of the melody notes. *Quadraturen V*, like *24 Hour Psycho,* foregrounds the limits of resolution of the sampling technology being used, by making the dimensions of its grid 'large' enough (or slow enough) to be easily perceived.

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[104] Ablinger, e-mail message to the author, August 27, 2015.
[105] Ablinger, http://ablinger.mur.at/docu11.html#qu5
[106] Ablinger, http://ablinger.mur.at/docu11.html#qu5

Ablinger is quite proud of not having written a note while creating *Quadraturen V,* which he describes as "a machine that can write orchestral music".[107] The recordings were analyzed according to Ablinger's instructions and the results sent directly to a music-notation program to be tidied up by a copyist. The piece is indeed uncompromisingly conceptual, the result of an algorithm, and as such the musical details lurch between strange unheard beauty, and the awkward and even ugly. I do believe though, that there are other extra-musical, extra-conceptual aspects to the work. The choice of source material, for instance, seems quite personal and connected to Ablinger — Hanns Eisler was also an Austrian who lived in Berlin (East Berlin), and I also wonder whether the piece is not a comment on nationalism, national anthems and the GDR.[108] National anthems are uniformly march-like and in major keys, and Eisler, despite being an interesting compositional figure of his day, did not manage to add anything original in his contribution to the repertoire — *Auferstanden aus Ruinen* is pretty standard fare. Anthems are also in any case generally a bit dull, and get duller still when we are subjected to multiple samey verses of them. Perhaps *Quadraturen V* in some respects exaggerates this aspect of the anthem by extending it to ten wordless stanzas, subverting the optimism of the national song by focussing on its flatness, and turning the major into minor. Maybe the piece is even symbolic of Eisler's own disillusionment with the GDR, or of what we might imagine was the grey day-to-day reality of living in it.

4.12 *To be beside the seaside*

Whereas Ablinger talks about grids, I am going to speak about pixels (and 'strips') in relation to my orchestra piece *To be beside the seaside* (2015).[109] I am not sure what the difference is effectively between imagining sound gridded or pixelated — grids of course imply lines of demarcation without actual thickness, while a pixel is the inverse — an area of uniform value that has been determined by a grid. I think in the

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[107] Ablinger, http://ablinger.mur.at/docu11.html#qu5

[108] Ablinger, in typical contrary fashion, told me that although the reality of life in the GDR was at the back of his mind, it was the anthem itself he was attracted to, and the contrast that it made with the West German anthem (also coincidentally written by an Austrian). I have to say that I am not entirely convinced by his account of things. Ablinger, e-mail message to the author, August 24, 2015.

[109] See Appendix 8.

end it is a matter of the specific techniques that have been used, and since these imaginings made in the frequency domain are ‘fake’ and not really based on the way sound actually is, the difference is terminology is not something of central importance.

It is recordings that provide the basis for *To be beside the seaside:* the second movement of Debussy’s *La Mer*, the third movement of Beethoven’s Symphony No. 4 and Johann Strauss’s *Wiener Blut* and *Geschichten aus dem Wienerwald*. Though issues of recognisability and resolution are still relevant in the three movements that make up my orchestra piece, unlike the *Quadraturen*, they are not direct adaptations derived from a strictly-applied analysis. In fact I think about the work more in terms of it using the frequency domain as a tool with which to dismantle the source recordings into a set of small parts that are then reassembled at will. I cannot help but think in terms of visual metaphors when talking about each movement —and the frequency domain offers a very useful way of working with sound for a composer like myself, suffering from wannabe-synesthesia.

The first movement involves a ‘repurposing’ of sonic material from *Jeux de Vagues*, the second movement of Debussy’s *La Mer* (1905). I started by using the Max freezing patch to ‘pixelate’ a recording of the second movement by François-Xavier Roth and Les Siècles (Musicale Actes Sud 2013). I then removed the ‘non freezes’, numbered the remaining freezes, and split this material up into four frequency bands using the band-filter function in Audiosculpt. The frequency bands were 0-300 Hz, 300-600 Hz, 600-1200 Hz and 1200-7000 Hz. I grouped the freezes according to the sections of the score they were drawn from and then ‘cross-pollinated’ two sections together, by making hybrid sonorities that would use blocks 1 and 3 (0-300 Hz, and 600-1200 Hz) from one freeze in one section, and blocks 2 and 4 (300-600 Hz and 1200-7000 Hz) from another. Audio example 4.4 together with Fig. 4.10 illustrate the formation of a hybrid sonority from two different freezes.

I made a great many hybrid sonorities and then chose my favourites on the basis of whether I thought the sonority sounded interesting, and perhaps more importantly, if I believed it would be possible to orchestrate it. In the end, from a couple of hundred hybrids I chose just 24, the material drawn from three short excerpts of the second movement of *La Mer* that barely total 40 seconds (audio example 4.5). The 24 hybrid sonorities were then arranged as a sequence of overlapping chords which are repeated to form a series of diminishing loops: sonorities 1-24, 6-24, 8-24, 11-24, 14-24, 16-24, 18-24, 20-24, 21-24, 22-24, and finally sonorities 23-24 alternated six times. The choice of hybrid sonorities and the construction of the sequence involved a great number of compositional decisions based on my desire to create a satisfying harmonic progression with good voice-leading, that would bear repetition and that was reminiscent of Debussy while also containing something new. I believe the relative classicism of my approach to harmony was counter-balanced by the formalism of the way the material was constructed in the first place, and the seeming arbitrariness of the rhythmic and dynamic structure created from an analysis of a recording I had made of waves breaking on Brighton Beach (audio example 4.6).

I then had to re-transcribe the electronic model I had made (audio example 4.7), using a combination of spectral analysis and the score. Some things were quite easy to transcribe, others less so. I was particularly perplexed when I heard certain frequencies very strongly in the hybrids that I could not see in the sonogram display. I then realized that these were phantom fundamentals — aural hallucinations created by the presence of the higher partials of a particular note. In these cases I generally chose to orchestrate the fundamental and trust my ear over my eye. I used all the instruments (woodwinds, horns, percussion and strings) that Debussy used in the original sections with the exception of the harp (which I thought might be difficult to balance in full chords) and the glockenspiels (which were substituted by crotales because they are easier to bow). Due to their incomplete spectra, individual instruments are quite hard to identify in the hybrid sonorities, so instead I chose to orchestrate by considering practicalities of range (all instruments play very comfortably inside their range), by keeping particular notes in the same instrument in adjacent chords (creating connections between the sonorities), but by also changing this instrumentation from time to time in order to provide variety. Given some of the

issues that arose during this process of re-orchestration, perhaps it would have been interesting for me to use a program such as IRCAM's Orchids, which I mentioned in the introductory chapter. It certainly would have been fascinating to compare the results of my own orchestration attempt with that of the software, or even to merge the two. Unfortunately, deadlines and a certain amount of fear generated by the occasion of my first orchestral commission, led me to stay inside the familiar world of my own taste and musical instincts. In the end I hope the movement can be seen not only as an exploration of how the sonic essence of a piece can be taken apart and reassembled to form something else like parts in a mosaic, but also as an attempt to break the classical grid of summative rhythmic durations by modelling the length of the sonorities on a natural phenomenon.[110] The movement as a whole is a kind of hybridization of the sound of Debussy with that of the real sea, brought about in the frequency domain.

The second and third movements deal with the identity of the source recordings more closely. *Slow sliding reveal*, is exactly that, a gradual revealing of the first three minutes and 49 seconds of the third movement from Beethoven's fourth symphony, using a set of band filters that gradually get wider as they drop in pitch. I used the 1983 Karajan/Berliner Philharmomiker recording from Deutsche Grammophon and the 1862 Breitkopf & Härtel edition of the score. This is the only movement not to use the idea of 'sonic pixels' or freezes, instead we might imagine the Beethoven Allegro Vivace progressing at normal tempo in *Slow sliding reveal*, but with the greater part of its spectrum missing. Most of the band filters, for a large part of the movement, capture only the harmonics of the orchestral instruments in the recording, and it is not until the end of the movement, when a critical mass of this spectral material is achieved (along with a scattering of fundamentals), that we have enough information to identify the source. The band filters were designed with the idea of a set of Venetian blinds in mind, opening up slowly to reveal a familiar scene. The piece is also a game of sorts, based on the idea of a threshold of recognisability, and

[110] These 'natural' durations are of course quantized to a certain extent — they do after all have to fit back into the grid of traditionally-notated music.

resembling those media like transistor radios and mp3s where the listener must fill in the gaps of missing sonic information in order to create a ‘whole’.

I designed a set of 12 band filters in Audiosculpt, which had a roughly harmonic relation to one another. I then manually altered the filters, making them thin at the beginning (around 10 Hz wide) and thicker at the end (about 40 or 50 Hz wide), as well as dragging them downwards to create a sloping effect. I adjusted the filters until I was happy with the results, but also split the file into three regions (low, mid and high), so that I could have a little more flexibility over the development of the movement. After a bit of editing in Cubase, the result is what can be seen in Fig. 4.11. I wanted to build up the spectra of the Beethoven very slowly — only four streams of filtered material can be heard in the first 75 seconds, and the full twelve only appear in the final 40 seconds. I think this is a good example of a compositional process derived from a clear concept that needed quite a bit of tweaking in order to sound exactly how I had imagined it. The reveal had to be timed in such a way that the identity of the original piece only becomes apparent at the end of the movement, and the evolution of the material paced so as to be musically satisfying. As with my other works, an initial idea was filtered through a process of listening and editing and the result is a fusion of concept with personal compositional instincts.

I then transcribed this electronic realization (audio example 4.8), using the sonogram in Audiosculpt, a frequency to pitch table and the score. By making a time-code for each of the bars (based on the Karajan source recording), I was able to notate what could be heard in the filtered version using the original score as a rhythmic template. I always opted to ‘neaten up’ what I could hear, by ignoring sounds I could not fit into the rhythmic template or that were very quiet, and emphasizing certain important motifs from the original piece. I only notated microtones at the very beginning of the movement where they would make more musical sense and reveal the ‘sliding’ of the filters. I thought that too much awkward and unnecessary detail would detract from the clarity of the idea.

The orchestration of the movement was fairly straightforward, given that the majority of pitches I had transcribed could only be played successfully by the upper strings executing artificial harmonics. It made sense to assign each group of strings only one (gradually flattening) note to play because of the speed and rhythmic precision required in the music. Each note is executed by between 1 and 4 players depending on the volume needed. Four instrumentalists playing harmonics at a loud volume also recreated the kind of saturated, slightly distorted sound that I had heard in parts of the electronic realization. Some woodwinds gradually enter as the movement progresses, again generally only playing one note. The hocketing effect of the orchestration helps to keep the music quite broken up and the filtered streams separate, hopefully creating a soundworld that is Beethoven and not Beethoven at the same time.

The final movement attempts the opposite process — an 'anti-reveal' in which the source material becomes increasingly hard to identify as its rhythmic patterns are slowed down. *Double flicker waltz* was inspired both by the flicker films of artists like Peter Kubelka and their rapid alternation of two things, and a work from the Argentine visual artist Jack Vanarsky entitled *La Baigneuse de Rembrandt se mirant à la Source d'Ingres* (1997). Vanarsky was a member of the OULIPO-affiliated organisation OUPEINPO, and the piece is a humorous attempt at interpolating two famous works of art that bear certain resemblances to one another. Vanarsky uses what he terms 'lamellisection' — horizontal strips taken from each work and alternated to produce a kind of cross-fade between the two paintings. He describes the process as follows:

> As soon as the works were divided into narrow strips, they became permeable to one another. A judicious, progressive shifting of strips was enough to create an area of passage, a no man's land across which the fundamental connections between the works — those *beyond* their edges — could be

> established… Lamellisection can thus replace colour graduation, *sfumato*, and the optical mixing dear to Seurat.[111]

In *Double Flicker Waltz* it is two waltzes by Johann Strauss that are interpolated:[112] *Wiener Blut* (1873) and *Geschichten aus dem Wienerwald* (1868). I used a Wiener Volksopernorchester recording of *Weiner Blut* and a Wiener Philharmoniker recording of *Wienerwald*, both being available on a Decca compilation CD from 2012 entitled *Popular Waltzes*. The fact that the two waltzes were not from the same recording session or even the same orchestra bears directly on the dynamic contrasts of the resulting piece. The reference scores I used were both Ernst Eulenburg editions. I ran a few minutes of each waltz through the Max patch as I had done with *La Mer* in movement 1, but as frequently as the patch could manage, which was every quarter of a second. I then removed the unfrozen segments and numbered each freeze (there were about 400 for each waltz), but I did not further subdivide the freezes by band-filtering. 147 frozen sonorities from each waltz were arranged in an alternating 3/4 waltz-type pattern that gradually slows down — a *Wienerwald* freeze occupies the first beat of the bar, a *Wiener Blut* freeze the second two beats. Approximately halfway through the piece, the conducted decelerando stops as the tempo reaches 76 (rehearsal letters GG in the score) and the slowing down effect continues by extending the written duration of the sonorities. At the same time the durations occupied by the two waltzes gradually become equal. As in other pieces from the portfolio such as *Artificial Environment Nos.9a-d*, this rhythmic pattern was created by trial and error with the intention of achieving a perceivable and engaging sense of slowing down. The freezes are used in the order that they appear in the original works, drawn from the music that starts at page 20 in the Eulenberg edition of *Wienerwald*, and page 7 of *Wiener Blut*. Apart from the

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[111] Cited in Harry Mathews and Alastair Brotchie eds, *Oulipo Compendium* (London: Atlas Press, 1998), 284.

[112] For a long time I considered the waltzes of Johann Strauss practically interchangeable, or somehow all the famous tunes had coalesced in my head to form one waltz that I could never remember the name of. *Double flicker waltz* is in many ways a response to my previous relationship with the waltzes.

omission of a small brass interlude in *Wienerwald* towards the end of the excerpt, the sequences of freezes are left intact, a fact that is very noticeable at the beginning of *Double Flicker Waltz* where a stuttering version of the famous *Wiener Blut* tune can be heard quite clearly. The choice of starting points for the two waltzes was also made by trial and error. I tried many different interpolations of the pieces and in the end found that the one containing the most formal repetitions was the most satisfying (which is not surprising given the potential harmonic chaos that can be created by alternating two different pieces). I only used the score to help me transcribe my electronic model (audio example 4.9), and ended up borrowing Strauss's orchestration as well. I identified the location of each freeze in the score including 'in-between' freezes that contain two consecutive melody notes, and then made a table of orchestrations for all 294 sonorities. 'In-between' freezes were realized either by having an instrument trill the notes, or making a divisi in the relevant section, depending on the sonic grain of the freeze. Although I mostly used the same orchestrations as Strauss, I had to redistribute many of the brass notes since no trumpets in F would be available to me at the BBCSSO.

In fact, though 'pixelated' (inasmuch as many of its melodic details have been lost), the tune of *Wiener Blut* is readily identifiable, losing this identity as the piece gets slower and we can no longer string the pixels together, fill in the gaps and recreate the famous melody in our minds. In addition, by losing their connection with the original, the sonorities from *Wiener Blut* inevitably become their own thing, or more precisely a thing in conjunction with the sonorities of *Geschichten aus dem Wienerwald*. Indeed, the alternation is no longer heard as an alternation between two musics, but has been transformed by slowness into what sounds like a coherent sequence of chords. I think for me, one of the most potent possibilities of processes of adaptation, rather than just allowing us to fuse novelty with familiarity, involve the utter transformation of the source material into something we would never have imagined that it could be.

To be beside the seaside is the only piece in my portfolio that does not involve electronic media with regards to the format of its final output. It is just an orchestra piece, and one might wonder how it fits in with the intermedial forms we have been discussing throughout this thesis. Like Ablinger's *Quadraturen V,* I consider the work to be an example of intermedially-conceived monomedia. It is intermedial because it was created using recorded materials which were manipulated according to concepts drawn from digital images (pixelation), sound imagined in a two-dimensional image space, as well as flicker films. The kind of intermediality expressed in the work corresponds to a certain extent to Jens Schröter's third category — "transformational intermediality" which we have already seen in relation to the photographs of Hiroshi Sugimoto.[113] However, although *To be beside the seaside* 'contains' other media (CD recordings, and the idea of pixelated images and flicker film), I am not sure if their incorporation is explicit enough to warrant inclusion into Schröter's system. I also wonder if the piece is explicit enough about what it was adapted from and how it was made. When turned into real live instrumental sounds, sonic pixels and spectral strips lose their digital quality and instead become complex, wavering sonorities coated in the historical and aesthetic associations we cannot help but attach to the orchestra.

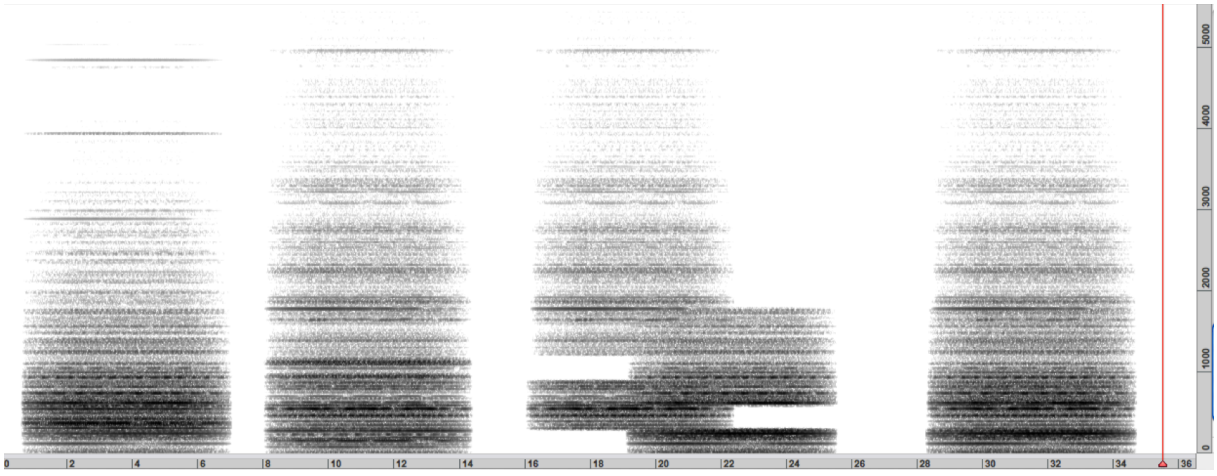

Fig. 4.10 The making of a hybrid sonority as shown in Audiosculpt

[113] Schröter, "Four Models of Intermediality," loc. 678-82.

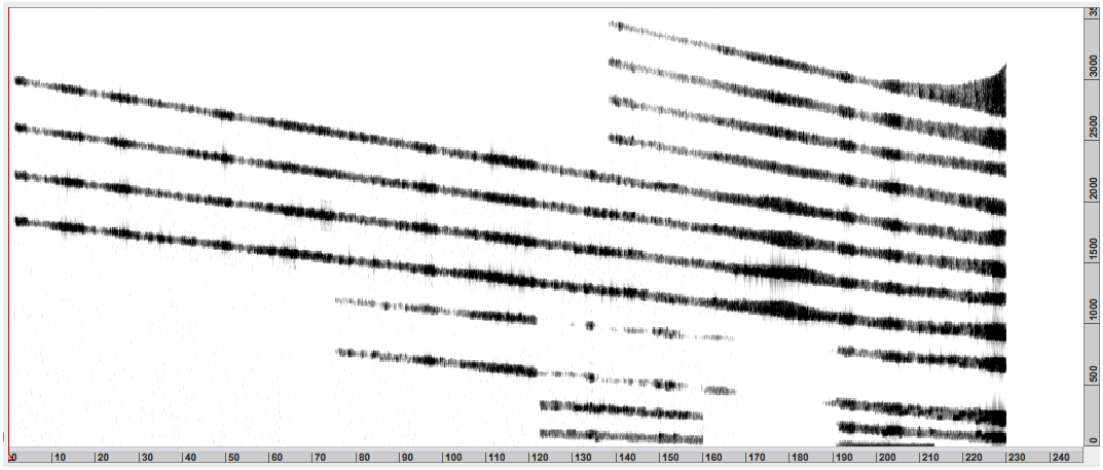

Fig. 4.11 A sonogram of the electronic realization of *Slow sliding reveal* in Audiosculpt

Fig. 4.12 Jack Vanarsky — *La Baigneuse de Rembrandt se mirant à la Source d'Ingres* (1997)

4.13 Conclusion to Chapter 4

This chapter has not been directly concerned with recorded audio and visual media to the same extent as previous ones, but instead these media have been contextualized into a wider discussion about how sound and image relate to each other (and to ourselves) on physiological and cognitive levels. The hope is that an understanding of the audio-visual from a broader perspective might equip the artist wishing to negotiate the intermedial space between sound and visual technologies with additional tools. In the first part of the chapter we learnt about how well we can actually see and hear, and compared the relative strengths of sight and hearing. It seems that art can demand things from us in terms of our attention and patience if it utilizes the extremes of what we can see and hear, and in turn remind us of our own perceptual capacities. Synesthesia, a relatively unusual involuntary mapping between senses, can prove useful to art, especially intermedial art, as a model for creativity with regards to its tendency to connect things in unexpected ways. The issue of audio-visual synchronization is perhaps a little more complex in how it relates media to ourselves. It might be seen as another example of medial loss inasmuch as the complexities of audio-visual relationships in the real world are rarely reflected in the manufactured good gestalts of mainstream films. Conventional sound-image synchronization it seems, requires less of our attention, and the fact that its workings are largely covered-up is as highly problematic, if not more so, than the smoothing-out of cinema's 24 frames per second. In fact the gap between how film is made and its perceived content is a kind of variation on the idea of a space between reality and its representation in media. As with all of these kind of spaces that we have discussed throughout this text, perhaps the first step for an artist is to acknowledge the space's existence and find a way to inhabit it creatively.

A possible strategy for inhabiting this space successfully comes in the form of synchronization itself. Beyond good gestalts and the subterfuge of sound film, it seems that audio-visual synchronisation is a powerful tool, and that harnessed creatively, the combination of visual and audio can produce an enormous array of objects that are other than the sum of their parts. I have also tried to analyse my own

work through the lens of synchronization, and have discovered a range of possible relationships (both inter-audio and audio-visual) that might be exploited in a more conscious fashion in future works.

In the first three chapters we looked at approaches towards dealing with image and sound that were based on the ways recording media function and how unexpected creative results can be derived from attempting to transpose techniques from one media to another. In the last part of this chapter we have dealt with a less technologically-driven strategy. Using Snyder's "image schemas" as a starting point, the usefulness of imagining sound in an intuitive visual space (and employing its signal-processing counterpart the frequency domain) has been examined, as has the question of how this space can facilitate the quite radical adaptations of materials found in the work of Peter Ablinger and myself.

We also looked at issues of loss from the perspective of the grid that we can superimpose onto this sound-image space. According to Trevor Wishart, Western classical music has traditionally limited itself to a lattice of fixed pitch and rhythmical values, a set of limitations that was codified in the score. His desire for a music free of these set values, and reflecting the indivisible continuums of pitch, time and intensity that characterize sound in the real world, relates to the issue of discrete and continuous recording media. In fact there is not such a large conceptual leap to be made between thinking of sound in this (gridded) two-dimensional space of pitch versus time, and imagining it as being like a digital image, subject to the effects of spatial resolution. As we have seen in previous chapters, loss of information is not necessarily a bad thing, and can enable greater legibility and useful generalizations. In terms of traditional classical music it is the 'reduction' of possibilities produced by set pitch values which allowed for the creation of the tonal system. As is apparent in the work of Peter Ablinger, processes of adaptation are facilitated by the grid, and even 'poor resolution' is useful inasmuch as it can create unexpected variations on pre-existing material. I would therefore contend that this kind of work also approaches the idea of a poetics of sampling, with the focus on the

interstices of film frame and digital audio we found in Chapter 3, being replaced here by the blur and sharpness of detail incurred by degrees of pixelation. It is also important to acknowledge that such degrees of pixelation not only highlight loss, but also act as useful compositional techniques in and of themselves. Having studied the extremes of low resolution at the end of this chapter, we will start the next by looking at the very opposite — the high resolution that can be found in the most recent technologies. In this concluding chapter we will discuss the closing of the gap between the discrete and continuous, and try to imagine what it would mean for us to be able to build the perfect recording machine.

Chapter 5

CONCLUSION

5.1 Closing the gap

When Peter Jackson's film *The Hobbit* was released in 2012, one of its unique selling points was that it was shot at 48 frames per second. One might have thought that by using a higher frame rate and thus increasing the temporal resolution of the action, something closer to 'reality' would be achieved — after all a doubling of the standard frame-rate certainly constitutes a significant closing of the gap between film and the continuously changing values that constitute the actual world. The higher frame-rate though, was generally not met with great enthusiasm, and like the motion interpolation function on modern televisions that converts 24 frames per second into as much as 120 frames per second, people felt that it was rather too real and even a little cheap looking.[1] This reaction has been termed the "soap opera effect"[2] and refers to the similarity in appearance between high definition and the type of American daytime soap opera that is filmed on video using a 60 frame-per-second interlaced format. Even though these soap operas look more 'real', and possess a fluid quality of movement not found in normal film, they are also associated with low production costs and all the bad acting and poorly written scripts that this might entail. The soap opera effect is a cultural as opposed to technological artefact, and a surprising one at that given the prevailing synonymity between high definition and better quality. I suppose that McLuhan would have considered HDTV and films to be extremely hot media, but strangely enough, instead of making us passive, such media

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[1] See Bryant Frazer, "The Hobbit, the "Soap Opera Effect," and the 48fps (and Faster) Future of Movies," accessed July 16 2015, http://www.studiodaily.com/2012/04/the-hobbit-the-soap-opera-effect-and-the-48fps-and-faster-future-of-movies/html.

[2] I have not been able to find any academic material on this subject, only a handful of articles in internet magazines on film and TV. However, I am quite convinced of the existence of this phenomenon having experienced it firsthand. Back in 2012 while watching HDTV at a friend's house, I was rather perplexed that what I thought was a high-budget American network show, *Homeland*, looked very strangely real, and possessed what I can only describe as a certain visual 'warmth'. The look of it did indeed remind me of my favourite daytime soap *Days of Our Lives* which I had not seen in years — this version of *Homeland* had none of the cool distant appearance one associates with film and expensive TV. My friend of course had the motion interpolation function activated on her TV and a little internet research led me to discover the soap opera effect.

might be seen to have unwittingly provoked an unusual type of connection-making, that has in turn become a form of resistance.

High-speed cameras can of course shoot far in excess of *The Hobbit's* 48 frames per second. Such cameras possess frame-rates ranging between 250 and 4.4 trillion[3] images per second, and for the most part their purpose is to record action in a high degree of temporal resolution that will then be slowed down for viewing.[4] Like high-speed photography to which it is clearly related, the idea of this kind of filming is to reveal things that we would be unable to see with the naked eye, and it is not surprising that such technology is mostly utilized in military, industrial and scientific contexts. Shooting high-speed film is not without its problems, however. The very short exposure times that inevitably accompany high frame-rates require a great deal of light in order to register an image, a need that only increases as exposure times are further reduced. Even more problematic (and in common with high definition digital audio) are the vast amounts of data involved in storing moving images of this type, especially if they employ a large number of pixels per frame.[5] It seems that as we try to close the unclosable gap between recording discrete and continuous values, rather like a spaceship trying to approach the speed of light, we become increasingly weighed down by mass — in this case the 'mass' of information needed to preserve the sounds and images in question.

5.2 The role of the artist

> The effects of technology do not occur at the level of opinions or concepts, but alter sense ratios or patterns of perception steadily and without any resistance. The serious artist is the only person able to encounter technology

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[3] This is called Femto-photography: http://www.gizmag.com/fastest-camera-44-trillion-frames-per-second/33330/

[4] Bill Viola's *The Greeting* from 1995 is an example of this kind of film in an artistic context. Forty-five seconds of action were filmed at 300 frames per second, and then slowed down so that the sequence lasts ten minutes.

[5] The femto-photography, recording at 4.4 trillion frames per second, uses a correspondingly small number of pixels per frame: 450 x 450.

> with impunity, just because he is an expert aware of the changes in sense perception.[6]

I am not sure whether the existence of the soap opera effect validates or undermines McLuhan's assertion. It does appear that many of us have become rather used to the aesthetics of 24 frames per second without knowing it, and as we have seen, often meet deviations from this format with some bewilderment and not a little hostility. On the other hand, the fact that large differences in frame-rates are still so clearly apprehensible indicates that our senses have not been completely dulled. I think it is also important to remember that McLuhan was writing in 1964, and the extract above does not suggest anticipation of anything beyond passive media consumption.[7] As we saw in Chapter 2, access to media devices that can both playback and record has increased tremendously in the last 40 years, and in particular since the advent of affordable digital technology. We can not only watch and listen as we like, we can record and edit things with relative ease and then post them on Youtube. Even the parameters determining the formats of digital images and sound can be selected by the user — just a little exploration of the settings menus of our devices reveals a choice of frame-rate, resolution and audio compression. These choices are of course limited, or even extremely limited depending on the technology in question, but there is no question of a growing half-awareness of how things work.

The writings of Baudry and Le Grice echo McLuhan's sentiment that is up to the artist to save the day and deal with the new technologies in a critical way. In the 1960s, and as work by artists such as Kubelka and Le Grice demonstrate, film was the particular focus of these critical responses. More often than not, such responses involved deconstructing the media itself — either to reveal the actual flickering frames that serve as the source of the filmic illusion, or to expose the smoothing over of the filming/editing/screening process that is so central to the functioning of

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[6] Marshall McLuhan, *Understanding Media: The extensions of man* (London: Routledge, 1964), 19.

[7] I cannot help thinking of the image of a 1960s family glued to a television set. I am also reminded of the fatally enticing film created by optics expert James Orin Incandenza in David Foster Wallace's novel *Infinite Jest* — a film that leaves viewers in a permanent catatonic state.

mainstream cinema. More recently Olafur Eliasson's *Model for a Timeless Garden*, and Douglas Gordon's *24 Hour Psycho* have addressed the issue of frame-rates and sampling, though arguably their intentions extend quite a bit further beyond it (more on this later). On the other hand, Peter Ablinger's *Quadraturen* series draws our attention to audio sampling by taking this sampling out of the time domain, placing it in the frequency domain, and blowing up the grid that determines resolution to a size that can be clearly apprehended. Ablinger's grid reminds us of the orderliness, ease of reduction and adaptation inherent in the digital — and indeed, if we were too update McLuhan's artist job description for the present day, surely it would be to include the necessity of grappling with this vast media monster. Charlie Gere's 2002 book *Digital Culture* approaches the subject from a highly critical standpoint, warning us against the "technological enchantment"[8] practiced by proponents of the digital. He also reminds us of the similarities between the digital and the modus operandi of capitalism, a system described as "predicated on abstraction, standardization and mechanization, to ensure that it can operate as a universal machine, capable of treating disparate phenomena as equal and interchangeable."[9] The digital, however, is far from being a direct expression of capitalist principles, and Gere traces its complicated history starting with Turing's Universal machine, through developments in the military context of the Cold War, without forgetting to acknowledge the contributions made by those involved in counter-culture. It is clear though, that the ease of adaptation that interests us as artists and is afforded by the digital, looks less rosy when seen in its full context. Friedrich Kittler, describes the ultimate digital endgame where "sound and image, voice and text are reduced to surface effects."[10] Like the nightmare reverse side of the intermedial nexus, Kittler predicts a situation in which:

> … any medium can be translated into any other. With numbers, everything goes. Modulation, transformation, synchronization; delay, storage,

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[8] Charlie Gere, *Digital Culture* (London: Reaktion Books, 2002), 19.

[9] Gere, *Digital Culture*, 24.

[10] Friedrich A. Kittler, *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young and Michael Wutz (Palo Alto: Stanford University Press, 1999), 1.

> transposition; scrambling, scanning, mapping a total media link on a digital base will erase the very concept of medium. Instead of wiring people and technologies, absolute knowledge will run as an endless loop.[11]

The American conceptual artist Cory Arcangel takes this ease of conversion to its logical conclusion in *Data Diaries* (2003). By exploiting a bug in its programming, Arcangel tricked the media playing application Quicktime into creating videos from the contents of the RAM on his computer. The resulting videos do not make much sense by themselves and are not supposed to (it is data without the correct interface to view it), and I cannot help but be reminded of the wounded CDs of Yasunao Tone, and Caleb Kelly's concept of 'cracked media'. The window of opportunity for cracking Quicktime in this particular manner was only a short one though — a few years later, the bug was fixed and Arcangel was unable to continue with the project.[12]

5.3 Participation, losses and gains

As I believe I have been suggesting throughout the course of this thesis, our relationship with media is quite a complex one, and the job of the artist more multifaceted than simple didacticism. Elements of participation, and a constant see-sawing of loss and gain colour this relationship quite considerably, and generate possibilities to reinvigorate creative practices, and discover new things about the world and ourselves. Caleb Kelly, Jonathan Sterne and Jonathan Crary have all drawn attention in their writings to the idea that media is a two-way process involving participation on the part of the spectator that may be both psychological or physiological, voluntary or involuntary. Sterne has identified audile techniques,[13] a kind of over-looking and over-coming of the poor quality of early forms of media as a particular type of user participation that has proved vital in the development of audio technology, while Crary's designation of a viewer of film as "simultaneously the magician and the deceived"[14] underlines the useful role we play through our

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[11] Kittler, *Gramophone, Film, Typewriter*, 2.

[12] See http://www.coryarcangel.com/things-i-made/2003-002-data-diaries

[13] Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction* (Durham NC: Duke University Press, 2003), 259.

[14] Jonathan Crary, "Techniques of the Observer," *October* 45 (1988): 35.

filling in of the gaps of the incomplete, and enjoyment of visual trickery. Even Chion's 'synchresis', that which results when sound is synchronized with image in film, is dependent upon our physiological reaction to it, where something is created that adds up to more than the sum of its parts. Olafur Eliasson is a very good example of an artist who is highly aware of the contribution a spectator can make to a work, describing this contribution as a kind of physiological co-authorship, and desiring that the new knowledge obtained in the course of the experience be taken and applied to the outside world. As we have seen, reawakening the senses, though not necessarily in as spectacular fashion as Eliasson, might be thought of as a preoccupation of the avant-garde, and is manifested in the kind of extremes of speed, duration and intensity in pieces that do not so much remind us of how *things* work, but of how *we* can work when given the chance.

Recorded media, for all the loss they incur during the process of capturing, often allow us to attend to things we would not normally be able to see and hear. Our ears and eyes can only perceive a limited bandwidth of light and sound, and the way we experience the world temporally is set to a certain scale of not too fast, not too slow. Media can slow things down, giving us access to the 'optical unconscious' and ultrasonic frequencies on the one hand, or else speed the world up so that we may observe slowly-changing patterns and movement on the other. A work such as Christina Kubisch's *Electro-Magnetic Sound Walks* (2004—) even reveals to us a realm that is otherwise inaudible and invisible (but still very much in existence) by converting low-frequency EM radiation into sound. *Electro-Magnetic Sound Walks* is an example of intermedia, and along with most of the other artworks that I have mentioned during this thesis, it shows the potential that such formats possess to connect the seemingly dissimilar, create strange adaptations and ultimately renew creative practices for artist and spectator alike. We should indeed stay vigilant concerning the complex of economic, cultural and perceptual issues surrounding media, but I do believe at the same time that making the most of the media possibilities available to us is both a realizable as well as necessary goal.

5.4 Audio-visual

We have explored many different kinds of gaps or spaces during the course of this PhD — for instance the micro-gaps in recording that occur when a movie camera shutter is closed or between voltage meter readings in digital audio, and the macro gaps that open up as a result of the time elapsing between when something is recorded and played back. The space separating audio and visual technology, and both the way we see and hear, and think about seeing and hearing, is a useful one for artists wishing to engage with the intermedial (and indeed composers in the process of broadening their practice). A combination of appreciating how things work, and creative connection-making is key to being able to negotiate this space successfully and with the renewal of artistic practice that this might entail. Going back to Kittler, it is important to understand how much of this intermedial gap is created by the fundamental difference in the way that we record and manipulate (and are able to record and manipulate) audio and image. It is the very limitation of visual recording, the fact that we are unable to capture light directly, only its indirect effects, that gives rise to the discrete, photography, and film sampling techniques. In turn, image-recording technologies have created the possibility for the kind of temporal manipulations such as freezing, slowing down and the verticalizing of time that we have tried to emulate in sound. Again, there is a difference to be appreciated between how these effects are achieved in each domain, and in general how much more technologically involved it is to create an audio-freeze or slow down a sound without changing its pitch. I also wonder why it is that the visual always takes the lead in determining the kind of manipulations we can imagine — perhaps another fruitful artistic direction could be found if the roles were reversed: a film slowed down by means of overlapping and repeated grains, or photographs taken apart at the seams and recombined using some kind of equivalent of a spectral filter. The point is that understanding the gap facilitates the generation of multiple artistic possibilities. Even more intermedial opportunities can be discovered through exploring the way sound and image go together. Synesthesia provides a model for mapping between audio and visual elements in rigorous and yet unexpected ways, as well as for a utopian united artistic landscape where disciplines are not as aesthetically and institutionally

separated from one another as they are at this current moment. We may also think about the potential latent in the simultaneous apprehension of a flash and a bang. A fusion more than the sum of its parts, synchronization represents an opportunity for perceptual magic-making, as long as its part in soundfilm's subterfuge has been fully appreciated, and the conventions of sound-image combinations we have all become so accustomed to, rejected. Perhaps the most intriguing possibility for dealing with the audio-visual is to try to imagine one through the lens of the other. In the last chapter we saw how harnessing our own innate tendencies to visualize sound in image-spaces can allow us to move beyond conventional ways of dealing with musical adaptation. Again, I would be interested to know if the reciprocal (and considerably less intuitive) approach of imagining image through sound might provide the intermedial artist with yet another set of creative strategies.

5.5 Media/reality/ourselves

Near the beginning of my film *The Grand Tour*, the narrator describes the ultimate recording device, capable of capturing "an absolute seamless record of everything that ever happens".[15] Such a device would I suppose be the gold standard of media, if indeed we consider a recording that could truly be confused with its original object as something that we would like to have. This part of the text was inspired by *The Invention of Morel*[16] written in 1940 by Adolfo Bioy Casares. In the novella, a fugitive arrives on what he believes to be a remote deserted island, only to discover that he is sharing it with a group of mysterious tourists who appear to be reliving the same week over and over again. It eventually transpires that the tourists are not real at all, but are part of a recording so lifelike as to have fooled the fugitive completely. Casares, avoids going into any detailed science-fictional explanations of how it might be possible to make a perfect 'solid' recording that one can not only see and hear, but also touch and smell. However, it is also clear that the main point of the

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[15] Here it is in full: "I've tried to picture the ultimate recording machine, comprised of billions of devices controlling overlapping fields of operation extending in all directions. If these devices were recording continuously without recourse to the discrete units of the film frame or digital sound sampling, then and only then could we imagine an absolute seamless record of everything that ever happens."

[16] Adolfo Bioy Casares, *The Invention of Morel*, trans. Ruth L. C. Simms (New York: New York Review Books, 2003).

novella is not the workings of the technology itself, but the ontological implications of making a recording that is to all intents and purposes the same as the thing that has been recorded. The inventor Morel claims that the people inside the recording have been effectively reconstituted in their entirety and are therefore by logical consequence conscious, though this is (not surprisingly) never proven to be the case. The fact that everyone who is recorded by the device dies shortly afterwards, implies that maybe the recording does indeed capture their soul, as well as reminding us of some of the attitudes and expectations surrounding early media — that it could in some way preserve the dead. The recording and everyone in it though, is immutable, their reality is superimposed onto that of the fugitive, and his only way of at least appearing to take part in the week's proceedings (and interacting with the woman he has fallen in love with), is to overdub himself into the action.

Casares was both a contemporary and a good friend of Borges, and clearly *Funes the Memorious* and *The Invention of Morel* have a great deal in common. Both writers take the idea of recording to its very limits, creating a human remembering machine (Funes) and the ultimate recording device (the invention) that in their uneditable comprehensiveness, are not terribly useful to anyone. One might also worry, as in the case of the high frame-rate film, that we would not be able to accommodate all the data that such exhaustive recording techniques would generate. Funes in the end goes mad and dies young as a result of his capacity to remember, and Morel's invention, with its ability to superimpose recordings onto the present moment, threatens to over-populate the world with the solid manifestations of everything that ever happens.

Fortunately then, it seems that the media we are currently stuck with are comparatively speaking quite limited. Made to a certain extent in our own image, these media are just another way of not apprehending the world in its entirety. What exactly it is that constitutes 'the world in its entirety' is in any case a tricky question to answer. Like Kittler, I must admit I am quite seduced by the Lacanian notion of

the real, as an undifferentiated, ineffable realm beyond language.[17] Lacan described the real as a "a noise in which one can hear everything, ready to submerge with its splinters what the reality principle has built under the name of external world",[18] and Kittler believed that in its ability to capture continuities of pitch and time, the gramophone[19] was the one media device worthy of representing it.[20] The real certainly falls through the grid of the digital, between the frames of a film and expands far beyond the limits of the small terrain of stimuli apprehensible to our senses.

I am reminded of Janet Coleman's observation, quoted in Chapter 1, of the gap that exists between the nature of the world in its infinite particularities and the means we have to record it.[21] As I think we have seen over the course of this thesis, it is perhaps this gap, or indeed the frictional space of not-quite-sameness, that is the most interesting thing for us in art. It is a space that has to be there in order to accommodate all those acts of human cognition: reflection, comparison, creation, theorization — and even the desire to nostalgize — that we hold so dear.

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[17] It is important to note that though Lacan's theories were drawn from eclectic sources, and his influence has been far-reaching, in the end, notions such as 'the real' were devised by him to serve psychoanalysis (which is not really our concern here).

[18] Jacques Lacan, quoted in Lionel Bailly, *Lacan: A Beginner's Guide* (Oxford: Oneworld publications, 2009), Kindle edition, loc. 1464-5.

[19] I wonder if even the gramophone can capture the real though. Somehow I imagine that it would have to have total frequency response, and though modern vinyl can record well into the ultrasonic range, it does not have this particular capacity!

[20] Kittler, *Gramophone, Film, Typewriter*, 22.

[21] Janet Coleman, *Ancient and Medieval Memories: Studies in the Reconstruction of the Past* (Cambridge: Cambridge University Press, 1992), 61.

Appendix 1

***Artificial Environments Nos.9a-d (from fast to slow)* (2012)**

Artificial Environments Nos.9a-d (from fast to slow) is a 15-minute work for tape and small conducted chamber ensemble (flute, alto saxophone, electric guitar, violin, cello and mezzo soprano). It was commissioned by the young Parisian group Soundinitiative with funds from Diaphonique. It was premiered in Paris on the 3rd of February 2013 at the Collège Franco-Britannique, with the second performance taking place on the 24th of March 2013 as part of the Ars Musica Festival, Brussels. Although the last in the *Artificial Environments* series (a project that I began two years before commencing my doctorate but which feeds into it to a large extent), *Artificial Environments Nos.9a-d (from fast to slow)* is very much a companion piece to the installation *The place you can see and hear* (see Appendix 2). The same Max/msp patch that is employed in the installation, was used to process the field recordings that are used in the ensemble piece. In addition, the piece uses a very similar 'score' of decelerating freezes and unfreezes, which like the installation, highlights the difference of effect that different tempi have on the material that is being processed. However, an important distinction between the two works, and one that is of central importance to this thesis, is that one uses live microphone feed and the other pre-recorded material. While the installation explores the 'present' in its continuous and discrete forms, *Artificial Environments Nos.9a-d* is very much about the past, memory and nostalgia and what it might mean to present this 'past' in a concert situation. To that effect, the work is accompanied by a minimal power-point presentation, which indicates the circumstances of each of the four recordings as they appear. The four slides are as follows:

Artificial Environment No.9a)
An afternoon on a beach in Kythira, Greece, July 2009

***Artificial Environment No.9b*)**
Gare du Nord, Paris on the 7th of December 2011 while changing trains between Reims and Brussels

Artificial Environment No.9c)
A Friday morning in late May at the Maison Communale in Schaarebeek, Brussels. Recorded covertly while waiting to receive my residency permit.

Artificial Environment No.9d)

Between 11pm and midnight on the 27th of June 2012 at the Bourse, central Brussels. Hundreds of Spanish fans celebrate their victory (4-2 on penalties) against Portugal during the semi-finals of the 2012 European Football Championships.

These recordings were not especially made for the piece, but were selected from my archive, because of both the variety of material they would provide when frozen, and their significance for me personally — the recording from Paris for instance, was captured a few minutes before receiving an upsetting phone call, and I cannot but associate this very ordinary soundscape with something extremely negative. All the recordings were made in a 44.1 kHz/16 bit format using a Tascam DR-07[1] with external omni-directional microphones, except for the recording of the sea that was captured using only the built-in microphones of the Tascam.

Processing

See section 2.4.

Instrumental part

The ensemble and tape part were co-ordinated by means of a click-track that was given to the conductor. I generally prefer using a conductor, to giving a click to each player in this kind of situation, since it gives the musicians more of a chance to listen to themselves and each other.

The material for the ensemble was derived entirely from the analysis of the tape part. In the 'sea' section, the players imitate the white noise sound on the tape by using various techniques appropriate to their instrument such as blowing air down the tube for the woodwinds, muting the strings and brushing with the hand on the guitar, and bowing the side of the bridge on the violin. The section at Gare du Nord is still quite fragmented, reflecting the sporadic occurrence of pitched material in the recording

[1] This was the only recording device I owned at the time and it was not capable of recording at high sampling rates.

(such as the SNCF jingle and the drone of a stationary train). The ensemble part follows the form of the tape, gradually getting more centred around pitch and chords as the piece progresses. The final instrumental chordal section though, is itself faded out to single instrument pitches as the ring-modulated sound takes over. The relationship between ensemble and tape part is centred around synchronized resemblances and the instruments rarely do anything that is not directly related to the electronics. The one exception to this occurs in the 'commune' section starting at bar 89, where the ensemble part consists of notes plucked out of the freezes, and extended to form a kind of halo that sits on top of the electronics.

Performance and recording

Although the performances went well, I perhaps regretted not choosing a more homogenous ensemble (I would not have used the guitar and singer), or alternatively writing an ensemble part more suited to the heterogeneity of the line-up. The young ensemble had not played many pieces with tape before, and one interesting thing that they told me afterwards, is that they had no idea what the tape and instruments sounded like together — they were playing what was written with no notion of the eventual outcome. This is clearly something to be addressed in future pieces, and which is tackled to a certain extend in *Trains* where there is a more elastic, less automated relationship between the cello and tape. The recording that is in the portfolio is from the Paris premiere, and was unfortunately mixed live by an audio engineer, so I was unable to do any work on the balance.

Appendix 2

The place you can see and hear (2012 —)

The place you can see and hear is a series of site-specific installations involving a single or double camera obscura, and live environmental sound treated by a Max patch. The patch freezes and unfreezes the sound according to a cue list that functions as a 'score'.

Performance Space #1/Rue Darimon

This was the first incarnation of the installation and it was developed during what seems in retrospect to have been a luxuriously long residency period between the 27th of August and the 9th of September 2012. The residency took place at the Q-o2 workspace for experimental music and sound art in the Molenbeek district of Brussels. The installation was open to the public on the afternoons of the 8th and 9th of September.

Visuals

The second performing space at Q-o2 was made into a room-sized double camera obscura by covering the windows with black plastic and then making a small hole in the covering of each window. Weak reading-glass lenses (+0.5 and +0.33 dioptres) were placed over the holes. The two windows were at 90 degrees to each other, one facing northwest to the outside view of the Rue Darimon, and the other to the adjacent room (Performance space #1). Two small projector screens were placed a few metres away from each hole (depending on where the image was sharpest), at roughly 90 degrees to one another. Due to the law of optics which states that light travels in straight lines, an image of each scene (the Rue Darimon and Performance space #1) was formed on the screen directly opposite, inverted both horizontally and vertically. In addition, much of the image from the Rue Darimon spilled over onto the ceiling, floor and far walls of the room.

Audio

The sound came from three speakers placed next to the screens. The source of this sound was a Max patch that processed the input of two sets of microphones: one that

picked up the sound outside the building, and the other a slowed down and extremely subdued version of Orlando Gibbons's *Lord Salisbury's Pavan.* The choice of music was a nod to the heyday of the camera obscura in the 16th and 17th centuries and a reference to the musical function of the performance space. The Max patch took both of these sound sources and put them through a real-time temporal filter that alternately sent live unprocessed feed, and 'freezes' to the speakers. These freezes were a spectral prolongation of a small sample of the microphone feed. The pattern of freezing and non-freezing was determined by a score of time segments that were gradually shortened and then lengthened to create an accelerating and decelerating structure. At this point in the installation's history I had to manually loop the eight-minute score myself since the cue list on the Max patch was only 300 lines long and had no looping function. There were also some problems with feedback, which meant that I could never turn the volume up too high. At the time, I thought this was due to microphone/speaker proximity, but in retrospect I believe it was caused by the multiple connections between the mixer and the soundcard.

Other Observations

This was a very quiet and still installation. Since the Q-o2 space is located on the third floor of a building, the direct scene was of the rooftops of the neighbouring street. Movement, such as that of a passing bird or fluttering curtain was rare. Earlier in the day it was possible to have a lower view of the street scene by using a different hole, and then an occasional car or passer-by would be seen. By about 4pm unfortunately, this view was obscured by shadow. The weather was extremely sunny during the period the installation was up. Bright weather is generally a good thing for a camera obscura since it increases the luminosity and colour saturation of the image. However, good weather also casts strong shadows and this can be a problem in the late afternoons. The interior scene was almost always still and empty, and many people commented that it resembled a painting by Vermeer — in fact it is probably the other way round, Vermeer's paintings look like a camera obscura view because they were the results of copying images made using one. The amount of sonic activity reflected the atmosphere of the neighbourhood. There was always background noise from distant busy streets but for much of the day the area was deserted. During the weekend though, things became much noisier: a group of young

men would spend hours taking turns on a very loud motorbike, and flight paths from Brussels airport changed so that planes passed directly overhead.

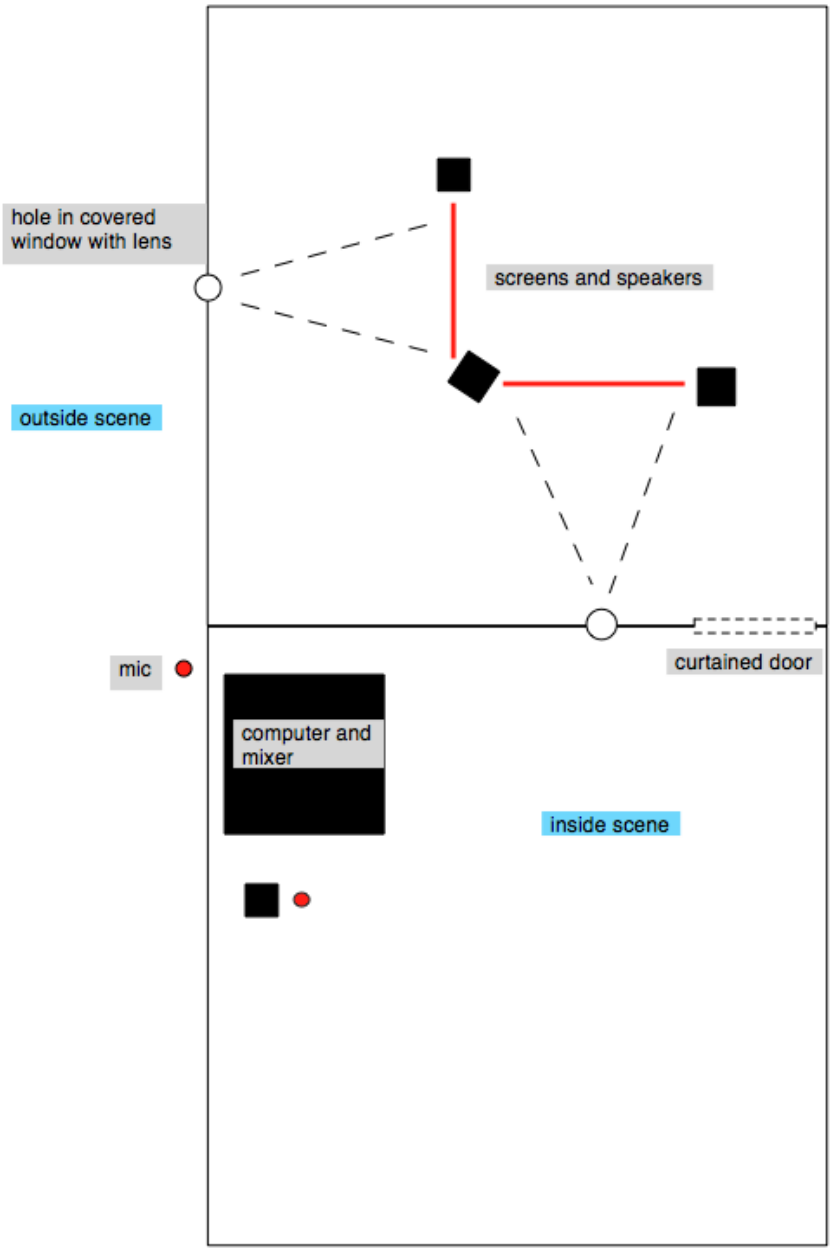


Fig. 2a.1 *Performance Space #1/Rue Darimon* set-up

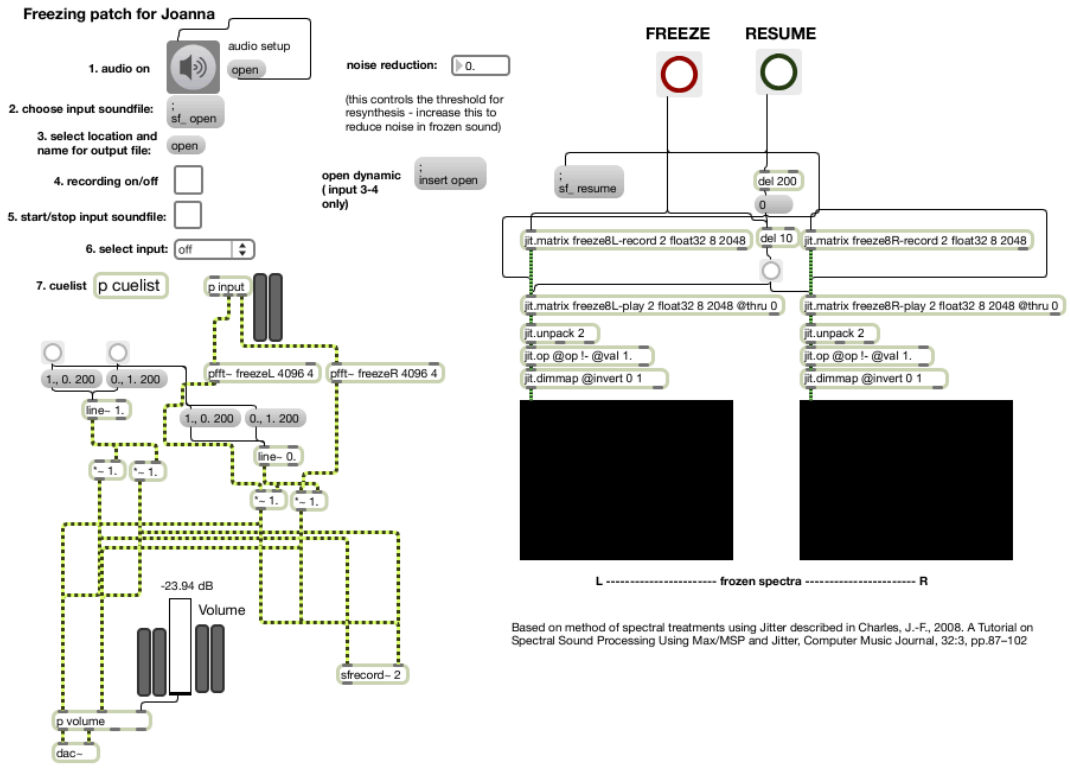


Fig. 2a.2 The MaxMSP freezing patch

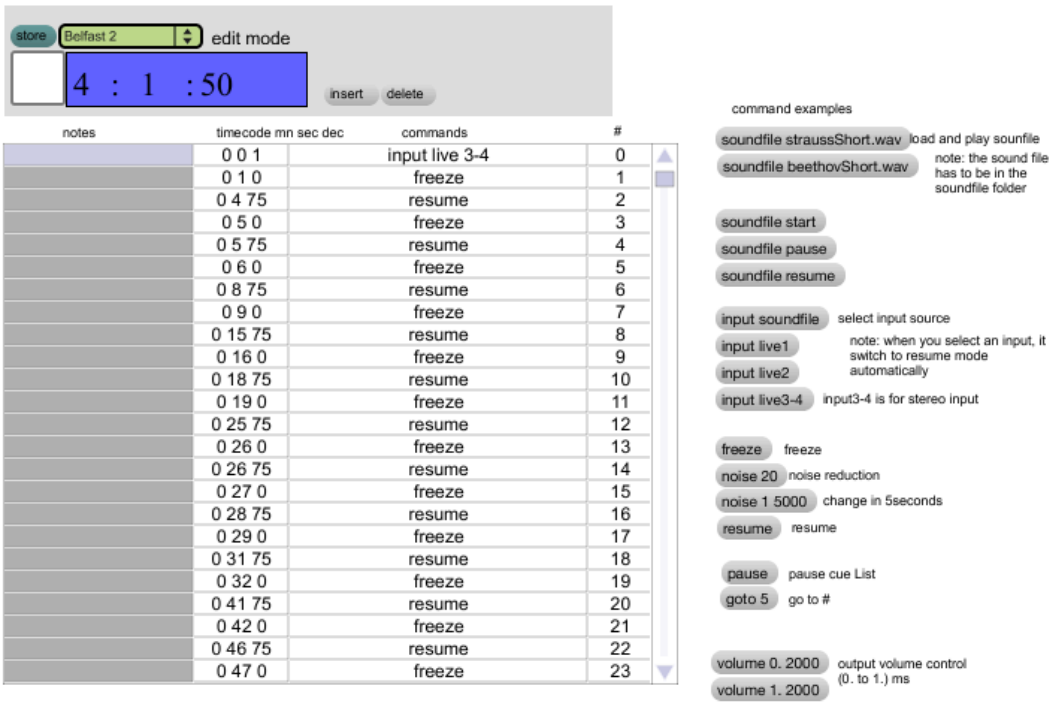


Fig. 2a.3 The cue list function

Fig. 2a.4 *Performance Space #1/Rue Darimon* at around midday using an alternative view of the outside scene

Fig. 2a.5 With viewer at 6pm

Fig. 2a.6 Detail of *Performance Space #1*

Fig. 2a.7 Detail of *Rue Darimon*

Fig. 2a.8 Cars on the ceiling

Fig. 2a.9 Clouds on the floor

Donegall Street

The place you can see and hear was programmed as part of the Sonorities Festival 2013 *Beyond Soundscape* in Belfast organized by Queen's University. The installation was hosted by the art gallery PS^2 located at 18 Donegall Street in central Belfast. It was open to the public during the afternoon, between the 24th and 28th of April 2013. The exhibition was preceded by a short preparation period of two days.

Visuals

The gallery at PS^2 is a small white room, approximately 3 metres by 5 metres in size. We covered the windows in vinyl, which was hard to put up and then in the end proved to be transparent. Black curtains were hung up to provide extra darkness. This was only a single camera obscura. The hole was 3cm in diameter and placed near to the middle of the window wall. I used a +0.5 dioptre lens due to the proximity of the screen to the window. The focal point was the façade on the other side of the street, about 15 metres away. The screen was 1.90 m away from the northeasterly facing window. We originally had a small canvas screen, but it did not take the image very well. A larger screen was constructed from a white material that was a good reflector of light. It was around 2.5 m by 2 m, and took up most of the height and width of the room.

The outer lateral limits of the façade were blurred. Cars were slightly blurred and passers-by on the gallery side of the street even more so. This blurring was due in most part to the large diameter of the aperture. The choice of the size of the aperture is always a compromise between small (better depth of field) and large (greater luminosity). There was also image on the walls and the floor of the gallery that was quite blurred but bright because the image contained so much sky. As a car passed from the wall to the main screen, its form became elongated and distorted.

Audio

The patch was modified so that the cue list contained 1500 lines, a 'go to' command for looping, and a compression module. There were problems looping the patch. Max would 'fall out' of the loop after a few rounds. There were occasional clicks or pops and when I first turned on the sound, a terrible amount of digital distortion could be heard. In fact all of these problems were solved, one by one, through the adjustment

of the buffer and vector size on Max, in the DSP settings. It seems that for this sound set-up, the optimal buffer (I/O vector) size is 1024 with a vector size of 8.

In the end, I used the same microphones as in Brussels: a small Tascam DR-7 as pre-amp together with mini-omnis protected by windjammers. The sound was not of a particularly good quality, but I wondered if it really needed to be given that most of the incoming sound is transformed into freezes. The microphones were left outside over night (sheltered by a ledge) and so I was happy that they were not expensive ones. There were no problems with wind-noise or feedback.

I originally made a suite of 5 movements, separated by long non-freezes or freezes with volume changes (usually fade-outs).

i) A 'random' movement consisting of freezes between 1 and 10 seconds, with a 0.25 second non-freeze.
ii) A decelerating wave similar to the one used in Brussels.
iii) A movement where the pattern of freezing was determined by the rhythm of the *Vienna Blood* waltz by Johann Strauss. The freezes were gradually denoised. The idea was to create the impression of music, without there being any actual music.
iv) An accelerating wave.
v) A 'random' movement containing silence. This consisted of segments of between 1 and 5 seconds that were freezes, non-freezes or silences.

The ambient sound of the street, especially at rush hours, was dominated by the sound of moving cars. In *Rue Darimon* there had only been the background noise of cars on more distant streets and the occasional passing car. In fact, car freezes are a little monotonous, noisy and limited to the usual register of a car engine (extended by the Doppler effect). The 'random' movement of the suite did not work as well as it had in other less car-dominated situations. It just ended up being a series of very similar noisy chords. Movement v did not work very well either. The cuts to silence were very abrupt and sounded like mistakes. I edited the score and only used movements ii, iii and iv.

Other Observations

Sunday was the best day of all due to the lack of cars. This patch responds well to a fairly diverse sound world. It is also interesting to consider the site-specificity of the sound: cars are ubiquitous and we cannot tell where we are only from the sound of traffic. Other sounds are very site-specific: people speaking in Belfast accents, seagulls and, for less than a minute on Sunday the 28th of April, the sound of the pipes and drums of an Orange Order parade passing 200 metres away. Because we were at street level rather than three floors up, there was an element of strange 'surveillance' about this particular version of the installation. We could see and hear people quite close up (although someone next to the window would be blurred).

There was much more activity in this version of the installation than the one at Q-o2 in Brussels. It enhanced the experience and made it continuously watchable (rather than only continuously listenable). The action, particularly that which was in sharp focus, looked very strange, almost hyper-real no doubt due to the frameless continuity of the image. We are not used to this level of temporal precision/resolution in a projected image, it is something akin to the 'soap-opera effect' (see Chapter 5). There was also a much stronger relationship between what you saw and heard. One could see a lot of the makers of the sound (though not all of them, such as distant cars or seagulls). It could even be predicted when the patch would catch something, and that something turn into a freeze. Because of this stronger relationship between seeing and hearing, the tension between the continuous and discrete was much more palpable.

Documenting the installation

When trying to document the piece, aspects of sampling (and indeed the idea of continuous and discrete) really come to the fore. The eight-second exposure needed to make a sufficiently bright photo, is generally too long to capture any moving subjects. The shots were empty of everything but the stationary, much like Daguerre's *Boulevard du Temple*. There were two photos of ghostly moving objects: a group of people who stayed still for seven seconds and then moved off, and a car that slowly un-parked itself. There was 'enough' of the group of people and the car in the overly-wide sample of the eight-second exposure, to register their presence.

Fig. 2a.10 PS^2 gallery window

Fig. 2a.11 The ‘real’ Donegall Street

Fig. 2a.12 Darkening the room

Fig. 2a.13 Behind the installation — the back projection

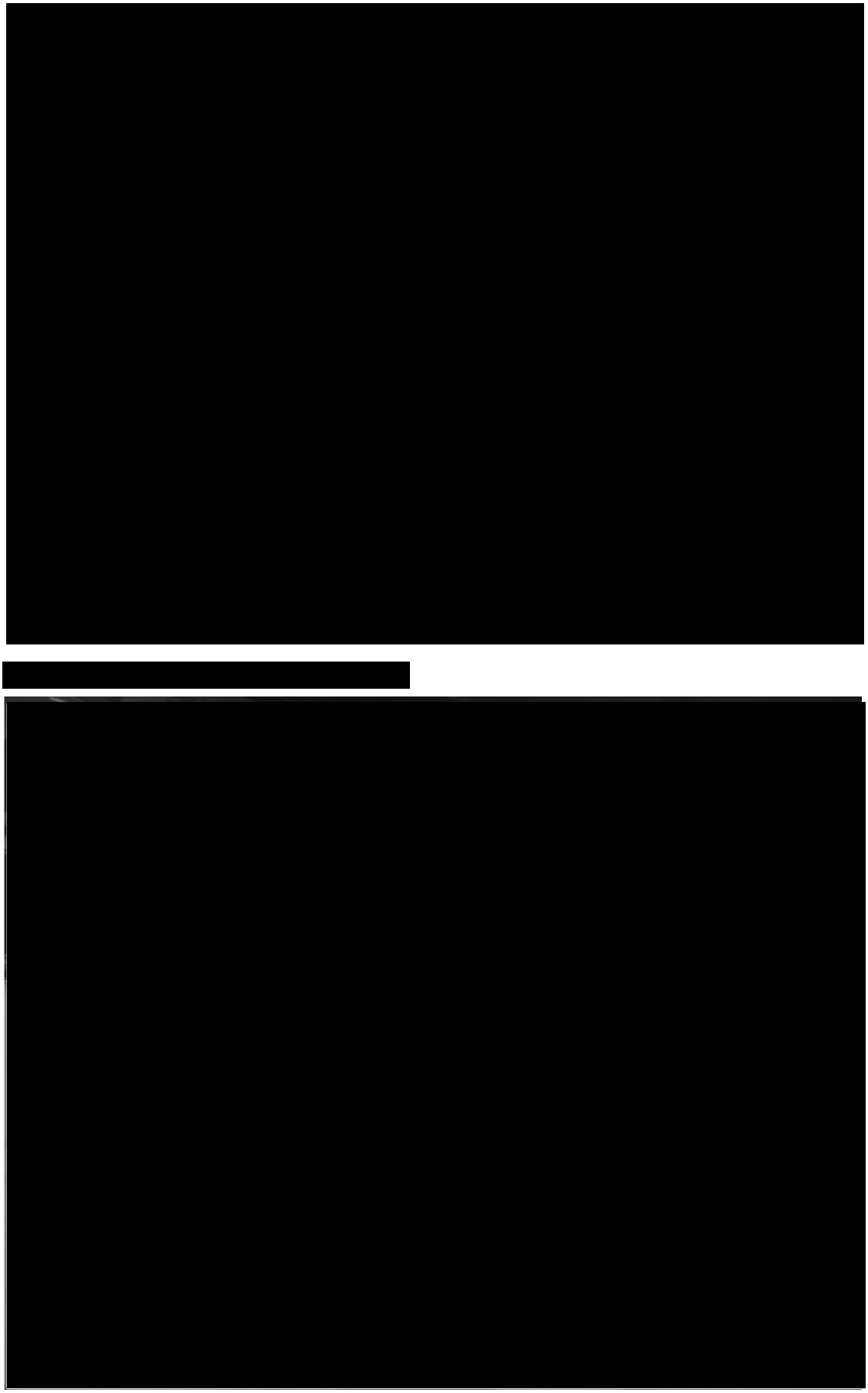


Fig. 2a.15 Right side of screen and wall projection

Fig. 2a.16 The façade of the estate agents

Fig. 2a.17 A car ‘un-parking’ over a period of eight seconds

Fig. 2a.18 A stationary group of people moves off

Fig. 2a.19 The gable on the floor

Northampton Square

The installation was hosted this time by City University as part of the City Summer Sounds Festival on the 11th and 12th of June 2013. On each day, the installation had to be set up in the morning and broken down in the evening. It was located inside the bandstand in Northampton Square and was open to the public between 12pm and 6pm. Because the bandstand is owned by Islington Council, getting the project approved involved some red-tape.

Visuals

By far the most time-consuming and difficult job was darkening the bandstand, which has openings of three by three metres on all eight sides. I had to do some research to find a material that was affordable, relatively smart and completely lightproof. In the end, I ordered white-black-white sheeting from a hydroponics gardening website and cut it into panels. I was helped enormously by a friend and the technical team from the music department, but even with their aid it took between two and three hours to completely darken the space. The weather was not very seasonable for mid-June: we had gusts of winds to contend with and extremely overcast conditions. Once the two screens were set up we had a choice of eight directions. I had not anticipated the weather, nor in fact the shadow that was added by the canopy of trees overhead. In the end, I chose to make the holes in the two south-facing walls because they had the most open view. In better weather this would not have worked because of the direct light coming from that direction, but the overcast conditions diffused the light, and effectively 'equalized' the usual hierarchy of directions (in which north is generally the best). Another unexpected aspect of this version of the installation was the combined effect of the wind and the flexible plastic sheeting 'walls'. The wind would blow the plastic sheeting wall (along with the hole and the lens) in and out, which in turn created the impression of a constant zooming in and out, and refocusing of the image. A visitor commented that, in combination with the fast passages of freezing and unfreezing, it was as if the whole installation was inhaling and exhaling. The two screens were angled at more or less 45 degrees to each other, like the octagon of the bandstand, and were placed just under two metres away from the holes. A lens of +0.5 dioptres was used on both openings.

Audio

I simplified the freezing score (back) to a decelerating and accelerating structure and used small fade-ins during the longer freezes. I used slightly different microphone set-ups on each day: the built-in stereo cardioid microphone pair on the Tascam DR-100 on the first day, and the mini-ominis I had used previously on the second. The first set-up had a better, clearer sound but the microphone itself, large and mounted on a tripod, was not very discrete and occasionally people would 'perform' into it. The sonic environment of the bandstand was quite pleasing — an interesting mixture of elements that changed noticeably throughout the day. During the lunch hour for instance, the benches around the bandstand were full of people having lunch and chatting (often in languages other than English). At other times, there would be the noise of power tools being used on a nearby building site, and every quarter hour of course, the 'Big Ben' chimes of the City University clock tower would sound. Mid-afternoon it became much quieter with only the sounds of distant cars and birdsong.

I made the decision to use headphones rather than speakers in this version of the installation in order to avoid feedback (I thought the thin walls would be problematic) and any potential difficulty with noise levels in a public space. I am not sure if my decision was ultimately the best one. The public had to sit down, cramped into a small corner with the screens and the headphones, and gone was the idea of an audio-visual space inside the bandstand itself. If I had possessed the resources I would have used speakers and eight screens (one for each side of the room) to make a sort of panorama around the room. One advantage of the headphones though, was that they created a slightly more intimate experience for the visitor in which the sound and visuals were slightly less decoupled.

Other Observations

In many ways, this version of the installation had the 'worst' camera obscura: the images were dark due to the overcast weather and dominated by the green of the leaves. Green, especially if it is dull, does not translate well into the camera obscura and often just remains a greyish tone. However, there is something to be said for a weaker image because the observer must make more effort, or rather take more time, to see it at maximum luminosity. As I mentioned in the main text of Chapter 3, the

eyes can take up to 40 minutes to adjust to dark lighting conditions, and if observers were willing to stay inside that long (and some were), they would be rewarded by the effect of the full fade-in of the image. Images in other versions of the installation produced an instant wow, but did not develop so much over time.

Again, the element of surveillance was present in the installation, especially with regards to the sound. Because people were sitting down and talking, whole conversations could be overheard. I felt guilty and embarrassed about what was essentially eavesdropping, and was glad whenever the freezing patch interfered to 'temporally pixelate' conversations and preserve the privacy of the speakers.

Documentation

A video was made by Bruno Mathez and David Kenny for City University.[1] It included an interview with me, a time-lapse sequence of the building of the installation and some footage taken inside the camera obscura. I had always thought it impossible to film due to the low lighting levels, but David Kenny used the infrared setting on his camera. This setting worked quite well, but of course was unable to capture the 'frameless' quality of the projection.

[1] It can be found on DVD 2.

Fig. 2a.20 *Northampton Square*, the first view

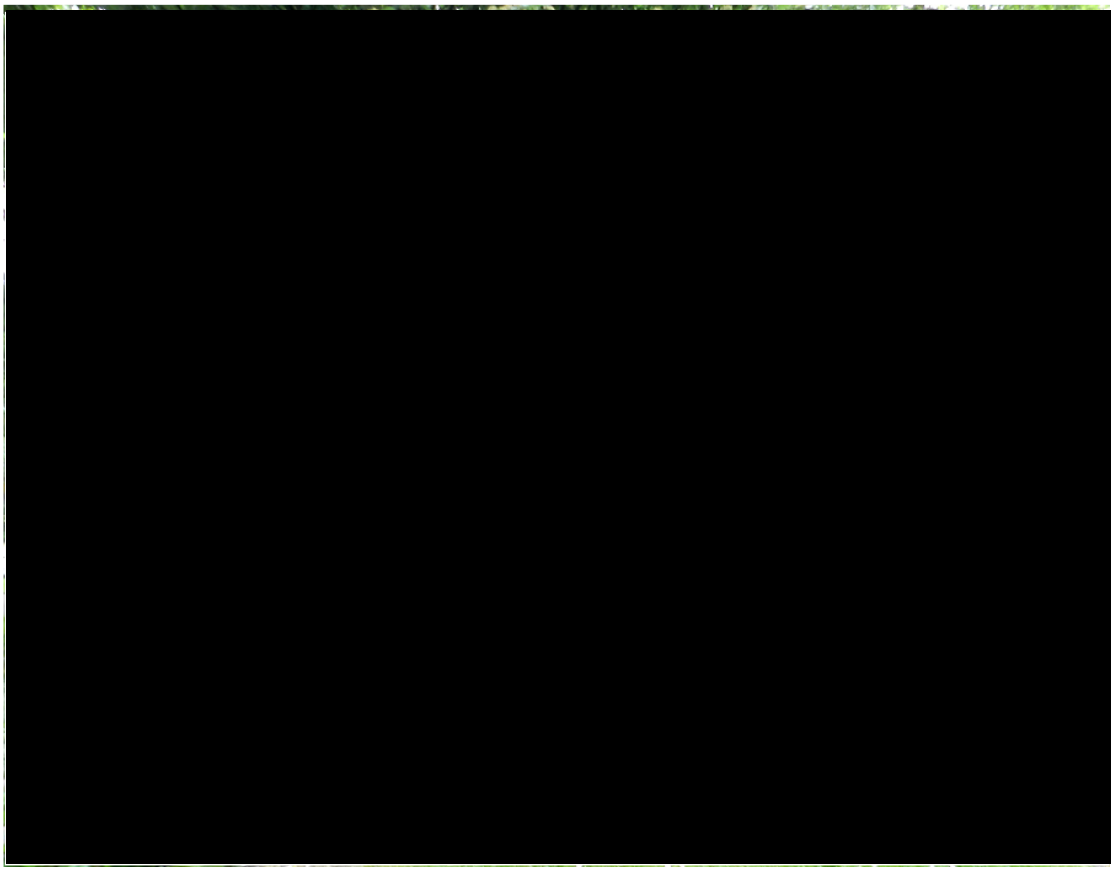


Fig. 2a.21 The second view

Fig. 2a.22 The bandstand covered in white-black-white plastic

Fig. 2a.23 Inside the bandstand, the first view

Fig. 2a.24 Inside the bandstand, second view

Fig. 2a.25 Both screens

Rue Royale/Rue Traversière

The place you can see and hear was curated as part of the Tuned City Festival, Brussels 2013. The installation was open for just one day on the 28th of June, at 173 Rue Royale in the Botanique district of Brussels. The area also provided the setting and theme for the first day of the festival entitled, "Relational Noise". *Rue Royale/Rue Traversière* was installed in a former newsagents situated in a block of buildings ear-marked for development, and run and let by an anti-squatting company working on behalf of a hotel chain. More recently the space had been used as a small alternative concert venue. It is a complicated, problematic area of the city, smart office buildings sit just on the other side of the ring road, while the Botanique neighbourhood itself is visibly poor. It is also the location of the largest squat in Brussels, home to hundreds of people, and the centre, so it is said, of a network of petty crime in the neighbourhood. However, I found the actions of the anti-squatting company itself rather questionable. They were charging money, generally to young artists, for what was essentially an extremely dirty and dangerous space, in an attempt to deter squatting and gentrify the area. I spent half of my setting-up day cleaning the space so that it would be presentable. The location also had a special personal meaning for me, situated an eight minute walk from my apartment, I had passed it many times on my way to and from the metro station.

Visuals

The space was relatively easy to darken, only a hole in the ceiling proved problematic. I was planning to set up the two screens at 90 degrees to each other to form a corner as I had done previously in *Performance Space #1/Rue Darimon*. However, the junction image from the north-facing window was so luminous that it completely over-powered the one of the Botanique building, and I had to separate the screens in such a way that they could not be viewed at the same time. Each screen was installed just under two metres from the window and the lenses used were +0.5 dioptres. The northwest view to the Rue Royale showed the top part of the Botanique building, the tram lines (which were the focal point) and a security camera. It was a very still image, the only movement came from the wind on the flag or the tram lines moving when a tram passed. The north view of the junction was in contrast extremely lively and the image vivid, with views of traffic to two roads and lots of pedestrians. There was no spill-over of image onto the walls because they were

painted black. The installation was open between midday and 8pm and the weather was overcast throughout. However, the images remained visible right up until closing time and in the view of the junction, extra light was provided by car headlights later in the evening.

Audio

For this version of the installation I used two Røde lavalier omni-directional microphones connected to a Tascam DR-100. The microphones were placed as far left and right as could be managed given the limited amount of audio cabling I had access to. The superior quality of the microphones was evident in the clarity of the sound, but leaving them outside in bad weather and in an unsafe neighbourhood was a source of worry during the day. Again, I avoided using a mixer and had no problems with feedback (in fact I could turn up the volume as far as I liked). As in the *Northampton Square* installation, I used the simpler pattern of decelerating and accelerating sequences of freezes and unfreezes, with small fade-ins during the longer freezes. The sound was of course dominated by cars, the conversation of passers-by, of friends hanging out next to the door, trams, tram bells and police sirens. It was a mixture of the site-specific and the characterless.

Other Observations

Because of the context of the installation as part of a popular sound art festival, I had a lot of visitors especially between 5pm and 7pm. At some moments, there were ten people inside at once, including small children. As wonderful as it is to have so many lively visitors, I felt that the space was at times over-crowded and full of distraction. It is a work that I believe needs concentration and time to fully 'get into'. In retrospect, I should have limited the number of people allowed in the installation at any one time. A macabre footnote: the neighbourhood as I have said, is troubled and the sound of sirens commonplace. What we did not realise was that while the installation was on, a murder was committed in a neighbouring street just slightly out of view of the north-facing junction image. The surveillance camera/bugging aspect of the installation almost encountered a very real world of crime.

Fig. 2a.26 Exterior view of the former newsagents

Fig. 2a.27 The Botanique building on Rue Royale

Fig. 2a.28 The junction between Rue Royale and Rue Traversière

Fig. 2a.29 The interior of the former newsagents

Fig. 2a.30 View of the Botanique building in the installation

Fig. 2a.31 View of the junction from the installation

Fig. 2a.32 Ghostly cars

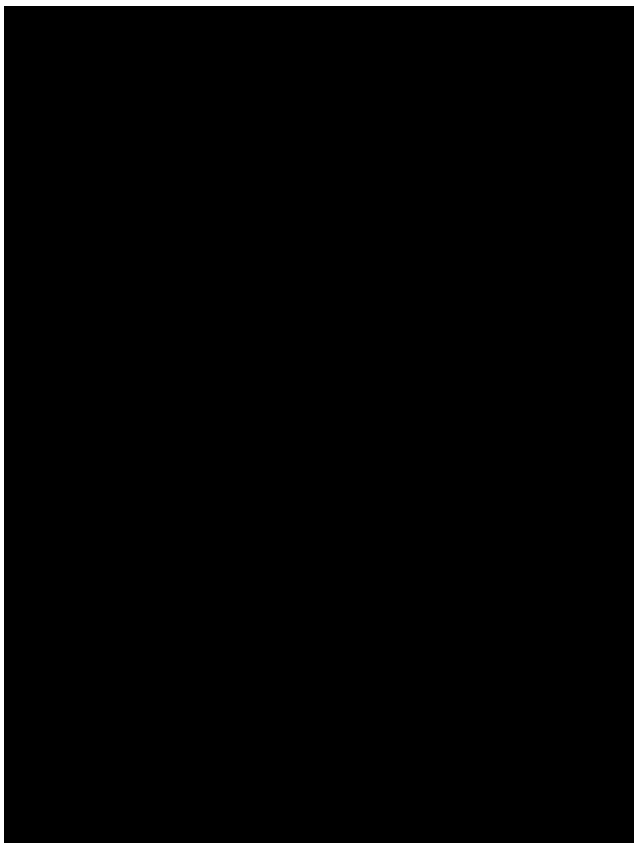


Fig. 2a.33 A visitor in the installation

River Medway/ Sun Pier

This version of the installation was shown between June 20th and June 22nd 2014 at the Töne Festival in Kent, curated by Claudia Molitor and Julie Louise Bacon. It was a single camera obscura on two screens angled away from the hole so that the image went from focused to blurry. The 'dark space' itself had to be built from scratch using temporary walls, since the exhibition space was entirely open-plan and also contained the work of another artist. The installation was open between 1pm and 5pm on each day of the festival and the weather was extremely sunny.

Visuals

I think of all the versions of the installation, *River Medway/ Sun Pier* was the most visually spectacular due to the combination of bright weather conditions and an impressive view. Using a long landscape-shaped screen configuration worked very well given the dimensions of the scene that was visible. In addition, I put a very light amber filter over the hole, to counteract the dominant blueness of the image and reference nineteenth-century landscape painting, where the tonal range of the work was invariably warmed-up by the artist's use of a Claude glass. I chose to angle the screens away from the hole, in order to open up the space (otherwise there is only a very narrow passage between hole and screen) and to provide more interest in what was only a single-hole camera obscura. The set-up produced a scene that became gradually stretched-out and blurry towards the left — this visual distortion was particularly noticeable with moving objects, in particular boats travelling down the river. In fact, there was plenty of action to be seen in the camera obscura — as well as the boats, there were seagulls, swans, people on the pier, rippling water, and for those who stayed a long time, the tide moving in and out. An additional aspect of the view was that it in fact contained another artwork, a neon-light sculpture entitled *Magnetic Eclipse* by the Australian artist James Geurts.

Audio

As always it seems, the installation's visual and audio elements balanced themselves out — in fact the sound was considerably less arresting than the image. The location of the room a few storeys up and next to an estuary, caused a lot of wind sound, never strong enough to distort the signal, but creating an uninteresting and undifferentiated noisy backdrop. There were a few sounds of seagulls squawking,

people talking and cars and trucks on a nearby street, but not quite enough to prevent the score of the freezing patch being completely foregrounded — a kind of form with a minimum of content.

Voorhof van de Landcommanderij Alden Biesen

The most recent version of the installation was programmed at the Albanova festival on the 29th of June 2014 at the Alden Biesen castle in East Flanders. The festival aimed to combine early music with newer music, and it was the hope of the festival's artistic director, Paul Craenen, that the installation might highlight this idea, through its utilization of both old and new technologies. The installation was open to the public for the duration of the one-day festival between 10am and 6pm. The weather was mostly very grey that day and it rained a great deal.

Visuals

After having benefited from the weather the previous weekend in Kent, the installation was very much at the mercy of it in East Flanders. A rainy day with

Fig. 2a.34 Low tide at the Medway Estuary

Fig. 2a.35 A close-up of Sun Pier

Fig. 2a.36 High tide

Fig. 2a.37 The full length of the installation from focused (right) to slightly blurry (left)

(very) few bright spells, and the dullish brown of the castle itself, combined to produce a camera obscura that was often on the verge of not working at all. For a viewer who only paid a short visit during the darkest outside conditions, the scene appeared to be only the silhouette of the castle against a leaden sky. For me at least, being confronted with the threshold of vision and the visual functionality of the camera obscura was quite interesting. On one hand, there seemed to be a level of storm-weather darkness beyond which the castle could not be seen, and on the other a little patience on the part of the viewer might allow him or her to experience a slow visual fade-in. I persuaded an intrepid visitor to stay 20 minutes while conditions were bad, and by the end of this period, she told me that she could see everything. Following on from its success in *River Medway/ Sun Pier*, I again chose to angle a landscape-shaped screen away from the hole in order to provide a more inviting viewing space and a bit more visual interest.

Audio

In contrast to *River Medway/ Sun Pier*, this version of the installation was witness to

an ever-changing soundscape. On the day that I set up the installation, it was rain and birdsong, and during the festival itself there was again rain and birdsong, but interspersed with the different kinds of live music being played on the castle forecourt, and the conversation of both people walking past and those queuing to enter the space. This last element, that of people chatting outside the installation, was perhaps the least interesting, and certainly eavesdropping on these unwitting sound sources was an uncomfortable experience.

Other Observations

Following on from the previous comment, again (as in *Rue Royale/Rue Traversière*) I found that the presence of large numbers of visitors at the same time detracted from the installation experience. Because the public had very little idea of how the piece worked, they thought that it might be a good thing to visit it when they wanted shelter from the rain. The viewing space could only allow for a maximum of four people, producing a line of slightly impatient (and dare I say elderly) people waiting to enter and dominating the microphone input by talking to each other in order to pass the time. Conversely, on the rare occasions when the sun came out, and there was live music to be heard stuttering through the freezing patch, virtually no one ventured inside the installation. The following month I was to rediscover the problem of audience management in small dark installations, but on this occasion from the vantage point of a member of the public. I went to visit one of my favourite installations, Bill Viola's *Tiny Deaths* at the Tate Modern in London. *Tiny Deaths* is shown on three screens in an extremely dark space, and (in my opinion) requires an atmosphere of quiet and calm to be properly appreciated. The first time I saw it, twenty years previously, I had been one of only three people in the room and no one said anything. This time around I was dismayed to be in a non-invigilated space full of noisy teenagers using their phones and thus providing a great deal of excess light. Of course, I was a bit unlucky on this occasion, but it made me think about how much the experience of an audio-visual installation can be influenced, improved and unfortunately ruined by the interaction with its audience.

Fig. 2a.38 The set-up (screen and speakers) from the back

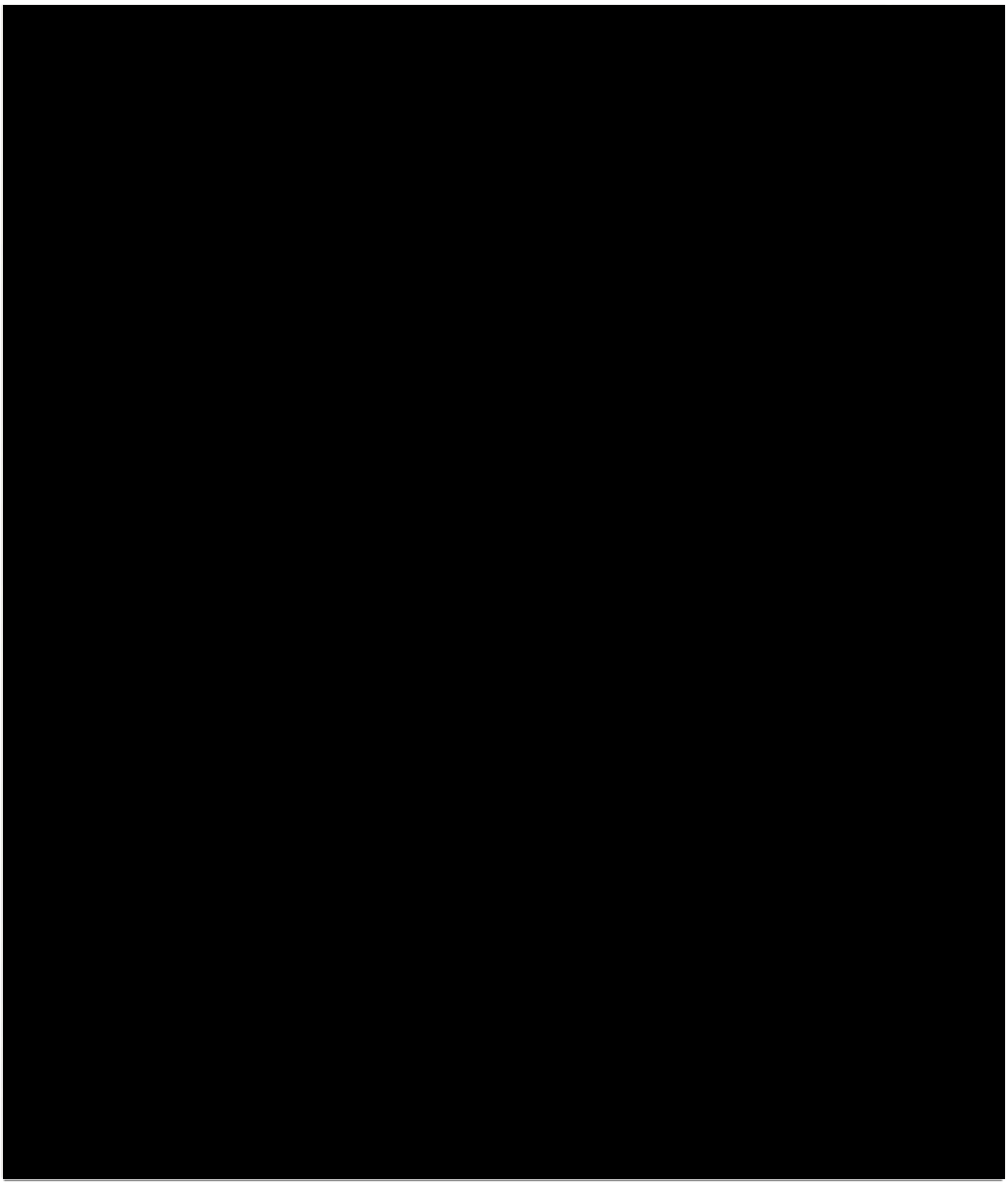
Fig. 2a.39 The full view at a slightly brighter moment

Fig. 2a.40 A close-up

Fig. 2a.41 A close-up showing the change in focus and stretching of the image to the right

Fig. 2a.42 Camera obscura on the screen and the window frame

Appendix 3



The score of Steve Reich's 1967 conceptual work, *Slow Motion Sound*

Appendix 4

Score: 9 Beet Stretch, op. 5

A recording of Ludwig van Beethoven's 9th symphony is to be stretched to 24 hours, with no pitch distortion.

For installation or performance, use either supplied material or augment any full length digital recording of Beethoven's 9th symphony. As the length of the source recordings varies, so will the ratio of the augmentation vary to reach the full 24 hours length. With a partial performance, the performed part must be augmented with the same ratio as would the whole recording.

There is a version for 9 Beet Stretch for each recording available of Beethovens 9th symphony.

If there for any reason is hard to obtain a copy of Beethoven's 9th symphony, please use Wolfgang Amadeus Mozart's Requiem.

The score/instructions for Leif Inge's 9 Beet Stretch. Found at http://www.expandedfield.net/

Appendix 5

Trains (2013-14)

Trains is a 10-minute work for solo cello and tape commissioned by the Italian cellist Francesco Dillon and premiered by him in Florence, Italy on the 4th of October 2014 at a music@villaromana event. The piece is in many ways an extension of the *Artificial Environment* series for instruments and tape, but differs from those works in terms of its use of a stopwatch video and time cues (rather than a click-track) to synchronize the cello and electronic part, the high-sampling rate recordings employed to capture the train sounds, and a move away from instrumental 'doubling' of the field recording in favour of an idea of 'implied melody'.

Recordings

The train recordings were made on two separate field-recording trips in Brussels — the first to Bruxelles-Chapelle during the evening rush hour in early December 2013, and the other in the afternoon at Gare de Schaerbeek in January 2014. The choice of these stations was important; they both lie on the main railway route that bisects the city, but relatively few trains stop there. This meant that there was a range of sounds available for capture, passing trains, stationary trains, stopping trains and a few station announcements. An earlier trip to the much busier commuter station of Gare du Nord had proved frustrating due to the constant stream of announcements that dominated the recordings. In addition to the sounds listed above, there were also building works going on at Gare de Schaerbeek which can be heard in one of the sections.

The recordings were made on two Røde lavalier microphones plugged into a Tascam DR-100 using a sampling rate of 96 kHz and 24-bit resolution. These were the highest quality recordings I could make on my own equipment.

Processing

I selected seven different recordings of train events that I felt together provided a range of dynamics, timbres and audible activities beyond the sounds of the trains themselves. I then decided on a scale of rising transpositions, which would provide a

sort of underlying form for the piece. I am not sure if the scale itself is really perceivable, but the fact that the field recordings are lower and slower than in real life, often adds an eeriness (as with the police sirens in Train 2), or just the impression that something is slightly 'off', for instance in the station announcement in Train 6 where the female voice sounds a little too low. I used Audiosculpt to transpose the train recordings and did so with the time correction setting turned off. The transpositions of the seven trains are as follows: minus 11, 9, 8, 6, 4, and 2 semitones, with the final train being played back at its original pitch. In addition to the formal considerations stated above, the transpositions were designed to bring some of the ultrasonic frequencies that had been recorded into the range of audibility, as well as to provide the piece with more variety of pitch — the sound of train engines and horns in Belgium is perhaps a little too homogenous for my purposes, and over ten minutes the reiteration of certain pitches might have become repetitive.

Once transposed, I analyzed all the seven recordings for pitch content by using the sonogram function in Audiosculpt. The most important elements to notate were the contours of the numerous Doppler effect glissandi of approaching and leaving trains, of the two police sirens in Train 2 (which are a combination of real glissandi and Doppler effect), train horns and the drones of stationary trains. I created sine tone drones and glissandi that corresponded to, and even extended the pitches of the field recordings, and mixed them in. The idea of the extensions was to expand the realm of the recording beyond what was actually captured (or at least audible on the recording), as was the addition of some subtle 'harmonizations' of the pitches, achieved through ring modulating the sine-tones (an effect that I had used before in some of my previous pieces: *Harmonizing (Artificial Environments No.7)* and *Artificial Environments Nos.9a-d)*. I had to do some more analysis, this time of the ring-modulated sounds, the pitch content of which would be added to the pool of available notes for the cello part. The use of both the added sine-tones and ring-modulation varies throughout the piece quite considerably. The electronic part of Train 2 for instance, consists of only the field recording, while in Train 3, the sine tone and ring-modulated extensions to the drone of a stationary train are the main focus.

A technique I developed especially for the piece, and which I also use in my film *The Grand Tour,* is a kind of 'hand-made' granulation of the field recording, achieved by simply cutting out tiny-pieces of material from the audio recording in various decelerating patterns. I came up with the idea as a kind of sound-processing response to the stuttering rail noises found in the Train 1 recording. Finally, in terms of processing, there is a small amount of freezing used in Train 7. I was not planning on using the technique at all, but I felt that it made sense in the context, allowing me to create scales of discrete steps out of the train glissandi that echoed the overall formal design of a rising scale of transpositions.

The instrumental part

After having come to an impasse in terms of writing for instruments within this kind of context in *Artificial Environments Nos.9a-d,* I decided that I would try a different approach in *Trains*. The most important aspect of this approach can be seen in the use of a video stopwatch (rather than click-track) to synchronize live instrumental and electronic parts. The piece uses both barred music (with a tempo marking), and unbarred music consisting of either single gestures, sustained tones or glissandi. Time-codes for the beginnings and endings of notes and phrases are given, but whatever happens in between this in terms of cello-tape synchronization is the result of small performance-generated fluctuations in tempo. A good example of this elasticity between instrument and electronics can be found in Train 2, where the cello plays a melody formed by the top and bottom points of two police siren glissandi. The melody has been shaped a little to taste, is barred and has a tempo. Pitch synchronizations between the tape and cello cannot be exactly predicted and vary according to the details of any one performance. Another way of relating the cello and tape part occurs halfway through Train 1, where the recording disintegrates into a series of waves of granulation. Each cello gesture is synchronized with the head of a wave, and the use of string techniques varied to echo some aspect of the sound — either the pitch, noise (heavy bow pressure), or stuttering effect (tremolo and jeté). Perhaps the most unusual passage in the piece involves the use of cello music not written by me at all. In Train 5, part of the gigue from J.S. Bach's Cello Suite No.5 in C minor is paired with the field recording. The two things are stuck together by the held notes and glissandi (roughly corresponding to those on the tape) that are inserted into the Bach. I wanted to develop the idea apparent in the ring-modulation,

as well as the sine-tone extensions and the downward transpositions of ultrasound, that the piece was about creating a heightened-reality from the train recordings where we would have access to things that we might not normally be able to hear, but that were a logical development of the sonic universe. The Bach fragment stretches the point quite far, but I think there is something in the rhythms of the gigue, written in an age before trains, that reminds me of the sound of a train — not necessarily the ones on the tape, but of that archetypal locomotive chugging noise.

Performance and recording

Though the performance in Florence went well, I would have valued the opportunity to sit at the mixing-desk and ride the fader on the electronic part (the cello was un-amplified). Unfortunately, the sound engineer did not permit this, and because the level of the electronics had been set a little low, the cello often dominated the piece where it should have been an equal component. Formally speaking, the work still seems a little episodic to me, some of that was intentional, and certainly a result of the relatively long periods of silence in the cello part. Though I feel a little uncomfortable with it (perhaps due in part to certain prevailing formal preferences in contemporary music), I would like to explore this approach a little further in the future.

The recording in the portfolio was recorded by Francesco Dillon and the sound engineer Marzio Benelli in Florence on the 29th of April 2015. Marzio sent me the various takes and I selected the recorded material and mixed it with the tape. It is an idealized version of the piece, certainly in terms of balance, and I made a lot of use of parallel compression in the cello part to bring out as much quiet detail as I could while keeping the instrument sounding fairly natural.

Appendix 6

The Grand Tour (2013-15)

Format

The *Grand Tour* is a digital video using a PAL 720 x 576 aspect ratio, 25 frames per second and a 48 kHz stereo audio track. Although the scanned photographs all have the same 3000 x 2250 size, I was obliged to use a much lower, standard definition format for the resulting film because Final Cut could not cope with the data rate needed to 'flicker' such large images. High definition formats exist only in 16:9, which would either have meant stretching the photographs, or leaving black bars down each side, neither of which I wanted. I chose a rate of 25 frames per second, simply to facilitate going between the film time of Final Cut (seconds and frames) and the audio time (seconds, milliseconds) of Cubase — 1 is neatly divided by 25 into 40 millisecond units.

Source Materials

The images in the film come from three different sources. Firstly, 58 old photographs owned by my father, and found in a box after his death. Some of the photographs were taken by him, while he features as a photographic subject in others. In fact, I had very little information concerning the provenance of the photos, except for the landmarks that featured in them. Discovering the various locations of the images involved internet research, and in some cases the help of German and Austrian friends. In particular, the photos taken in East Berlin of Stalin's statue and the sports hall were hard to identify, since (as I mention in the film) their subject matter was erected and dismantled again within a couple of decades. Two of the images were taken by the photographer at the summer courses of the "Internationale Hochschulkurse Universität Wien" and were stamped in the corner, giving me a clue to the nature of my father's travels.

I scanned the photographs and made a standard format for them of black and white (some photos were sepia tinted and needed to be changed) and 3000 x 2250 pixels. I thought the standardization would prove particularly useful for the flickering sequence — but even then, some of the images end up 'standing out' due to greater

contrast and sharper focus. The other main source of images, are two short sequences from the 1953 MGM Tom and Jerry cartoon *Johann Mouse*. I downloaded the cartoon from youtube and converted it into the required format. In addition, I downloaded two images from the internet, one of a mediaeval angel, and the other of a German soldier. As with the Jerry waltzing sequence at the end of the film, I had to cut the images out from their original background and superimpose them onto my father's photographs.

The audio sources are more varied. Firstly, there are the dry studio recordings I made at City University for my voice-over and the imaginary conversations in Vienna between my father and the mysterious woman (read by Laurence Crane and Karin Weissenbrunner), then examples from my own library of field recordings, excerpts of music from CDs and lastly background sound from film clips I found on the internet. The matching of field recordings to photographs was largely a question of what I thought I could 'get away with', for instance I imagined that the sound of the John Lewis Café in 2013 could 'pass' for the canteen of a Viennese language school in 1962 due to the absence of mobile telephone rings and contemporary pop music. Another example involves the photos from my father's workplace — I did not have a recording of an office from 1960 (nor would I be able to make one), so instead I took some audio from the film *All the president's men*, which in the newsroom scenes contains the sound of people talking and typewriters. The text for the voice-over narration and the Vienna conversations I wrote myself and can be found at the bottom of this appendix.

Tools

I used three different programs to make the film: Final Cut for the sequencing of images and putting these images together with the audio files, Cubase to do most of the editing and mixing of sound before exporting it to Final Cut, and GIMP (a free open-source equivalent of Photoshop) to prepare and alter the photographs. In fact, I chose to do as little work as possible in Final Cut, since I found it awkward to use, especially when going between different temporal magnifications and editing sound (though the program has all the facilities one needs to do so). I also relied on GIMP a great deal, and in fact the close-up sequences were created by making a series of cropped photographs. In this way, I managed to create a lot of unnecessary and large

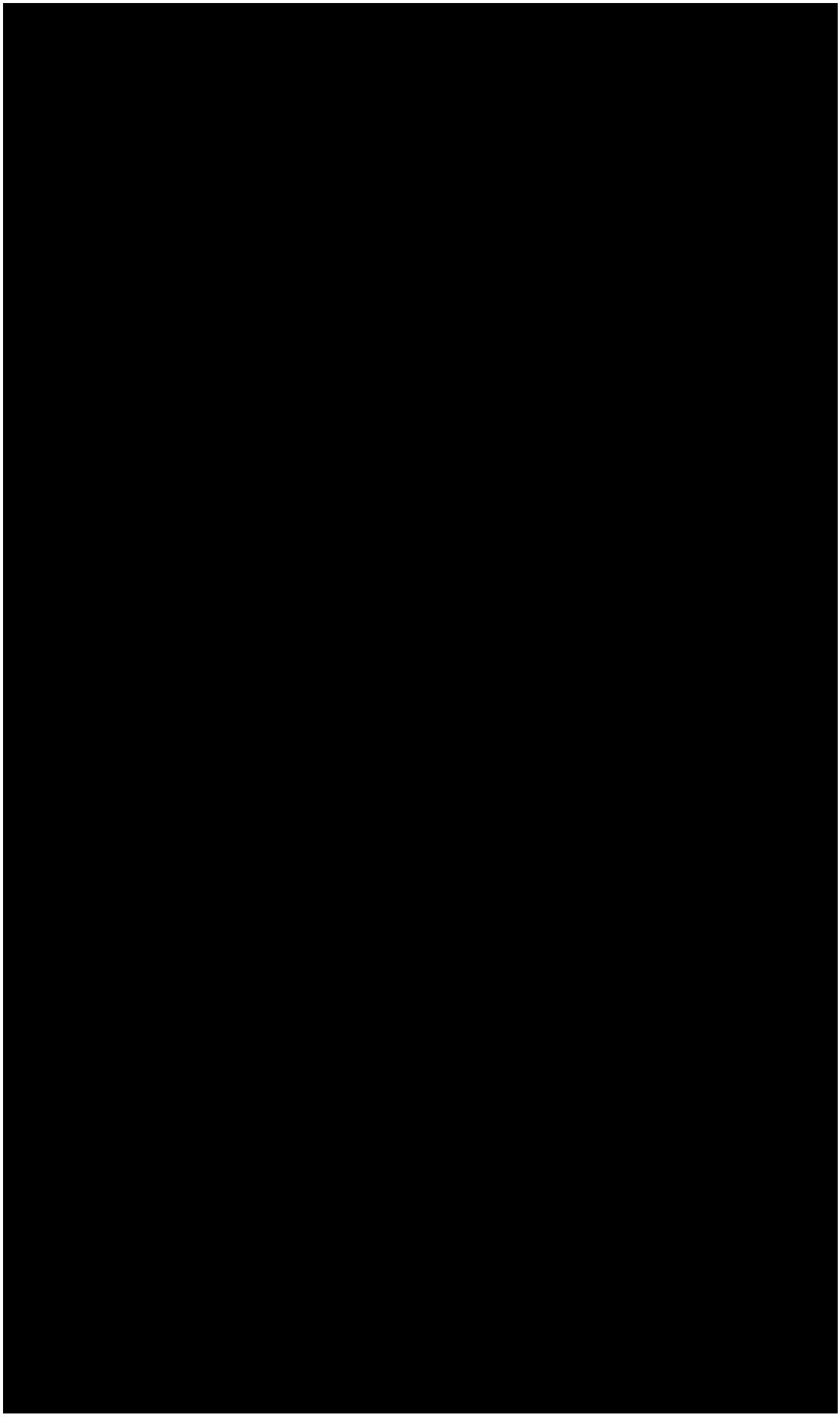
files, but again, I found this method a little easier to deal with than using key-frames in Final Cut. Furthermore, my insistence on using discrete photographic units even for these close-up sequences was more in keeping with the theme of the film.

Techniques

Please see a full explanation of techniques used in the film at the end of Chapter 3.

Structure

The film is divided into two halves: a kind of expository prologue followed by a more narrative section. The halves reflect each other to a certain extent in the sequence of elements within them: flickering, close-ups, compositing and deconstructed Tom and Jerry. One formal feature of the work is that some of the techniques that are used in the first part in a slightly more abstract context, are reinvented somewhat when repeated in the second by being connected directly to the narrative. For instance, photographs are pulled out of the flickering Berlin sequence when they coincide with the story, and the close-ups and pannings at the Vienna dining scene are a direct illustration of the text with which they are synchronized. The prologue text presents general ideas about the impossibility of capturing 'everything that ever happens' and the flaws inherent in all recording devices, including the closing shutter of the movie camera (which is a central conceit of the film, as well as of my doctorate as a whole). The second half serves as a kind of case study, and attempts to reconstruct my father's adventures during his summer holiday language-learning trips, using a box of photographs as the only source of information. The story is never completed, only Berlin and Vienna (and not Barcelona and Tuscany) are ever elaborated upon, and the film ends with the attempted reconstruction of the Viennese scenes (with accompanying dialogue).



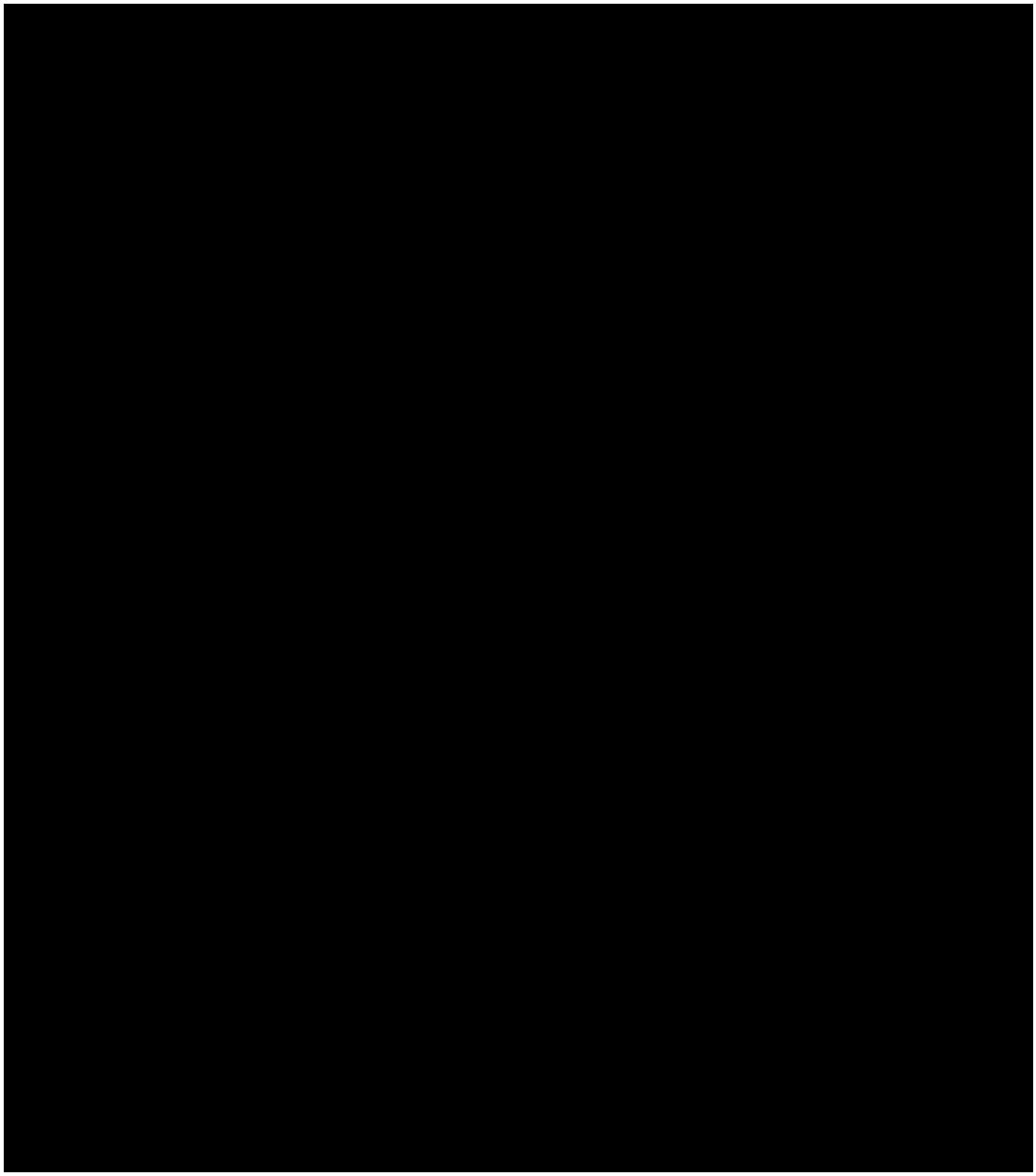


Fig. 6a.1 The 58 photographs in order of appearance.

Fig. 6a.2 Examples of compositing in *The Grand Tour*.

Filmscript

(prologue)

Nothing that happens can ever be captured resplendent in full spatial and temporal resolution, in its entirety, by either devices for recording sound and image, or by our minds. Even if we could make such documents, they would always be bounded by the physical limits of what can be seen and heard from any one location at any particular time.

I've tried to picture the ultimate recording machine, comprised[1] *of billions of devices controlling overlapping fields of operation extending in all directions. If these devices were recording continuously without recourse to the discrete units of the film frame or digital sound sampling, then and only then could we imagine an absolute seamless record of everything that ever happens.*

However, as I think I've already implied, things simply do not work like this.

Take a regular movie camera registering images at the rate of 24 frames per second. Between frames, for what amounts to half of a second, every second, the shutter is closed. One could imagine something unexpected happening in one of the split-seconds when the aperture is shut. Like a very brief apparition of some kind, of a ghost, a UFO, an angel even. But this would be lost to us.

[1] Unfortuantely the word 'comprised' is incorrectly used in this film text. It should be 'consisting'.

Stringing one separate thing after the other, as quickly as we can until we reach a semblance of continuity, is all we can do in the end. A kind of faking by necessity and one which only works if the separate things are only a little different from one another. Too much difference, too large a gap between the adjacent things and we just end up with flickering confusion.

(background)

During the first years of the 1960s, my father, a shy man in his early 30s then employed as a copywriter for Encyclopedia Britannica, decided to realize his own version of the grand tour, broken down into fragments and stretched over several annual summer holidays.

He was a graduate in Modern languages and member of the linguists club. The club gave him the occasion to indulge in his love for learning languages and it seems that every summer he enrolled in a different residential language course, twice to learn German, once for Italian and another for Spanish. These courses, a combination of language-learning, site-seeing and compulsory get-togethers, must have been an ideal social outlet for my introverted father.

This is an attempt at a reconstruction of sorts. I could tell you all the things I am not sure about, but I shan't, just know that story is full of gaps, in fact it is barely a story at all.

(Berlin)

What I can tell you though, is that he visited Berlin in the summer of 1960 with a German friend of his. My father met the family of this friend, perhaps the extended family, somewhere in the countryside, and then on another occasion, just the parents on a trip to what looks very much like Berlin zoo. And then comes the bit of the story that I know the most about because it was one of my father's favourite anecdotes. He and his friend went by U-Bahn into East Berlin and surfaced at Frankfurter Tor station on what is now the Karl Marx Allee, but what was for just a short while the Stalin Allee. The photos are full of things that had only a short span of existence — the statue of Stalin himself, and the sports hall outside which my father is posing, were put up and pulled down again within a decade or so. Anyway, as one can see,

my father and his friend were quite happily taking photos of all that they saw, until, according to my father, they were shouted at by an East German soldier for doing so, accused of spying and threatened with a gun. My father, never admittedly a man drawn to danger, claimed that this was the most terrifying experience of his life. Of course, there is no photo of that moment, only of the ones just before, and try as I might, I can't seem to discern any hint of immanent peril in them.

(Vienna)

The following year (or perhaps the year after) my father took a trip to Vienna. He never mentioned that he'd been there, or at least I don't remember him doing so, and the temptation of course is to analyze each of the photos in this slightly intriguing series of images, looking to piece together a story from fragments of evidence and a great deal of supposition.

For instance, one might wonder exactly what was happening at the moment this photograph was taken. What was my father thinking and why is he the only person at the table smiling for the camera? What is he eating? The black and white doesn't help and a close-up reveals very little: a slice of buttered bread on the plate and the last part of some potatoes. We can go further, and further until we enter the very limits of digital resolution, but nothing helps. Has he made friends with the woman sitting next to him? She also turns up in another photograph from the International language school wearing a knowing smile. Or perhaps it's not knowing at all, she's just one of those people who manages to project an inaccurate impression of how they're feeling at any particular time.

(Vienna Conversations)

Her: *You don't need to look so serious John! It's just another photograph.*

Him: *so what kind of music do you like then?*
Her: (laughing) *oh I don't know, a bit of everything really. Something nice to dance to.*

Him: *it says here: (reading a tourist guide) The institution has its origin in the imperial library of the Middle Ages. During the Medieval period, the Austrian Duke*

Albert III (1349–1395) shifted the books of the Viennese vaults into a library. Albert also organized important works from Latin to be translated into German. In the Hofburg, the treasure of Archduke Albert III had been kept in sacristies inside the south tower of the imperial chapel. The Archduke was a connoisseur of art; he supported the University of Vienna, and he founded a royal workshop for illustrating manuscripts. The oldest book on record at the library, the 1368 golden Holy Gospels, was owned by Albert III…

Her: *Now just walk across, full of purpose, play the "English tourist" for me.*

Him: *and maybe one of the gardens too.*

Appendix 7

Appendix 8

To be beside the seaside (2014-2015)

This is a work for symphony orchestra, a BBC commission for the Tectonics Festival 2015 in Glasgow, and performed on May 2nd by the BBC Scottish Symphony Orchestra conducted by Ilan Volkov. It is the only work in my PhD portfolio without electronics, and in fact my first entirely acoustic work since 2006. The piece is 16 minutes long[1] and divided into three movements entitled *To be beside the seaside*, *Slow sliding reveal* and *Double flicker waltz*. The work is more or less scored for the full forces of the BBC Scottish Symphony Orchestra as follows:

- 3 Flutes (no.2 doubling Piccolo)
- 2 Oboes (no.2 doubling Cor anglais)
- 3 Clarinets in Bb (no.2 doubling Eb Clarinet and no.3 doubling Bass clarinet)
- 3 Bassoons
- 4 Horns in F
- 2 Trumpets in Bb
- 2 Tenor trombones
- 1 Bass trombone
- 1 Tuba
- 1 Timpani player
- 3 Percussionists
  Percussion 1:
  - a set of crotales - 1 medium suspended cymbal - 1 snare drum
  Percussion 2:
  - a set of crotales - 1 medium suspended cymbal - 1 triangle - 1 bass drum Percussion 3
  - 1 triangle - 1 medium suspended cymbal
- 14 1st Violins
- 12 2nd Violins
- 10 Violas
- 8 Violoncellos
- 6 Contrabasses

The piece evolved a great deal from the original idea that I had of depicting nature (or even 'real life') in music. I had started with the plan of a reworking of Debussy's *La Mer*, followed by orchestrations of field recordings of the sea, and even went as

[1] In fact, the BBC recording from Glasgow lasts 19 and a half minutes due to the first movement being taken at a speed considerably slower than the crotchet = 72 indicated in the score. My theory (I would never have dared ask) as to why Volkov took this movement so slowly, is that it had not been played through in its entirety at rehearsal and musicians getting lost at a higher tempo was a potential risk given the unfamiliarity of the material.

far as to make a daytrip to Brighton to gather material. In the end, however, I became increasingly drawn to the process of taking apart and putting back together orchestral works by means of a visualization of the musical space that they occupy, 'pixilating'[2] or cutting the works into horizontal bands. The movements are unified by this particular idea, though the rhythmic structures, and indeed the resulting music are very different from one another. All the movements involved making an electronic model of the movement, and then re-transcribing this model for the orchestra.
The main description of the compositional processes involved in making this piece can be found in section 4.12.

Rehearsal, performance and reception

To be beside the seaside was rehearsed on four occasions in the days (and hours) preceding the concert. The rehearsal time totaled about two and a half hours and the piece could certainly have benefited from more. Ilan Volkov said that the second movement was particularly difficult and that executing the written decelerandos of the third would not be possible without more rehearsal. The orchestra and conductor worked efficiently, sometimes a little too much so — the first movement which was considered relatively easy, was not played in its entirety till the concert and I would have welcomed the opportunity to work more on the balance of the chords. On the whole, the work proved fairly playable, with the small exception of the bowed crotales of the first movement, which often did not sound, or were not quite under the control of the musicians. Ilan said that bowing crotales was a technique from contemporary music percussion playing and one that orchestral percussionists were not particularly experienced in. I suggested rolling the crotales instead, but this suggestion was not taken up.

It is interesting to compare the electronic studies for the work (audio examples 4.7, 4.8 and 4.9) and the actual performance. The first movement loses some of the

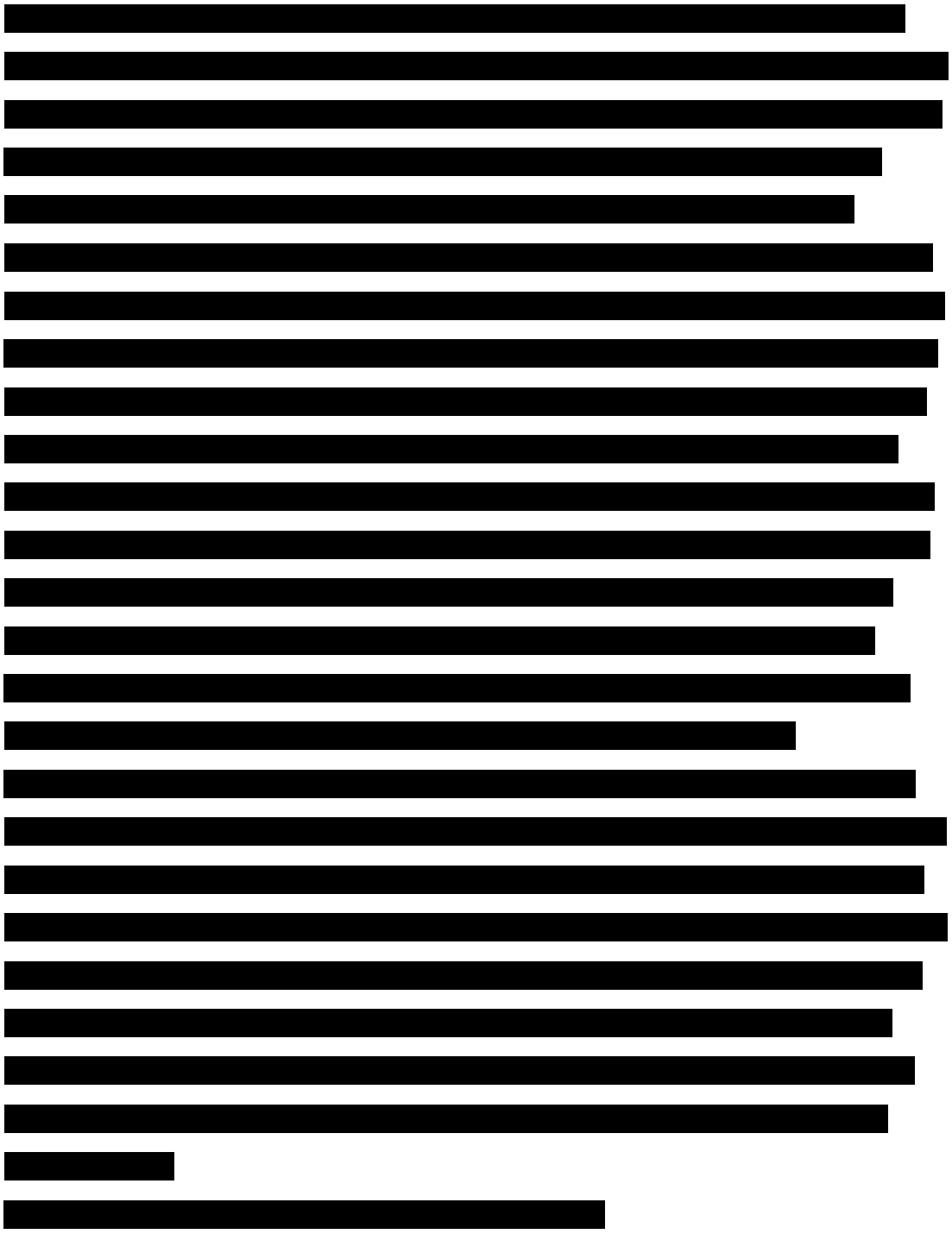
[2] The sonic pixel is explored in Chapter 4 of this thesis and involves a mapping of the idea of the computer image pixel (an area of uniform 'colour') into the realm of sound. The sonic freeze (especially a band filtered segment of it) can constitute a pixel since the timbre and harmony within such a freeze or sub-freeze remain more or less static (with some small fluctuations). This is the kind of imagining of sound afforded by the frequency domain and does not reflect the fact that sound, even a held timbre, is a constantly moving entity. The sonic pixel allows us a specifically visually-oriented way of thinking about sound, by letting us to play with levels of 'resolution' in relation to an original audio source.

colour and clarity of the electronic version — partly as a result of my orchestrational strategy of keeping common notes in the same instruments, but also because the high percussion either did not sound or was not loud enough. In the end, I made a more blended and subdued orchestration. It also lost colour because copying the sound of the electronic realization exactly is not possible — although this realization sounds like an orchestra, it is fake and consists of spectra that do not exist. Ultimately, I abandoned the idea of trying to reproduce the electronic version in favour of a sort of compromise. The dynamic and rhythmic model provided by the Brighton Beach field recording was certainly successful in invoking the irregularly timed swells of the sea. The second movement (although even harder to play than I had imagined) did not produce any surprises. As I mentioned in Chapter 4, I decided to 'neaten up' the sound that was produced by the original band-filtering and make it crisper and more definite in pitch. Predictably, the last part of the third movement (where the sonorities are lengthened) is much improved and given life by being played by a real orchestra. Conversely the beginning is a little too slow and rough — I would have liked more of the 'robotic' quality that was requested in the score.

The program booklet for the festival contained no program notes for individual pieces, only brief paragraphs summarizing the concert content based on only a little information provided by the composers. So, with my compositional strategy left unexplained, I should not have been surprised that the work was misinterpreted by some reviewers as parody or some kind of stylistic exercise (as if these might be the only reasons to use pre-existing material as the basis for a composition). I am not terribly bothered by the opinions of broadsheet reviewers, but the question of whether a piece should require additional explanation to be interpreted correctly by a listener is an interesting one. In the contemporary visual arts, such explanations (in the form of wall texts) are the rule. I would have liked to make a piece that did not need a program note, perhaps I could have added recoded spoken texts as in some of my previous work, or perhaps kept an electronic element in the work to clarify the origin of the materials and processes. In the end, there are no real traces left of how the work was made, or what it is trying to highlight.

I have included below an extract from Lawrence Dunn's blog on the premieres from the 2015 Tectonics Festival. It is a thoughtful piece of writing, and I enjoy the fact

that he hears so many things that I did not intend with the work. Perhaps it is a good example of Rancière's 'translation' between a piece and a spectator. The fact that Lawrence has made his own interpretation of the work is entirely valid, and quite exciting.



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