Ecology and Environmentalism in Contemporary Sound Art

by

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– a fact which makes it a fundamental part of our duty of care to them
to shine a spotlight on it in every aspect of contemporary culture.
This research, in its small contribution towards that end, is most of all for you.

Abstract

In recent years, ecological issues have grown to become some of the most significant socio-political concerns of our time – something which has been reflected by an explosion in engagement with such issues across every area of arts and culture. Across most major art forms, this trend has been identified, analysed and promoted both by critical studies in the growing field of ecocriticism, and by the curatorial recognition of new 'ecological' genres; however, to date there has been no equivalent ecologically-focused engagement within sound art. This can be recognised as the product of two significant gaps in sound art scholarship: the first critical in nature, regarding the lack of ecocritical engagement with sound art; and the second curatorial, regarding the failure to recognise the growing number of ecologically-engaged works of sound art as a distinct genre in their own right.

The research detailed within this thesis will address each of these gaps by conducting a comprehensive investigation into ecology and environmentalism in contemporary sound art. The critical gap will be tackled by coupling a thorough analysis of the field of ecocriticism with an investigation into the ways in which ecological principles manifest within sound as a medium and listening as a means of engagement. This will then be used to develop a new ecocritical framework specifically designed for sound art, which will be employed to conduct ecocritical listenings to a selection of canonical and contemporary sound works. To address the curatorial gap, meanwhile, a new genre of 'ecological sound art' will be proposed, with a second set of ecocritical listenings focused upon a selection of ecological sound works in order to determine the precise nature of their ecological engagement, and to develop both a comprehensive definition and an initial catalogue of works for this important and timely contemporary movement.

Contents

Terminology

Prior to commencing this investigation into ecology and environmentalism in contemporary sound art, it is important to clarify the meaning of some of the key terminology as it is used within this thesis. What is meant by the terms 'ecology' and 'environmentalism'? What does 'ecological issues' refer to? And what is encompassed by the term 'sound art'?

Ecology and Environmentalism

In the case of 'ecology' and 'environmentalism', their official definitions in the Oxford English Dictionary will be taken as a starting point for a discussion of their precise meaning and usage in the context of this thesis.

> **Ecology**, *n.*
>
> 1. a. The branch of biology that deals with the relationships between living organisms and their environment. Also: the relationships themselves, esp. those of a specified organism.
>
>   b. Chiefly Sociol. The study of the relationships between people, social groups, and their environment; (also) the system of such relationships in an area of human settlement.
>
>   c. In extended use: the interrelationship between any system and its environment; the product of this.
>
> 2. The study of or concern for the effect of human activity on the environment; advocacy of restrictions on industrial and agricultural development as a political movement; (also) a political movement dedicated to this.
>
> (OED Online, 2017a)

In its broadest sense (1c) of "the interrelationship between any system and its environment", the term 'ecology' is widely used in a vast array of contexts and disciplines. Within this thesis, however, the term is used in its primary, biological sense, with reference to the network of interrelationships between living things and their environment. As will become clear in the exploration of contemporary ecological theory in Chapter Two, this may also incorporate a consideration of the ecological impact of nonliving things – indeed, of all *matter* – however, this is still ultimately considered primarily with relation to its impact upon living organisms.

Environmentalism, *n.*

1. A theory positing the primary influence of environment (freq. as opposed to heredity) on development, esp. that of a person or group.
2. Concern with the preservation of the natural environment, esp. from damage caused by human influence; the politics or policies associated with this.

(OED Online, 2017b)

Clearly, within this thesis, the term 'environmentalism' is understood in terms of the second of these two meanings, referring to the concern for the ways in which humans are impacting the operation of the earth's ecological systems, and the political movement which has developed around this concern, particularly since the 1960s. In this regard, 'environmentalism' can be seen to intersect with the secondary meaning of 'ecology' quoted above; and indeed, since this research focuses specifically upon the critical and artistic engagement with issues such as pollution, biodiversity loss and climate change, its use of the term 'ecology' also carries with it resonances of this secondary meaning. Ultimately however, the use of both terms within this thesis represents a clear distinction between ecology, meaning the scientific study of the system of interrelationships between living organisms and their environment, and environmentalism, referring to the socio-political movement concerned with the human impact upon the healthy functioning of that system. This accords with Linda Weintraub's definitions of these terms in *To Life! Eco Art in Pursuit of a Sustainable Planet*:

> Ecologists study the distribution and abundance of living organisms and their interactions with each other and with the nonliving environment … Environmentalists, in contrast, contribute attitudes, opinions, and priorities to the verifiable information provided by ecologists. They are at liberty to relate to the Earth's systems by celebrating its splendor, healing its wounds, bolstering its resilience, managing its resources, mimicking its efficiencies, lamenting its infirmities, and the many alternatives evoked by the human imagination. (Weintraub, 2012, p. 19)

Ecological issues

In talking about the sorts of issues that are the concern of environmentalism, the terms 'environmental' and 'ecological' are often used interchangeably. Ultimately, however, it was felt that while 'environmental issues' could be potentially applied to any issue concerning the physical surroundings of a given subject, 'ecological issues' more accurately and

unambiguously represents the sorts of concerns which are to do with the healthy functioning of the earth's ecosystem; and so it is the latter term which will be used throughout this thesis.

The field of contemporary ecological issues encompasses a vast array of interlinked problems, abuses and crises. Rather than attempt to compile a definitive list of such issues (such as in Linda Weintraub's taxonomy of eighty-six 'eco issues' engaged with by works of eco-art, which, while a useful reference tool, inevitably results in omissions – her list, for example, contains no reference to issues of environmental justice), for the purposes of this thesis a more detailed definition of 'ecological issues' can be divided into the two key areas of ecological problems and ecological solutions.

'Ecological problems' incorporates the causes and consequences of a multitude of different interconnected concerns, which can be conceived as falling into four broad categories:

- Climate: issues around climate change (fossil fuel use and carbon footprints, global warming, melting polar ice, extreme weather events);
- Environment: issues around the destruction or despoliation of natural environments (deforestation, pollution, waste);
- Animal: ecological harm done to, or problems suffered by, other creatures (habitat destruction, endangered and extinct species, biodiversity loss);
- Human: ecological harm done to, or problems suffered by, people and communities (health problems, scarcity of resources, environmental justice issues).

'Ecological solutions' incorporates the multitude of different approaches to taking action about these problems, which can be divided into three broad categories:

- Education: informing people about ecological problems and what they can do about them;
- Connection: facilitating a personal connection and an attitude of caring around ecological issues, and the various environments, animals and people that require protection;
- Activism: taking positive action to solve problems, repair damage, counter abuses and protest against ecologically destructive or irresponsible actions.

These two lists function as a rough guide to the ground covered by the term 'contemporary ecological issues' as it will be used in this thesis.

Sound art

The term ‘sound art’ is probably the most problematic of all the terminology employed in this thesis. Sound art is a wide field with fluid boundaries, encompassing works in a variety of media which share a core concern with issues around sound and listening. In this case, the Oxford English Dictionary cannot be referred to, since it does not yet contain an entry for sound art; and definitions by others vary widely. In particular, the dividing line between sound art and music can be very unclear; indeed, prior to the term gaining currency in the late 1990s, works which would now be considered sound art were generally categorised as experimental music, and even today the distinction between the two largely depends upon one’s individual interpretation of the terminology. Ultimately, perhaps the best solution would be to simply leave it in the hands of the listener, rather than the artist, critic or curator, to decide whether a given work is regarded as sound art or music – or even as something else – based upon whatever proves most conducive to the understanding and appreciation of that particular work.

This said, a study such as this demands that a definition of sound art nevertheless be proposed in order to determine the boundaries of the study. This thesis will thus employ a relatively inclusive definition of ‘sound art’ whose scope is roughly equivalent to Leigh Landy’s ‘sound-based music’, defined as “the art form in which the sound, that is, not the musical note, is its basic unit” (Landy, 2007, p. 17), and incorporating forms such as electronic, electroacoustic and soundscape composition, *musique concrète*, radiophonic works, sounding or sound-based sculptures, installations, and site-specific works. Additionally, since many works fall under more than one of these categories, the general term ‘sound work’ will be used to refer to all works of sound art, regardless of form or context. Some may disagree with such an inclusive definition, which incorporates a great deal of work that might be regarded by many as musical composition rather than sound art; however, it should be noted that this decision has been motivated not only by a general reluctance to place restrictions upon a contemporary art form whose identity is still developing, but also by the relatively exclusive definitions of ‘art’ and ‘music’ which have resulted in the restriction of eco-art exhibitions and ecocritical art histories to the visual arts, and of ecomusicological studies to note-based musical forms, thereby excluding all of the above-mentioned forms of sound-based work, and creating the gap in scholarship which has made this research necessary in the first place.

Introduction

For as long as I can remember, my two greatest passions have been sound and ecology – passions which, moreover, have always been strongly linked. Some of my earliest childhood memories involve feelings of wonder and delight at the sounds of the natural environment: the modulating tones made by the wind howling around the house, the snatches of melody in the creaking of the tree in the front garden, the satisfying tonal 'plop' made by throwing a stone into the lake in the park; while my childhood membership of the RSPB's Young Ornithologists' Club was motivated far less by a love of birdwatching than of bird*listening*. As I got older, my love for the natural world was joined by a growing awareness of the ecological issues which threatened it: aged ten, I founded my own band of eco-warriors named The Green Gang, and attended a local council meeting armed with a petition to campaign for recycling facilities in the village where I lived; while in a school concert I proudly performed a self-penned rap whose lyrics were all about global warming, the melting of the polar ice sheets and rising sea levels. Although perhaps a relatively trivial event in itself, looking back I can recognise that my first (and so far only) outing as an MC represented my own small attempt to use a cultural medium as a means to express – and to try to encourage others to share – my concern with ecological issues; and that in this perhaps lay the first seeds of what would eventually grow into the research detailed within this thesis.

In 2007 – fifteen years after my environmentalist rap – I was in the final year of a degree in Creative Music and Sound Technology at Anglia Ruskin University, during which my musical compositional practice had given way to an exploration of the growing contemporary discipline of sound art. In February of that year, I took part in a workshop and concert organised by artists' collective Mongrel entitled *Antarctic Data Jam*, which involved the creation of sound works from field recordings and data streams sent by scientists researching the effects of climate change at the Antarctic. The project's evocative tagline was 'move to the sound of the icecaps melting'; and my own contribution was a piece called *melt*, which I composed from the sounds made by melting glaciers, and which was subsequently used as the opening track on the project's CD release.

My participation in that event had a profound effect on me, revealing the possibility that I might be able to combine my creative interest in sound art with my long-held concerns with ecological issues; and it was at this point that my research into the connections between these two areas really began. I was aware of the field of acoustic ecology, and the work of soundscape composers such as Hildegard Westerkamp and Barry Truax; however, I now began investigating to see if I could find any artists using sound to specifically engage with contemporary ecological issues – something which I soon found in the work of artists such as David Monacchi, Matthew Burtner, Andrea Polli, David Dunn and Douglas Quin. I also discovered that in October 2006, a number of artists had gathered for a five-day festival of

ecologically-engaged sound art in New York, organised by Joel Chadabe and the Electronic Music Foundation, called Ear to the Earth – an event which would continue to be held annually for the next seven years, and which today operates as "a global community of environmental sound artists responding to climate change" (Ear to the Earth, 2011). I also discovered Matthew Burtner's organisation EcoSono, described as "an activism network advocating environmental preservation through experimental sound art" (Burtner, 2011, p. 234), whose many activities included an annual EcoSono Institute in which participants learn to creatively engage with the Alaskan environment to create their own 'ecoacoustic' sound works.

The more I read about these artists and heard their sound works, the more it became clear to me that ecologically-engaged sound art constituted a growing movement, and I was excited to learn more, particularly as I wanted to try to steer my own creative practice in this direction. Above all, I wished to discover what scholarly critical analysis of such works could tell me about the ways in which they operated, and whether it would ultimately support my gut feeling that sound art might prove to be a powerful medium for creatively addressing contemporary ecological issues; and so I began searching for literature which engaged with these questions. At this point, however, I reached a dead end, since – aside from a handful of papers by the sound artists themselves discussing their own work – I could find no published writing on the subject whatsoever. I found plenty of writing *around* it, in the increasing number of fascinating and valuable texts on sound art, acoustic ecology and eco-art, but ultimately found myself frustrated each time by the omission of any reference to the ecologically-engaged sound art of which I was discovering an increasing number of examples. I also discovered plenty of texts in the thriving discipline of ecocriticism in the fields of literature, visual art, film, theatre and music; however, I could find no ecocritical scholarship which engaged with sound art – and, equally, no sound art scholarship which incorporated ecocritical approaches or concerns.

In 2011, I decided to pursue this interest via a Master's degree at Bath Spa University, during which I wrote a paper on the subject which swiftly rose to the top two per cent of papers viewed on the online research network academia.edu, demonstrating to me that I was far from the only person with an interest in the subject. In November 2013, I was invited to present this paper at the Symposium on Acoustic Ecology at the University of Kent; and while the event featured a wide range of fascinating papers and performances, by its conclusion I was shocked to find myself the only delegate who had spoken about any ecological issue other than that of noise pollution during the entire two-day programme. It was this which finally confirmed for me that the only way I was ever going to discover more about ecology and environmentalism in contemporary sound art was if I researched it myself – a conclusion which led somewhat naturally to the undertaking of the PhD research detailed within this thesis.

In the decade since my personal interest in the field began, ecocritical texts, conferences and courses have continued to multiply at an ever-increasing rate, with the result that today it has become firmly established as a thriving contemporary school of critical theory – and one whose

significance can only continue to grow in an age when ecological issues such as pollution, biodiversity loss and climate change represent some of the most urgent socio-political – and, many would argue, moral – issues facing humankind across the globe. The current lack of ecocritical engagement with sound art thus has serious implications, excluding it from the wider critical discourse surrounding the cultural response to ecological issues, and missing a prime opportunity for this fast-growing yet still under-recognised art form to impact public concerns and agendas outside academia.

The number of sound artists creating ecologically-engaged works, meanwhile, has also continued to grow in parallel with increasing public awareness and concern around contemporary ecological issues. However, while equivalent ecological movements in other art forms have become recognised as distinct genres in their own right, such as eco-art, ecocinema, ecotheatre and ecofiction, and have consequently come to enjoy increasing academic and public recognition through curated exhibitions, festivals and texts, ecologically-engaged works of sound art remain a largely disparate and unconnected body of works, whose ecological meanings and messages are often lost or ignored as a result of being subsumed within the more general fields of 'environmental' or 'soundscape' works.

The research presented in this thesis will thus proceed to address each of these two significant gaps in current ecocritical and sound art scholarship. Chapter One will begin by establishing the precise nature of these two gaps: the first critical, regarding the lack of ecocritical engagement with sound art; and the second curatorial, regarding the failure to recognise ecologically-engaged works of sound art as a distinct and coherent genre in their own right. It will then proceed to establish the cultural context for this research, with examinations of ecocritical approaches to other art forms, and of the curatorial establishment of new 'ecological' or 'eco-' genres. Finally, it will take the first steps towards addressing the identified curatorial gap by proposing the new terminology of 'ecological sound art' and formulating a basic definition, which will then be used as the basis for compiling an initial selection of potential ecological sound works.

With its cultural context thus established and the scope of its curatorial aspect defined, Chapter Two will proceed to lay the groundwork for addressing the critical aspect of this research with an examination of the core principles which underpin ecocriticism. It will identify that an ecocritical analysis can take two main approaches: the analysis of ecological themes within a work's subject matter; and the identification of ecological principles within its form and operation. It will then proceed to determine the elements which may be incorporated into an ecocritical framework for sound art in each of these two areas: firstly, by examining the major tropes that emerge from the ecocritical analysis of subject matter in other art forms, and secondly, by identifying key points of confluence between ecological theory and sound studies which illuminate the ecological principles in operation within sound as a medium, and listening

as a means of engagement. Finally, it will bring these elements together in the formulation of a new ecocritical framework specifically tailored to the analysis of works of sound art.

In Chapter Three, this framework will be employed to conduct ecocritical readings – or, perhaps more properly, 'listenings' – to a selection of eight works of sound art, in order to take the first steps towards addressing the lack of ecocritical engagement with the medium. Six of these will be classic or canonical works which have already been extensively analysed elsewhere, in order to demonstrate how an ecocritical listening can unlock new facets of such works which have not previously been identified, and which allow them to speak to contemporary ecological issues; while the other two will be contemporary works, whose analyses will demonstrate how an ecocritical perspective can form an important part of our understanding and appraisal of new works by revealing their relevance to the ecological issues which constitute such a significant part of the social, political and cultural climate in which they exist.

Chapter Four will then proceed to combine the critical with the curatorial by turning the ecocritical ear towards a selection of the works identified in the first chapter as potential works of ecological sound art. These ecocritical listenings will involve a thorough analysis of the approaches and methodologies employed by these works and the nature of their engagement with the ecological issues they address, which will then be used to determine the positioning of each work upon a spectrum of ecological sound art, and which will also provide the final aspect of the curatorial element of this thesis, enabling the compilation of a catalogue of ecological sound art (provided as an appendix). The overall outcomes of these analyses will then be used to formulate a more comprehensive definition of the genre, including a list of some of its common characteristics.

Finally, Chapter Five will conduct a thorough critical evaluation of the research presented in this thesis, including a summary of its key findings, and an investigation of problematics uncovered; and it will conclude by proposing future directions both for ecocritical sound art research, and for ecological sound art. In this, it is hoped that this research might provide a foundation for further investigations into the ways in which sound art might take its place alongside other art forms in addressing the ecological issues which constitute some of the most urgent crises being faced by humanity across the globe, and which therefore demand that both sound art and sound art scholarship open their ears to the warning signals, and lend their voices to sounding the alarm.

Chapter 1
The Cultural Response to Contemporary Ecological Issues

Introduction

In recent years, ecological issues such as biodiversity loss, pollution, sustainability, environmental justice and climate change have grown to become some of the most significant socio-political – and, many would argue, moral – issues of our time; however, it is generally acknowledged that humankind is still failing to respond with anything like the appropriate degree of urgency. In a 2005 article on climate change, leading US environmentalist Bill McKibben argued that a central problem lay in the fact that while it was recognised as an important scientific and political issue, climate change had not yet properly permeated our culture:

> Here's the paradox: if the scientists are right, we're living through the biggest thing that's happened since human civilization emerged. One species, ours, has by itself in the course of a couple of generations managed to powerfully raise the temperature of an entire planet, to knock its most basic systems out of kilter. But oddly, though we know about it, we don't *know* about it. It hasn't registered in our gut; it isn't part of our culture. Where are the books? The poems? The plays? The goddamn operas? (McKibben, 2005)

McKibben argued that the arts could play a crucial role in facilitating a cultural understanding of climate change and helping us to process what is happening, noting that "[a]rt, like religion, is one of the ways we digest what is happening to us, make the sense out of it that proceeds to action" (ibid.). Far from being a lone ecological voice crying in a cultural wilderness, however, McKibben's call-to-arms coincided with the beginning of a surge of interest around arts and ecology – a fact which he acknowledged in a follow-up piece four years later, in which he reflected that at the time he wrote his original article, "[c]learly there were lots and lots of people already thinking the same way, because ever since it's seemed to me as if deep and moving images and sounds and words have been flooding out into the world" (McKibben, 2009).

The degree to which the arts are able to impact ecological issues such as climate change is not merely dependent upon the volume of artists addressing them, however, but also upon the ecological significance of their work being recognised and engaged with, and having it promoted and made accessible to audiences – factors which are, to a large degree, dependent upon the contributions of two key cultural figures: the critic and the curator. Of course, this is

not to say that works of art can only be considered significant if they exist within and are accepted by the mainstream art world, nor that their cultural success is determined solely by these two arbiters. However, it would be disingenuous to ignore the immense influence they have upon the degree to which works of art become known amongst the general public, and the ways in which they are generally received and understood: factors which are perhaps of particular importance if part of a work's raison d'être is to speak to audiences about, and perhaps even have some form of impact upon, contemporary socio-political issues.

The role of the critic can be broadly summarised as the assessment and evaluation of the meaning, significance and overall success of cultural works – a role which means that critics possess considerable influence over the way in which such works are interpreted and regarded by the rest of society. Some critics employ particular schools of critical theory, such as feminist, Marxist, psychoanalytic, postcolonialist or queer theory, to frame their analyses, enabling them to assess the significance of works in relation to a specific issue or area of interest; and in recent years, the exponential increase in awareness and concern around ecological issues has given rise to the school of ecocriticism, which analyses the ecological significance of both historical and contemporary cultural works.

Ecocritical approaches have been increasingly adopted with regard to numerous areas of cultural activity, as evidenced by the abundance of ecocritical texts in many different fields.[1] Such scholarship plays an important role in determining, analysing and promoting the ecological significance of cultural works in these fields. In surveying this extensive canon of ecocritical scholarship, however, sound art is notable by its absence. The fact that ecocritical approaches have not yet been applied to this fast-growing contemporary art form means that its potential ecological significance has so far been left unexplored, preventing its inclusion within the wider critical discourse surrounding the cultural response to contemporary ecological issues.

The curator also plays an extremely significant role with regard to the promotion and understanding of works of art, whether within the art world, in academia, or amongst the general public. In a 1998 article entitled 'The Curator's Moment', art historian and critic Michael Brenson asserted that "the era of the curator has begun" (Brenson, 1998, p. 16), outlining the immense influence of the curator upon how contemporary art is received and interpreted:

[1] Such ecocritical texts (which I have limited here, for reasons of space, to five examples for each cultural field, but whose numbers extend far beyond these) include studies in visual art (Bradock and Irmscher, 2009; Kagan, 2013; Miles, 2014; Davis and Turpin, 2015; Demos, 2016), fashion (Hethorn and Ulasewicz, 2008; Brown, 2010; Minney, 2011; Black, 2013; Gordon and Hill, 2015), design and architecture (Guy and Moore, 2005; Stang and Hawthorne, 2005; Shedroff, 2009; Anker, 2010; Bergman, 2012), literature (Glotfelty and Fromm, 1996; Armbruster and Wallace, 2001; Buell, 2005; Garrard, 2012; Westling, 2014), film (Ingram, 2000; Willoquet-Maricondi, 2010; Gustafsson and Kääpä, 2013; Rust and Monani, 2013; O'Brien, 2016), theatre (Heinlein, 2007; Cless, 2010; Arons and May, 2012; Besel and Blau, 2014; Lavery and Finburgh, 2015), and music (Mellers, 2001; Ingram, 2010; Pedelty, 2012; Von Glahn, 2013; Allen and Dawe, 2016).

> As much as any artist, critic, or museum director, the new curator understands, and is able to articulate, the ability of art to touch and mobilize people and encourage debates about spirituality, creativity, identity, and the nation. The texture and tone of the curator's voice, the voices it welcomes or excludes, and the shape of the conversation it sets in motion are essential to the texture and perception of contemporary art. (ibid., p. 16)

In Brenson's article, the term 'curator' is used in its traditional sense of referring to those responsible for selecting works of art for gallery exhibitions. In recent years, however, the concept of curation has taken on an increasingly expanded meaning as it has been applied to an ever-wider variety of contexts outside the art gallery, to the point that, some might argue, it is losing all sensible currency: David Balzer notes "the increasing use of the noun *curator* and the verb *to curate* outside the art world, where playlists, outfits, even hors d'oeuvres are now curated" (Balzer, 2014, p. 1).

The understanding of the role of the curator and the nature of the curatorial act adopted within this thesis falls somewhere in between these two extremes. In *Rethinking Curating*, Beryl Graham and Sarah Cook list the basic roles of the contemporary curator as "selecting artworks; directing how they are displayed in an exhibition; and writing labels, interpretational material, catalogs, and press releases. The curator is basically in this case acting as a kind of interface between artist, institution, and audience in 'the development of critical meaning in partnership and discussion with artists and publics,' as Barnaby Drabble states" (Graham and Cook, 2010, p. 10). Taking its cues from this description, in this thesis the curatorial act is also used to refer to the practice of "selecting artworks" and "directing how they are displayed in an exhibition"; however, here the term 'exhibition' is understood in an expanded sense which is not confined to physical collections existing within the walls of a gallery, but includes any medium in which works of art are collected together according to an overarching theme for presentation to the general public, and which may thus include so-called 'coffee table books', historical surveys and other textual collections, or CDs, DVDs or playlists of audio or visual works.

Whether in gallery exhibitions or in other contexts, however, the curatorial act is fundamentally understood here as something which serves not only to display and promote works of art but also, crucially, to contextualise them, demarcating certain groupings defined by a set of shared characteristics – something which has considerable influence over the ways in which such works are received and understood by an audience. Furthermore, if a given curatorial strategy is replicated elsewhere and becomes more widely adopted, it can occasionally lead to the recognition of a new artistic genre or movement, providing a coherent identity which can facilitate wider awareness of the works included within it. In the last few decades, the growing number of artists addressing ecological issues have been recognised by curators who have gathered them together within an increasing number of international

exhibitions, festivals and texts. This, in turn, has led to the establishment of distinct ecological or 'eco-' genres in a range of different art forms, such as 'eco-art' (Weintraub, 2012), 'ecofiction' (Dwyer, 2010), 'ecocinema' (Willoquet-Maricondi, 2010) and 'ecotheatre' (Standing, Schafer and James, 2014) – something which plays a significant role in consolidating and promoting common bodies of ecologically-engaged practice.

Sound art is no exception to this cultural surge in ecological engagement, with an increasing number of artists such as Leah Barclay, David Monacchi, Matthew Burtner, Andrea Polli, David Dunn, Cheryl E. Leonard and Douglas Quin using sound as a medium to creatively address a wide variety of contemporary ecological issues, and with international organisations Ear to the Earth and EcoSono evidencing the existence of a tangible and coherent movement. Aside from these two isolated examples, however, and in contrast with the widespread recognition enjoyed by equivalent works in almost every other art form, the growing movement of ecologically-engaged sound art so far remains almost entirely unacknowledged, with not a single exhibition, book, article or website having yet taken the curatorial step of gathering such works together and framing them as a distinct genre in their own right.

This thesis therefore aims to fill the two significant gaps identified above: one critical, regarding the absence of ecocritical engagement with sound art; and the other curatorial, regarding the lack of recognition of the growing number of ecologically-engaged sound works as a coherent genre. The present chapter will begin by establishing the cultural context for this research, by looking firstly at the development of ecocritical approaches within different areas of art and culture, and secondly at the curating-into-being of distinct ecological genres, establishing the absence of sound art from each of these areas, and thereby demonstrating the existence of the two major gaps in current scholarship which this thesis will address. The final two sections of the chapter will take the first steps toward addressing the second of these gaps, by first establishing the most suitable generic terminology and basic definition for a new genre of 'ecological' sound art, and then using this as the basis for identifying an initial selection of sound works which demonstrate an engagement with ecological issues relating to five key areas or tropes, in order to demonstrate the validity and importance of the critical and curatorial endeavour undertaken here.

1.1 Ecocritical approaches to the arts

1.1.1 Literary ecocriticism

Ecocriticism has its origins as a critical school within literary theory. Some of the earliest texts to engage with ecocritical themes include Leo Marx's *The Machine in the Garden: Technology and the Pastoral Ideal in America* (1964), which focuses upon how American literature has

portrayed the impacts of modern industrial technology upon rural life; and Joseph W. Meeker's *The Comedy of Survival: Studies in Literary Ecology* (1972), which aims to discover what role ecologically-themed literature might have in the achievement of an ecologically balanced lifestyle. The term *ecocriticism*, meanwhile, was coined by William Rueckert in his 1978 essay 'Literature and Ecology: An Experiment in Ecocriticism', in which he argues that modern literary theory is in need of a shift towards a "principle of relevance" (Rueckert, 1996, p. 107), and that this principle demands "the application of ecology and ecological concepts to the study of literature, because ecology (as a science, as a discipline, as the basis for a human vision) has the greatest relevance to the present and future of the world we all live in of anything that I have studied in recent years" (ibid., p. 107). Ecocriticism, he argues, would engage "teachers and literary critics as creative mediators between literature and the biosphere whose tasks include the encouragement of, the discovery, training and development of creative biospheric apperceptions, attitudes, and actions" (ibid., p. 121).

Following Rueckert's paper, however, the term 'ecocriticism' lay dormant for a further decade until, at the 1989 meeting of the Western Literature Association (WLA), Cheryll Glotfelty presented a paper entitled 'Toward an Ecological Literary Criticism' in which she urged its adoption to describe the field that, until then, had been loosely known as 'the study of nature writing'. A few years later ecocriticism was consolidated as a coherent field of study when, at the 1992 meeting of the WLA, the Association for the Study of Literature and Environment (ASLE) was formed, beginning publication of its own journal, *Interdisciplinary Studies in Literature and the Environment* (*ISLE*) the following year. In 1996, together with Harold Fromm, Glotfelty edited the first major collection of ecocritical writings, entitled *The Ecocriticism Reader*, in which she defines the field in broad terms as "the study of the relationship between literature and the physical environment" (Glotfelty, 1996, p. xviii); however, she also emphasises its strong relationship with ecological issues, noting that "most ecocritical work shares a common motivation: the troubling awareness that we have reached the age of environmental limits, a time when the consequences of human actions are damaging the planet's basic life support systems" (ibid., p. xx), and boldly stating that the recognition of such issues by contemporary literary studies is essential if it is to avoid "remain[ing] academic in the sense of 'scholarly to the point of being unaware of the outside world' (*American Heritage Dictionary*)" (ibid., p. xv). The selection of essays in *The Ecocriticism Reader* is notable for its expansion of ecocriticism's scope beyond its original conception as the 'study of nature writing'; and subsequent ecocritical publications continued to broaden the field, such as the reader *Beyond Nature Writing: Expanding the Boundaries of Ecocriticism* (2001), in whose introduction editors Kathleen R. Wallace and Karla Armbruster state that "ecocritics must make a unified and rigorous effort to demonstrate the field's true range and its power to illuminate an almost endless variety of texts" (Armbruster and Wallace, 2001, p. 3).

1.1.2 Ecocritical art history

In 1972, the same year as the publication of Meeker's *The Comedy of Survival*, artist György Kepes edited a collection entitled *Arts of the Environment*, which can be identified in retrospect as a key early ecocritical text in the visual arts. In common with Meeker's text, several of the contributions to Kepes's collection explored ways in which art might imagine more ecologically harmonious ways of living, including Kepes's own introductory essay, 'Art and the Ecological Consciousness', in which he argued that art could form a significant part of the solution to the ecological plight that humankind was in:

> Environmental homeostasis on a global scale is now necessary to survival. Creative imagination, artistic sensibility, can be seen as one of our basic, collective, self-regulating devices that help us all to register and reject what is toxic and find what is useful and meaningful in our lives … Clearly, the artist's sensibility has entered a new phase of orientation in which its prime goal is to provide a format for the emerging ecological consciousness. (Kepes, 1972, pp. 6-9)

As in literature, however, ecocriticism did not really begin to make an impact within the visual arts for another twenty years, until in 1992 – the same year as the founding of ASLE – Barbara C. Matilsky curated an exhibition entitled *Fragile Ecologies*, which gathered together ecologically-concerned art from the previous three decades and recognised it as forming a distinct movement in its own right. This movement, which Matilsky termed 'ecological art', has since become widely recognised as a significant artistic genre, and will be examined in greater depth in the following section. However, the book Matilsky wrote to accompany the exhibition also included the first significant ecocritical analysis of visual art history, providing an overview of the artistic expression of humanity's relationship with the natural environment from the earliest cave paintings of animals through to the post-1960s ecological art that was the subject of the exhibition. Following Matilsky's example, several subsequent curatorial texts on ecological or 'eco-' art have also incorporated brief ecocritical art histories (Spaid, 2002; Weintraub, 2012; Brown, 2014); while in 2009, Alan C. Braddock and Christoph Irmscher edited *A Keener Perception: Ecocritical Studies in American Art History*, the first – and, to date, the only – ecocritical art history reader, whose twelve essays explore ecological themes in the works of visual artists from the 16th century to the present day, "seek[ing] to promote a new environmental discourse at the disciplinary intersection of art history and a growing body of ecocritical scholarship already in progress elsewhere" (Braddock and Irmscher, 2009, p. 19). Aside from these examples, ecocritical studies in visual art have tended to focus almost entirely

upon post-1960s eco-art, providing in-depth analyses of overtly ecologically-engaged works in relation to issues such as sustainability (Kagan, 2013) and environmental justice (Demos, 2016).

1.1.3 Ecocritical film and theatre studies

Since the turn of the millennium, ecocritical approaches have also begun to be applied to other forms of art and culture. In film studies, David Ingram's *Green Screen: Environmentalism and Hollywood Cinema* (2000) provided the first comprehensive critical examination of Hollywood's relationship with ecological issues; and following this, many other ecocritical texts have been published, many of which focus upon Hollywood, but with some others which also look beyond it to explore ecological issues in independent and experimental film (MacDonald, 2001; Willoquet-Marricondi, 2010), international cinema (Gustafsson and Kääpä, 2013) and documentary (Alex and Deborah, 2016). Many of the concerns within ecocritical film studies replicate those in its literary counterpart, simply transferred to filmic 'texts'; however, it also introduces new considerations, specific to its nature as a visual and time-based medium, as Willoquet-Marricondi explains:

> Literary ecocriticism has examined what a writer's use of language and metaphor reveals about his/her perception and experience of nature. Cinematic ecocriticism, what others call 'green film criticism' or 'eco-cinecriticism' (Ivakhiv 1), must engage with how visual representations position nature and natural features, how these are framed by the lens of the camera or shaped by the editing process. (Maricondi, 2010, p. 8)

To the ground covered by ecocriticism, ecocritical film studies also brings from the field of ecomedia the question of the sustainability of cinema itself, asking how we might reconcile the apparent hypocrisy of ecological messages being delivered through a medium which generally has a significant carbon footprint (Bozak, 2012). Recent years have also seen ecocriticism make the transition from screen to stage, with the emergence of ecocritical texts in the field of theatre studies (Heinlein, 2007; Kershaw, 2007; Cless, 2010; Arons and May, 2012; Besel and Blau, 2014; Lavery and Finburgh, 2015).

1.1.4 Ecomusicology

In musicology, meanwhile, the application of ecocritical approaches has given rise to the school of *ecomusicology*, defined by Aaron S. Allen in the *Grove Dictionary of American Music* as

"the study of music, culture, and nature in all the complexities of those terms … consider[ing] musical and sonic issues, both textual and performative, related to ecology and the natural environment" (Allen, 2013). Allen notes that the growth of interest in ecomusicological issues "has paralleled increasing environmental concern in North America since 1970, a period of greening in academia when environmental studies developed in the physical, natural, and social sciences as well as the humanities", but that the term "gained currency in the decades around 2000 in North American and Scandinavian academic circles" (ibid.). Allen also makes it clear that ecomusicology shares ecocriticism's strong foundation in contemporary ecological issues, concluding the Grove entry by stating that "ecomusicology can offer fresh approaches to confronting old problems in music and culture via a socially engaged scholarship that connects them with environmental concerns" (ibid.). Some ecomusicological studies closely emulate their literary counterpart by focusing upon the analysis of ecological themes in song lyrics and libretti (Ingram, 2010; Pedelty, 2012); while studies of classical and instrumental works (Mellers, 2001; Von Glahn, 2013) involve the identification and analysis of ecological principles in the form and structure of the music itself; and, as in ecocritical film studies, some ecomusicological studies also engage with issues surrounding the sustainability of the medium itself in areas such as instrument-building, recording and touring. This broad scope is evidenced by the wide range of concerns to be found within the pages of Aaron S. Allen and Kevin Dawe's reader *Current Directions in Ecomusicology: Music, Culture, Nature* (2016).

1.1.5 Eco-aesthetics

An even broader ecocritical perspective is also offered by recent texts in the field of 'environmental' or 'eco-' aesthetics, which investigate the ecological implications of works across a range of different forms of art and culture. Timothy Morton's *Ecology Without Nature: Rethinking Environmental Aesthetics* (2007), along with his more recent books *The Ecological Thought* (2010), *Hyperobjects: Philosophy and Ecology After the End of the World* (2013) and *Dark Ecology: For a Logic of Future Coexistence* (2016), outline a new model of self-reflexive ecocriticism which investigates the potential of the arts to facilitate new modes of ecological thinking through their embodiment of the principle of interconnectedness. Malcolm Miles's *Eco-Aesthetics: Art, Literature and Architecture in a Period of Climate Change* (2014), meanwhile, analyses a range of artworks, texts and architectural projects, evaluating their meaning and usefulness as a response to today's urgent ecological issues.

1.1.6 Exclusion of sound art from ecocriticism

From its origins as a school of literary criticism, then, ecocriticism has come to be adopted as a significant critical approach within a number of different fields. In many respects this has simply involved the main principles of literary ecocriticism being borrowed and adapted for other art forms, such as the analysis of common themes relating to the natural world, ecological issues, and the relationship between nature and culture. In other respects, however, its adoption by different art forms has opened up new avenues of ecocritical thinking: its application to art history, for example, has enabled the exploration of ecocritical themes to be carried back much further in human history than had been possible in literary theory, right back to the earliest human-created art over 30,000 years ago; while the analysis of certain areas of sculpture and installation has facilitated investigations into the practical, as well as the philosophical, ecological implications of works. Ecocritical film studies, meanwhile, has brought with it a new focus upon the ecological footprint of works; while ecomusicology has focused less upon the narrative or thematic concerns which drive much ecocriticism in other media, and more upon the embodiment of ecological principles within the form and operation of works. Eco-aesthetics, meanwhile, offers more of a meta-critical perspective, proposing strategies for the analysis of ecological themes which cut across a range of different art forms. This range of ecocritical scholarship which has developed within the fields of literature, film, theatre, music and visual art serves an important function in providing analysis and evaluation of the ecological significance of these art forms, enabling their incorporation into the wider critical discourse surrounding the cultural response to the urgent ecological issues facing humankind. In surveying this growing canon of ecocritical scholarship, however, sound art is notable by its absence.

As an area of artistic practice, we might perhaps expect to find some works of sound art incorporated into ecocritical art histories; however, all existing texts in this area limit their scope to the visual arts. Ecomusicology, meanwhile, appears at the outset to offer a more inclusive perspective: Jeff Todd Titon states that "the proper frame [for ecomusicology] is sound and sustainability; music is too narrowing. We should open our ears to all sound, music included" (Titon, 2013, p. 8); while Aaron S. Allen and Kevin Dawe claim that "[w]ork in ecomusicology is on a music-sound continuum: the ecomusicological objects and/or subjects of study are parts of complex systems involving a wide range of sonic phenomena" (Allen and Dawe, 2016, p. 8). Alexander Rehding also argues that ecomusicology should encompass a wide range of sonic practices:

> How can music studies respond to the sense of crisis in a way that would be comparable to the other arts? … Quite possibly an answer will be forthcoming from a widening outlook on the objects under discussion, starting with a critical

> examination not only of what we mean by "nature" but also of what we mean by "music." Non-Western musical traditions and sound art, in a post-Cagean universe, hold considerable potential in this regard, as does the pioneering work in sound studies that has exploded traditional notions of music and musicological enterprise. (Rehding, 2011, p. 412)

In light of these statements, we might perhaps expect to see works of sound art included within ecomusicological texts; however, it is, once again, notable by its almost complete absence from the field. The sole concession is Sabine Feisst's study of electroacoustic compositions by Maggi Payne and Laurie Spiegel in *Current Directions in Ecomusicology* (Feisst, 2016); aside from this, all current ecomusicological scholarship confines its scope to the more traditional, 'note-based' musical genres of popular (Ingram, 2010; Pedelty, 2012) and classical music (Mellers, 2001; Von Glahn, 2013).

In many ways, this situation merely reflects the position of sound art in general, as a field which exists in the gap between 'art' and 'music', belonging partly to both, but still, at least within academia, largely unrecognised by either. This has led, in recent years, to the growth of a substantial body of critical scholarship specific to sound art; however, an ecocritical approach has yet to be applied to this field. While there are texts which engage with the links between the environment, environmental sound, and sound art (Truax, 2001; LaBelle, 2006; Bandt, Duffy, and MacKinnon, 2007; Carlyle, 2007; Rudi, 2011; Bijsterveld, 2013; Belgiojoso, 2014; Gandy and Nilsen, 2014), they invariably do so from the perspective of acoustic ecology, the discipline developed in the 1970s by Canadian composer R. Murray Schafer and his colleagues at Simon Fraser University in British Columbia, and which he defined as "the study of the effects of the acoustic environment or soundscape on the physical responses or behavioural characteristics of creatures living within it" (Schafer, 1977, p. 271). Many of the core principles of acoustic ecology, such as its advocating of an aesthetic appreciation of environmental sound, its examination of the interrelationships between humankind and the soundscapes in which we live, its study of the ways in which they are changing, and its combatting of noise pollution caused by modern industrialisation, are important considerations within an ecocritical approach to sound; however, the fundamental restriction of its focus to the *acoustic* environment means that acoustic ecology only engages with ecological issues to the extent that they impact the environmental *soundscape*, and thus cannot be regarded as a sufficient substitute for a properly ecocritical approach to sound art.

Thus seemingly neither 'visual' enough for ecocritical art histories, nor 'musical' enough for ecomusicological studies, and with current sound art scholarship too confined within the soundscape-based parameters of acoustic ecology to be properly ecocritical, a substantial gap in revealed in which sound art is absent from current ecocritical scholarship, and ecocriticism is absent from current sound art scholarship. This has serious implications, resulting in the

exclusion of this rapidly-growing art form from the critical discourse surrounding the cultural response to contemporary ecological issues. This represents the first of the two major gaps which this thesis will address, through the development of a new ecocritical framework tailored specifically to sound art in Chapter Two, and its employment in the ecocritical analysis of a selection of canonical and contemporary works of sound art in Chapter Three.

1.2 Curations of ecological genres

1.2.1 Arguments against the establishment of new ecological genres

The second gap addressed by this thesis is curatorial in nature, gathering together the growing number of ecologically-engaged works of sound art and recognising them as a distinct genre in their own right; and the following section will provide the cultural context for this curatorial strategy through an examination of the 'curating-into-being' of equivalent ecological genres in other art forms. Before proceeding with this task, however, it must first be acknowledged that the establishment of new generic categories is also an inescapably flawed endeavour. In his study of ecological aesthetics in the arts, Malcolm Miles summarises these flaws in order to make a case against the establishment of precisely this sort of new ecological genre:

> The book's title *Eco-aesthetics* poses an intersection between ecology and aesthetics, but I do not propose this as a new specialism within philosophy; nor would I advocate new specialist practices such as eco-art, eco-writing or eco-architecture. This is in part because the arts are not rigidly bounded fields today, but expanded fields, and because subfields tend to reproduce the exclusionary tendencies of the fields from which they depart or to mask inadequacies in some of the practices which they contain. A new subfield can be a bandwagon for artists, curators and critics just as for anyone else. (Miles, 2014, p. 2)

Miles raises several important points here, which merit proper consideration. Unfortunately, despite his opening disclaimer that he does not propose 'eco-aesthetics' as a new philosophical specialism, his choice of title somewhat compromises the rest of his argument against the establishment of specialist 'eco-' fields and practices; for, despite Miles's assertion to the contrary, the use of such a term inherently, and inescapably, suggests precisely such a new philosophical specialism, which the content of the book then serves to describe. It begs the question: if the author is so opposed to subfields, why call the book *Eco-Aesthetics*, rather than (for example) *Ecology and Aesthetics*? In fact, this is something of a moot point anyway: Miles really had no need to worry about the possibility of being responsible for a new philosophical

specialism, since ‘ecoaesthetics’ had already been growing as a philosophical field in the East, and particularly in China, for over a decade by the time his book was published in 2014 (see Carson, 2017, for a comprehensive list of references in this respect). Furthermore, in recent years, ‘ecological’ or ‘eco-’ aesthetics has also been increasingly adopted in the West, in order to distinguish it from the already established field of ‘environmental aesthetics’.

The question of the title aside, however, Miles makes some valid arguments which must be engaged with. First, his assertion that the arts should be understood as ‘expanded fields’ refers to the model proposed by art historian Rosalind Krauss in 1979 in relation to works of minimalist sculpture and land art which, she argued, had stretched the definition of ‘sculpture’ to such an extent that it made more sense to define them by their relation to the wider elements within whose sphere they operated, but which they were not: thus, she argued, such works could be understood as existing at the point where ‘not-architecture’ met ‘not-landscape’. Miles argues that artworks which engage with contemporary ecological issues must also be understood in these terms, as works which “operate in art’s expanded field and cannot helpfully be separated from political critique or cultural discourse” (ibid., p. 14). This is certainly an important point to remember when approaching such works, many of which exist at the intersection of art, scientific research, political activism and community engagement. However, it does not quite work as an argument against the formulation of generic categories such as ‘eco-art’, ‘ecofiction’ or ‘ecocinema’, since it misses the vital point that such terms have been developed in reference to bodies of work whose core characteristic is precisely their blend of art with ecological science, politics and activism: that is, they already contain the notion of being an expanded field within their essential definition. In fact, it might reasonably be stated that these terms simply pose an intersection between ecology and art / fiction / cinema in exactly the same way that Miles’s use of the term ‘eco-aesthetics’ “poses an intersection between ecology and aesthetics” (ibid., p. 2); and, as we have already noted, the use of these terms inescapably positions these intersections as new specialist genres or subfields.

Miles makes another important point regarding the exclusionary nature of subfields. The curatorial act of gathering together a group of things according to certain shared characteristics is inevitably an exercise in exclusion as much as inclusion, which will always result in a multitude of other things being left out simply because they do not match the criteria that have been established. However, while the inevitability of these exclusions should be acknowledged as a limitation of curatorial strategies, this does not negate their usefulness: indeed, Miles’s own book inherently involves the curatorial act of gathering together a selected group of works of art, literature and architecture whose common characteristic is their perceived relevance to contemporary ecological issues – something which has been determined according to Miles’s own criteria, which he does not explicitly reveal. The book thus, in effect, creates its own subfield, which we might identify as ‘works with characteristics relevant to the field of eco-

aesthetics' – and which does not avoid being exclusionary just because it does not identify its selected group of works by a collective name.

Miles also states that new subfields "can be a bandwagon for artists, curators and critics" (ibid., p. 2). This is undoubtedly true of eco-art, which has gained a significant cultural presence since its establishment in the early 1990s, with an ever-growing number of major international exhibitions and curatorial and critical texts devoted to it (including, of course, Miles's own book). It is likely, as Miles's statement implies, that a certain proportion of these have chosen to associate themselves with the eco-art movement simply because it is popular or fashionable, rather than because of a genuine and considered commitment to its principles or aims; and that this will result in some works, exhibitions and studies which lack authenticity, quality and critical rigour. What we might call the 'bandwagon phenomenon' is, unfortunately, something of an unavoidable consequence of something becoming well-known and popular: indeed, the only reason a new subfield can become a bandwagon for artists, critics and curators is because it provides the coherent identity and recognition which facilitates wider awareness and breeds popularity – something which is surely not only desirable, but essential for art whose core purpose is to have a cultural and political impact upon real world issues. However undesirable the existence of inauthentic or sub-standard works might be to the discerning cultural critic, therefore, we have to ask whether it would really be preferable for ecologically-engaged works of art to have remained a disparate and undefined body of works, rather than a recognised subfield with a coherent identity and a strong global profile, the consequence of which is a proportion of less authentic and lower quality works 'jumping on the bandwagon'? To deny ecologically-engaged art this recognition in an attempt to prevent the involvement of those who are deemed to lack true authenticity of intention would thus appear to be somewhat self-defeating; indeed, literally so in the case of Miles's own book, large sections of which could not have been written had eco-art not been established as a distinct genre, enabling it to become such a thriving global movement.

In summary, therefore, while the arguments against the curatorial establishment of new genres or subfields within the arts merit careful consideration, and while it comes with inherent and undeniable drawbacks and limitations, the advantages of recognising ecologically-engaged cultural works as distinct 'ecological' or 'eco-' genres far outweigh the disadvantages; indeed, the adoption of suitable generic terminology is a prerequisite for any field if it is to gain wider recognition and become part of a meaningful discourse. With this point established, therefore, we will now move on to examine the ways in which such ecologically-engaged genres have developed across different forms of art and culture.

1.2.2 Environmental art and eco-art

As a form whose public profile is often based around the curation of exhibitions which bring together works sharing a common theme, it is perhaps no surprise that the establishment of distinct 'ecological' genres of works began in the visual arts. While the expression of humanity's relationship with the natural world has been a key theme throughout the history of the arts, the modern movement known as 'ecological' or 'eco-' art is generally dated back to the rise of modern environmentalism in the 1960s. In 1962, conservationist Rachel Carson published *Silent Spring*, a book which exposed the ecological damage being caused by the spraying of crops with pesticides, and which is now credited with having kick-started the environmentalist movement. The same year, Joseph Beuys, a German artist who went on to co-found the German Green Party, proposed a performative 'action' to clean up the polluted Elbe River in Hamburg – an idea which, in its stated intention to positively impact an identified environmental problem, can be regarded as the conceptual birth of eco-art.

Another pioneering work of eco-art was Alan Sonfist's *Greenwich Village Time Landscape*, conceived and planned in 1965 (but not realised until 1978), which involved planting a forest in a disused lot in downtown New York City consisting entirely of plants and trees which populated the area at the time of the arrival of the first 16th-Century Dutch settlers, thus serving as "a constant reminder of the value of the land's historical past and the fragility of our environment" (Brown, 2014, p. 13). The first practically realised works of eco-art, meanwhile, came in 1968, with Agnes Denes's ritualistic performance *Rice/Tree/Burial*, which she described as "a symbolic 'event' [which] announced my commitment to environmental issues and human concerns … [and] is considered the first ecological realization in public art" (Denes, 2012); and Nicolás García Uriburu's *Coloración del Grand Canal*, in which he dyed Venice's Grand Canal green "to protest the polluting of these waters" (Molina, 2015). The next few years saw a surge in the environmentalist movement, with the establishment of the US Environmental Protection Agency, the UNESCO Man and Biosphere Programme and the UN Environment Programme, the founding of Friends of the Earth and Greenpeace, and the first International Earth Day all happening in the years between 1969 and 1972. The same period saw the aforementioned pioneering artists joined by others such as Helen and Newton Harrison, Hans Haacke and Bonnie Sherk, who all began responding to the growing environmentalist movement by creating works which explicitly addressed ecological issues (Matilsky, 1992; Weintraub, 2012; Brown, 2014).

A growing number of artists continued to produce ecologically-concerned art throughout the 1970s and 80s; however, it was not until 1990 that an exhibition at the Center for Contemporary Arts of Santa Fe entitled *Revered Earth*, curated by Dominique GW Mazeaud and Robert B. Gaylor, brought together a group of artists "whose primary concerns have been an affirmation toward the planet" (Gaylor, 1990, p. 5). In her essay for the exhibition catalogue, titled 'The

Ecological Imperative', Suzi Gablik explained the environmentalist purpose of the art collected in the exhibition:

> It may well be the case that, in itself, art will never save the world; but saving the world is not the same as saving the phenomenon 'world' itself, which is something art *can* do: it can help to reconnect us to the world as something precious and worthy of protection … The real message of these artists' works, if properly assimilated, has the potential to reconfigure our intellectual, emotional, physical and spiritual orientation in the world. (Gablik, 1990, p. 7)

Two years later, a major exhibition at the Queens Museum of Art in New York entitled *Fragile Ecologies: Contemporary Artists' Interpretations and Solutions*, curated by Barbara C. Matilsky, provided a retrospective of ecologically-concerned art from the previous three decades. The book which accompanied the exhibition constituted the first significant publication on this movement, and outlined some of the ways in which art might possess genuine agency in regard to modern ecological issues:

> Artists are in a unique position to effect … environmental changes because they can synthesize new ideas and communicate connections between many disciplines. They are pioneering a holistic approach to problem solving that transcends the narrow limits of specialization. Since art embodies freedom of thought, spirit, and expression its creative potential is limitless. Art changes the way people look at reality. In its most positive mode, art can offer alternative visions. (Matilsky, 1992, p. 3)

To describe the works gathered together in the *Fragile Ecologies* exhibition, Matilsky used the collective term 'ecological art', and in so doing, became the first person to explicitly frame it as a distinct movement in its own right. Up until this point, Matilsky observed, "critics and curators often lumped dissimilar artists together, which resulted in a confusion of different sensibilities and tendencies that continues to this day" (ibid., p. 38). Matilsky was referring to the common practice of conflating art which addressed ecological issues with the movement known variously as 'land art', 'earth art', or 'earthworks', in which the 'environment' merely served as site or material for works, and terming it all 'environmental art'. The distinction was important to make, since, as Matilsky pointed out, "[n]ot all environmental art is environmentally sound nor does it carry an ecological message" (ibid., p. 43); in fact, she noted of many works of land art that "their aesthetic was inherently insensitive, based on the mastery of nature" (ibid., p. 43). In order to make a clear distinction, Matilsky provided the following definitions:

Environmental art

encompasses a variety of forms that reflect a wide range of approaches to nature … [including] 'earth art' or 'earthworks' … temporary site-specific sculptures … indoor gallery installations in which the artist transforms the space into a field of growth … [works that] include animals as art … works that use elements of nature to interpret specific ecological problems … [and] outdoor ecological artworks that introduce flora and fauna into the city. (ibid., pp. 36-7)

Ecological art

provides solutions to the problems facing natural and urban ecosystems, or by interpreting and framing the problems through a variety of media … [espousing] a new approach to art and nature based upon environmental ethics. (ibid., p. 56)

Sam Bower, executive director of greenmuseum.org, broadly echoes Matilsky's definitions in his 2010 article 'A Profusion of Terms', in which he positions eco-art as a sub-category of environmental art:

Environmental art

an umbrella term encompassing 'eco-art' / 'ecological art', 'ecoventions', 'land art', 'earth art', 'earthworks', 'art in nature' and even a few other less-common terms. (Bower, 2010)

Eco-art / ecological art

a contemporary art movement which addresses environmental issues and often involves collaboration, restoration and frequently has a more 'eco-friendly' approach and methodology. (ibid.)

Both Matilsky's and Bower's definitions place a clear emphasis upon works which suggest or embody some form of practical ecological intervention or restoration. Thus, for them, eco-art generally fulfils a dual purpose: first, in its role in informing and inspiring audiences about ecological issues; and second, in modelling potential practical solutions. In recent years, however, as eco-art has grown to become a significant artistic movement, the conceptions of eco-art adopted by the growing number of international exhibitions and curatorial and critical texts devoted to it have tended towards a broader definition, expanding beyond restorationist works to become inclusive of works of painting, photography, sculpture, multimedia and performance art with ecological meanings or messages. This more inclusive definition is reflected by its entry in the Oxford English Dictionary:

Environmental art, *n*.

(originally) art characterized by the creation of a three-dimensional space intended to be experienced from within (cf. *environment*); (now also) art which manipulates or comments upon the natural environment (cf. *earth art*).

(OED Online, 2017c)

Eco—, *comb. form*

2. Forming nouns with the sense 'ecological —'.

c. Denoting intellectual, literary, or artistic works having an ecological or environmentalist theme.

(a) In general use: *eco-documentary, eco-novel, eco-opera,* etc.

(b) eco-art

(OED Online, 2017d)

In the twenty-five years since the *Revered Earth* and *Fragile Ecologies* exhibitions first took the curatorial step of collecting together ecologically-concerned artworks and recognising them as a distinct new genre in their own right, eco-art has developed into a significant global movement in the visual arts, with a growing number of curated texts[2] and international exhibitions[3] devoted to it.

1.2.3 Environmental literature and ecofiction

While the scale of eco-art's recognition as a distinct artistic genre has not been replicated in other cultural forms, there have nevertheless been significant moves towards the establishment

[2] Spaid, 2002; Buckland, MacGilp and Parkinson, 2006; Natural World Museum, 2007; Manacorda, 2009; Buckland and Wainwright, 2010; Weintraub, 2012; Brown, 2014; Brady, 2016.

[3] A selection of major eco-art exhibitions since 1990's *Revered Earth* and 1992's *Fragile Ecologies* would include *Natural Reality: Artistic Positions Between Nature and Culture* (Ludwig Forum for International Art, Aachen, 1999); *Ecovention: Current Art to Transform Ecologies* (Cincinnati Contemporary Arts Center, Ohio, 2002); *Groundworks: Environmental Collaboration in Contemporary Art* (Regina Gouger Miller Gallery, Pittsburgh, 2005); *Beyond Green: Toward a Sustainable Art* (Smart Museum of Art, Chicago, 2005); *Weather Report: Art and Climate Change* (Boulder Museum of Contemporary Art, Boulder, 2007); *Time Out: Art and Sustainability* (Kunstmuseum, Liechtenstein, 2007); *Greenwashing: Environment – Perils, Promises and Perplexities* (Fondazione Sandretto Re Rebaudengo, Turin, 2008); *Radical Nature: Art and Architecture for a Changing Planet 1969-2009* (Barbican, London, 2009); *Earth: Art of a Changing World* (Royal Academy of Arts, London, 2009); *Rethink: Contemporary Art and Climate Change* (National Gallery of Denmark, Copenhagen, 2009); *In the Balance: Art for a Changing World* (Museum of Contemporary Art, Sydney, 2010); *Expo 1: New York* (Museum of Modern Art, New York, 2013); *Ignite! The Art of Sustainability* (Pasadena Museum of California Art, 2014); *Here Today…: 50 Years of the IUCN Red List* (Old Sorting Office, London, 2014); *Rights of Nature: Arts and Ecology in the Americas* (Nottingham Contemporary, 2015); *ArtCOP21* (various venues, Paris, 2015); and *The Edge of the Earth: Climate Change in Photography and Video* (Ryerson Image Centre, Toronto, 2016); as well as the many exhibitions and events staged by the Natural World Museum between 2004-08, and by Cape Farewell from 2003 to the present.

of equivalent ecologically-concerned genres in other areas, particularly in literature and film. In the former, we find the term 'environmental literature' first used as a generic category in a 1985 publication by the Modern Language Association of America (MLA), edited by Frederick O. Waage, entitled *Teaching Environmental Literature: Materials, Methods, Resources*, which comprises nineteen outlines for courses "that combine humanities and environmental studies disciplines, with literature and writing as major components" (Waage, 1985, p. viii). However, as Greg Garrard observes, in this instance, "[a]side from an excursion into sci-fi, 'environmental literature' meant nature writing and regional literatures (American, by default)" (Garrard, 2010, p. 48). Ten years later, however, Lawrence Buell's ecocritical text *The Environmental Imagination: Thoreau, Nature Writing, and the Formation of American Culture* (1995) also favoured the term 'environmental literature' as a more inclusive alternative to 'nature writing' which Buell felt was "restrictive both in its implied identification of 'nature' as the writer's exclusive field of environmental vision and in its tendency to exclude borderline cases like eclectic travel and autobiographical and sermonic material" (Buell, 1995, p. 429). Glotfelty and Fromm's aforementioned collection *The Ecocriticism Reader*, published the following year, meanwhile, divides its ecocritical studies into 'Ecocritical Considerations of Fiction and Drama', and 'Critical Studies of Environmental Literature', also employing the term 'environmental literature' to refer to an inclusive category, with nature writing characterised as simply "[o]ne flourishing form of environmental literature" (Glotfelty, 1996, p. xxxi). In general, then, environmental literature appears to be the literary equivalent of environmental art: an umbrella term for works which simply take the 'environment' in its broadest sense as their focus or subject, but which do not necessarily involve an engagement with ecological issues.

In the fields of fiction and poetry, however, the prefix 'eco-' has increasingly begun to be adopted to refer to works which *do* specifically address ecological issues. A 1971 volume of short stories edited by John Stadler entitled *Eco-Fiction* was the first to use the term in describing its "collection of short stories that reveals man's position in the environmental crisis" (Stadler, 1971, front cover). Jim Dwyer's *Where the Wild Books Are: A Field Guide to Ecofiction* (2010) provides a comprehensive survey of ecofiction since this first collection, giving the following definition of the genre:

> Although most any text can be analyzed ecocritically, some are more inherently ecological than others, including many works of contemporary fiction. Fiction that deals with environmental issues or the relation between humanity and the physical environment, that contrasts traditional and industrial cosmologies, or in which nature and the land has a prominent role is sometimes called ecofiction. (Dwyer, 2010, pp. 2-3)

Contemporary ecofiction has also begun to develop its own subgenres, perhaps the most notable of which is climate fiction, or *cli-fi*, a type of science fiction writing which focuses upon possible future scenarios surrounding the impacts of climate change upon human civilisation, examples of which can be found in collections such as *Loosed Upon the World: The Saga Anthology of Climate Fiction* (Adams, 2015) and *Cli-Fi: Canadian Tales of Climate Change* (Meyer, 2017).

1.2.4 Ecocinema and ecotheatre

As in literature, recent texts in ecocritical film studies have begun using the term 'ecocinema' (Lu and Mi, 2009; Gustafsson and Kääpä, 2013; Rust, Monani and Cubitt, 2013) to refer to a distinct genre of film which explicitly addresses ecological issues. Paula Willoquet-Maricondi provides a comprehensive definition of the genre in *Framing the World* (2010):

> The term ecocinema has gained currency to describe films that overtly engage with environmental concerns either by exploring specific environmental justice issues or, more broadly, by making 'nature,' from landscapes to wildlife, a primary focus. As a category of media, ecocinema cuts across genres and modes of production, encompassing full-length and short fiction, documentary, and experimental films/videos that actively seek to inform viewers about, as well as engage their participation in, addressing issues of ecological import. Thus, these films strive to play an active role in fostering environmental awareness, conservation, and political action. Ecocinema also encompasses those films that in a broader, more philosophical way compel us to reflect upon what it means to inhabit this planet: that is, to be a member of the planetary ecosystem or 'ecosphere' (see Rowe) and, most important, to understand the value of this community in a systemic and nonhierarchical way. (Willoquet-Maricondi, 2010, pp. 9-10)

Willoquet-Maricondi makes a clear distinction between ecocinema and Hollywood-produced 'environmentalist' films, using David Ingram's definition of the latter as films "in which environmental issues are central to the narrative but where the environment is merely a backdrop to human drama" (ibid., p. 9). Scott MacDonald, meanwhile, reinforces this distinction, stating that "the fundamental job of an ecocinema is not to produce pro-environmental narratives shot in a conventional Hollywood manner (that is, in a manner that implicitly promotes consumption)" (MacDonald, 2013, p. 20); however, he also has a more specific conception of what constitutes ecocinema, using the term to referring to films which

"offer audiences a depiction of the natural world within a cinematic experience that models patience and mindfulness – qualities of consciousness crucial for a deep appreciation and an ongoing commitment to the natural environment" (ibid., p. 19). Theatre, meanwhile, has also begun adopting new generic terminology, such as 'green theatre' (Jacobson, 1992; Heinlein, 2007) and 'ecotheatre' (Cless, 1996; Davis, 1997; Standing, Schafer and James, 2014) to refer to the growing number of works for the stage which address ecological issues.

1.2.5 Ecomusic?

In music, the environmentalist protest song perhaps constitutes the most widely-recognised ecologically-engaged genre, with a strong tradition that, as in the visual arts, dates back to the founding of the modern environmentalist movement. In *Ecomusicology: Rock, Folk, and the Environment* (2012), Mark Pedelty uses the phrase "environmental music" (Pedelty, 2012, p. 18) to describe music which addresses ecologically-concerned themes; however, for Pedelty this generally means songs with environmentalist lyrics. With regard to non-lyric-based musical forms, meanwhile, a few individual artists have made some movements towards proposing specific ecologically-concerned compositional approaches. François-Bernard Mâche states that the purpose of his music, which involves the use of environmental sound as a direct compositional model, represents "a seeking outside man and his own musical conventions the source of a new music, which could be both an instrument of knowledge and intercessor of harmony with the world" (Mâche, 1992, p. 190); while Walter Branchi characterises his electronic compositions as 'eco-music', stating that "[i]t is a music that goes beyond the concept of the world centered exclusively on anthropocentric values, but is based on ecocentric values … It is a music interwoven into a network of interdependent relationships with the world outside … [in which the listener] is not the center of the happening, but is included; he listens to music, listening to the environment" (Branchi, 2012, p. 71). Clarinetist David Rothenberg, meanwhile, whose musical practice has included 'jamming' with birds, whales and insects, offers his view that music "can help us discover the limits of nature by putting forth newly creative ways of fitting into a surrounding world. This is why there are so many kinds of music that could be called 'environmental' – those musics that create worlds, places to move into" (Rothenberg, 2009, p. 10). Perhaps the most prominent example of a composer whose work is often represented as being inherently 'ecological' in some way is John Luther Adams, whose numerous orchestral works are frequently identified, both by the composer himself and by critics, as having a fundamental connection to contemporary ecological issues. Adams himself has declared that "[a]s a composer it is my belief that music can contribute to the awakening of our ecological understanding" (Adams, 2009, p. 1), and has expressly identified his Pulitzer and Grammy award-winning work *Become Ocean* (2013) as a musical metaphor for the

consequences of climate change; while critic David Shimoni describes Adams's work as 'ecocentric' (Shimoni, 2012).

Despite these isolated examples, however, there has not as yet been any significant curation of a specific 'ecological' genre in music. The reasons for this are not entirely clear; however, it might be proposed that, while ecomusicology has demonstrated the potential for identifying ecological resonances within works of instrumental music, their general lack of the concrete narratives or clear symbolic meanings found within the visual arts, literature, film and theatre makes it less straightforward – and perhaps less desirable – to define them according to a specific ecological intention or message. However, this is not to say that, as global concern regarding ecological issues continues to increase, such a genre will not become established in the future.

1.2.6 Exclusion of sound art from eco-art curations

While it is thus in the medium of the visual arts that the curatorial act of gathering together and defining a distinct 'ecological' genre has had the most significant and widespread impact, it is also evident that this has established a precedent for the recognition and promotion of common bodies of ecologically-engaged artistic practice now being adopted within various other art forms. In sound art, however, such an ecological genre has yet to be recognised. This would perhaps not be a problem if ecologically-concerned works of sound art were included within curated exhibitions and textual surveys of eco-art; however, as with ecocritical art histories, the scope of eco-art has so far been almost exclusively limited to the visual arts. Linda Weintraub's extensive review of the field, *To Life! Eco Art in Pursuit of a Sustainable Planet* (2012) provides a stark example of this, with a taxonomy which divides the field into eleven kinds of art practice including paint/print, sculpture, performance, photo/video, bio art, generative art, social practice, digital art, installation, public art, and design – but with sound art nowhere to be found (Weintraub, 2012, pp. xviii-xxi). In all of the other aforementioned textual surveys of eco-art currently available, the only sound works to be found are in Andrew Brown's *Art and Ecology Now*, which features profiles of Katie Paterson's *Vatnajökull (the sound of)* and *Langjökull, Snæfellsjökull, Solheimajökull*, and Luke Jerram's Aeolian sculpture *Aeolus* – the latter of which does not really possess any tangible connection to ecological issues, and is thus strictly speaking more a work of land art than of eco-art. The only notable examples of sound art to have been included in the multitude of international eco-art exhibitions since the early 1990s, meanwhile, are Max Eastley's sound sculptures *Glacial Soundscape* (2005) and *Ice Field* (2006), which, along with his album *ARCTIC* (2006), were included within various exhibitions staged by the Cape Farewell project. Given that these constitute the only sound works amongst hundreds of visual works, however, these isolated examples might perhaps be considered the

exceptions which prove the general, yet usually unspoken, rule that eco-art really means *visual* eco-art.

This lack of inclusion of sound work within the flourishing genre of eco-art has serious consequences, resulting in a situation in which ecologically-engaged works of sound art are currently in danger of silently disappearing through the cracks, and being excluded from the discourse surrounding the cultural response to contemporary ecological issues. Furthermore, addressing this problem is not merely in the interest of the artists involved, but in that of the field of sound art as a whole: for an art form still battling to achieve the widespread public recognition enjoyed by art in almost every other medium, its active engagement with issues of such huge global importance represents a prime opportunity for sound art to impact upon public concerns and agendas outside the academic institutions and specialist circles to which it is still largely confined.

This lack of recognition for ecologically-engaged works of sound art thus constitutes the second gap which this thesis will address. It will do this through employing the curatorial strategy of identifying a selection of such works and establishing them as representative of a distinct new genre, in order that they might begin to be afforded the cultural recognition and critical engagement which are currently enjoyed by equivalent works in other art forms. As the first step towards this, the next section will proceed to determine the appropriate terminology and formulate a basic definition, which will then be used to compile an initial selection of examples of this new genre.

1.3 Ecological sound art: establishing a new genre

1.3.1 Terminology

As noted in the statement by curator Barbara C. Matilsky quoted in the previous section, until 1992's *Fragile Ecologies* exhibition ecologically-engaged works of visual art were generally conflated with many other works which had no relevance to ecological issues as part of the broad category of 'environmental art' – a situation which often meant that their fundamental ecological meaning was not properly acknowledged or engaged with. Matilsky's key curatorial act of bringing a selection of these works together and identifying them as examples of the new genre of 'ecological art', subsequently replicated across many other international exhibitions and texts, has led to a situation today in which this genre – now generally abbreviated to 'eco-art' – is widely recognised as a global artistic movement of considerable cultural, not to mention socio-political, significance. This has not only enabled an important discourse to develop around it but has also immeasurably increased the ability of works to achieve what, for many eco-artists, is their central objective: to have a genuine impact upon public awareness of

contemporary ecological issues, as well as upon the ways in which we understand and respond to them.

The current situation within sound art is still similar to that which Matilsky observed in the visual arts over twenty-five years ago: the term '*environmental* sound art' is already in limited use (Bakht, 2009; Otsuka and Sandberg, 2009; Cummings, 2010; Ear to the Earth, 2011; Koutsomichalis, 2013; Blackburn, 2015; Wright, 2015; Bianchi and Manzo, 2016), representing a broad field which is the direct equivalent of both environmental art and environmental literature – that is, encompassing all works in which the 'environment' (in its most general sense) serves as site, subject or material. I noted this broad scope in my introduction to the recent collection *Environmental Sound Artists: In Their Own Words*:

> The environmental sound artists featured in this book create works which range right across the spectrum of music and sound art, employing a wide variety of practices and approaches including (but not necessarily limited to) soundwalking, field recording, electroacoustic composition, instrumental music, sonification, sound sculptures, direct interactions with the soundscape, and the creation of immersive sonic environments. Their work exhibits an equally wide range of purposes, meanings, and messages: some aim to provide new insights about a particular environment; some investigate the sonic characteristics of particular spaces, elements, or phenomena; and some touch on cultural, socio-political, or environmental issues. (Gilmurray, 2016, p. xx)

Just as eco-art and eco-fiction have come to be established as ecologically-engaged areas of practice within the wider fields of environmental art and literature, there is now a pressing need for the same to happen with ecologically-engaged works of sound art, to ensure that their specific philosophies, meanings and methodologies are not lost, ignored or misunderstood through continuing to be conflated with the many other forms of environmental sound art.

With regard to terminology, it makes most sense to follow the convention already established in these art forms; however, a problem arises with the direct equivalent, 'eco-sound art', in that the prefix 'eco-' appears to apply only to the word 'sound', giving it the meaning 'art which employs ecological sound'. This problem is solved by returning to the original convention of employing the full word, 'ecological', in place of its abbreviation, in order to make it clear that the term applies to the art form, rather than just the sound; thus, the most suitable terminology proposed for this new genre is **ecological sound art**.

1.3.2 Definition

Having established the terminology with which to identify it, the next steps are to formulate a basic definition of ecological sound art, and to begin the curatorial process of compiling works which fall within this new genre. This process inevitably creates something of a chicken-and-egg situation: for while it is the commonalities between a collection of works that determine the characteristics of a genre, and therefore the components of its definition, the curatorial act of collecting them together in the first place necessitates the prior existence of such a definition in order to provide the criteria which determine their selection. In order to move forward, therefore, a basic definition of ecological sound art will be proposed, which will serve as the initial criteria for the curatorial compilation of a list of potential examples of the genre. A selection of works from this list will then be subjected to in-depth ecocritical listenings in Chapter Four, which will examine the various approaches and methodologies employed, and the nature of the ecological meanings and messages they contain, and which will determine the extent to which each work does, in fact, meet the criteria of the definition, which will be represented by their positioning upon a spectrum of ecological sound art. The collective outcomes of these ecocritical listenings will finally be used to formulate a more comprehensive definition of ecological sound art, including a list of the key characteristics of the genre.

In order to establish an initial, basic definition of ecological sound art, however, we will first turn back to its well-established equivalent in the visual arts. As discussed earlier in this chapter, eco-art has been variously defined as "artworks that provide solutions to the problems facing natural and urban ecosystems, or by interpreting and framing the problems through a variety of media" (Matilsky, 1992, p. 56); as an artistic movement which "addresses environmental issues and often involves collaboration, restoration and frequently has a more 'eco-friendly' approach and methodology" (Bower, 2010); and as "artistic works having an ecological or environmentalist theme" (OED Online, 2017d). Linda Weintraub, meanwhile, identifies four defining attributes possessed by works of eco-art: an ecologically relevant topic "derived from the rigorous methods of ecologists and the subjective considerations of environmentalists"; an embodiment of the principle of interconnection, "the inescapable law of links and relationships that govern all materials, all processes and all events on earth"; the incorporation of a dynamism which "emphasizes actions over objects, and changes over ingredients"; and an inherent ecocentrism which "urges humans into alignment with broader environmental directives" (Weintraub, 2012, pp. 6-7).

The common characteristic of all of these definitions of eco-art can clearly be seen to constitute its engagement with ecological issues; and this will therefore also be used as the fundamental characteristic of ecological sound art, giving it the following basic definition:

Ecological sound art: sound art whose content or subject matter displays an engagement with ecological issues.

1.4 An initial selection of ecological sound works

Having formulated a basic definition of ecological sound art, the next step is to determine whether the specific area of practice it describes contains a sufficient volume of works to merit its establishment as a distinct genre in its own right. In the early stages of this research, this was done by attempting to identify a selection of artists whose ecologically-concerned work merited their categorisation as an 'ecological sound artist'; however, this approach was ultimately decided against for a number of reasons. First, while some artists, such as Leah Barclay, Matthew Burtner and David Monacchi have made ecological issues the sole and ongoing focus of their artistic practice, for many others the ecologically-concerned works they have produced constitute just one facet of an artistic output which also explores many other subjects; thus, to characterise them as an ecological sound artist would be an inaccurate and limiting portrayal of them as an artist. Even if this were not the case, however, it was felt that it would still be undesirable to attempt to dictate to the artists involved the nature of their overall artistic identity, and it was therefore decided that the curatorial strategy would instead be applied to individual works. This means that certain artists feature more than once in the resulting list; this is merely a consequence of the fact that they happen to have produced a number of works which meet the criteria for consideration as ecological sound art, and should not be taken to imply any kind of bias towards a particular artist or their work.

The final section of this chapter will thus now proceed to take this initial curatorial step, collecting together a selection of works of sound art whose content or subject matter suggests that they might fulfil the basic criterion, stated in the definition of ecological sound art above, of displaying an engagement with ecological issues. Given the limitations of this thesis, and the multitude of complex and interconnected ecological issues that exist, it would be impractical to attempt to identify and list every single sound work which meets this criterion; therefore, the scope of this curatorial exercise will be limited to sound works which indicate an engagement with ecological issues relating to five key areas or tropes: the polar regions; trees and forests; rivers and seas; atmosphere and climate; and extinct and endangered species. The resulting list of works is thus not intended to represent a comprehensive or definitive catalogue of ecological sound art, but rather to function as a demonstration both of the validity of the present curatorial endeavour, and of the potential scope of this new genre.

It is also important to emphasise that, since this initial selection process is being undertaken prior to any kind of in-depth ecocritical analysis, the sound works listed are merely those whose content or subject matter, on initial inspection, have been identified as suggesting such an

engagement; and they must therefore, at this stage, be regarded as *potential* works of ecological sound art. The next stage in the curatorial aspect of this research will then occur in Chapter Four, when a selection of these works will be subjected to ecocritical analysis in order to determine the actual degree to which they may be considered works of ecological sound art.

1.4.1 The polar regions

Chris Watson – *Vatnajökull* (2003)
A collage of recordings tracing the journey of 10,000-year-old ice from the titular Icelandic glacier to the Norwegian sea. The piece begins with the deep, almost menacing creaking of the ice, and ends up in the open sea with the clicking of small fragments of ice, with other sounds including the harmonic howling of the Arctic wind, and the frenzied squawking of gulls.

Craig Vear – *Antarctica: Musical Images from the Frozen Continent* (2005)
A soundscape composition featuring a mix of both natural and human-made industrial sounds recorded at the Antarctic, along with layered interviews with people relating their personal experiences of time spent living and working there.

Max Eastley – *Glacial Soundscape* (2005) / *ARCTIC* (2007)
Two works created as part of the Cape Farewell project. *Glacial Soundscape* involves two large blocks of ice suspended over an amplified aluminium sheet, creating a constant dripping sound punctuated by loud and dramatic bangs from stones embedded in the ice, intended to reproduce the actual sounds made by a melting glacier. *ARCTIC*, meanwhile, is an album of twelve soundscape compositions, incorporating recordings of natural and industrial sounds, combined with those of Eastley's Aeolian instruments being played by the Arctic wind, and his own improvisations on an electroacoustic monochord.

Katie Paterson – *Vatnajökull (the sound of)* (2007) / *Langjökull, Snæfellsjökull, Solheimajökull* (2007)
The former of these two related works is a gallery installation in which a white neon sign on the wall displays a telephone number which, when dialled, connects callers to a hydrophone submerged in the Jökulsárlón lagoon in Iceland into which the titular glacier is gradually disappearing; while for the latter work, Paterson made recordings of the melting sounds of the three Icelandic glaciers of the title, pressed them onto records made from refrozen meltwater from the same glaciers, and played them until they melted.

Jana Winderen – *+4°C* (2007) / *Evaporation* (2009) / *Energy Field* (2010)

A series of compositions which combine recordings of the sounds made by melting Arctic glaciers in Greenland and Norway with deep, metallic drones which emulate the roaring in the ears heard when underwater, creating the feeling of being physically submerged in the Arctic waters.

Andrea Polli – *Sonic Antarctica* (2009)

An album featuring field recordings which convey Polli's personal experience of her time at an Antarctic research station, juxtaposed with interviews with climate scientists talking about the research they are doing at the Antarctic, as well as their own personal feelings about the issue of climate change, set to a backing of electronic sonifications of the climate data they are studying.

Cheryl E. Leonard – *Antarctica: Music from the Ice* (2009-15)

A suite of ten compositions dealing with various aspects of the effects of climate change upon the Antarctic. Each composition features a different selection of Leonard's homemade instruments made from materials gathered during her expedition there – including stones, limpet shells, kelp, sea salt, and Adélie penguin feathers and bones – combined with field recordings of the wind, sea, icebergs, elephant seals and penguins.

Douglas Quin – *FATHOM* (2010)

An album featuring four underwater recordings, two each from the Arctic and the Antarctic, focused mainly upon the wide variety of sounds made by the melting glacial ice, while the sounds of walruses and whales, and particularly the long, unearthly wails of bearded seals, also give voice to some of the wildlife for whom these polar waters are home.

Matthew Burtner and Scott Deal – *Auksalaq* (2012)

Matthew Burtner's many 'ecoacoustic' compositions utilise a sonification-based methodology to translate the sounds and dynamics of ecological materials and processes, most often those of Alaska and the Arctic, into music. *Auksalaq* (2012), realised in collaboration with Scott Deal, forms the final part of Burtner's 'Alaskan New Media Opera Triptych' (along with *Winter Raven (Ukiuq Tulucaq)* (2003) and *Kuik* (2006)) and combines a number of different approaches to realise an interactive performance which explicitly addresses the effects of climate change upon the Arctic.

Daniel Blinkhorn – *frostbYte* cycle (2012-15)

A cycle of soundscape compositions (including *wildflower*, *cHaTter*, *drift*, *chalk outline* and *red sound*) which use the sounds of melting ice at the Arctic as material for electroacoustic manipulation, sometimes in combination with other sounds or instruments.

Philip Samartzis – *Antarctica: An Absent Presence* (2014/16)
A work for radio combining field recordings of both natural and industrial sounds at the Davis Research Station with an actor narrating some of Samartzis's personal reflections from his expedition diary; subsequently expanded into a double CD of soundscape compositions, with the diary excerpts in an accompanying book which also features Samartzis's photographs of the environment and the research station.

Holly Owen and Kristina Pulejkova – *Switching Heads: Sound Mapping the Arctic* (2015)
A video work featuring an ice sculpture of a human head with binaural microphones in its ears, which listens to the sounds of the Norwegian city of Tromsø, including local people talking about the present and future effects of climate change on the region, as it steadily melts.

1.4.2 Trees and forests

Hildegard Westerkamp – *Beneath the Forest Floor* (1992)
A soundscape composition using recordings made in the forests of Vancouver Island's Carmanah Valley, processed to accentuate the natural musicality of the forest sounds, while the violent intrusion of the sounds of a chainsaw draws attention to the issue of the clear-cut logging which threatens the forest.

Francisco López – *La Selva* (1998)
A collage of field recordings made in the Costa Rican rainforest, edited down to a seventy-minute piece whose structure represents a compression of a twenty-four-hour circadian cycle.

Natasha Barrett – *Viva La Selva!* (1999)
A soundscape composition featuring processed recordings of the soundscape of the Costa Rican rainforest, and which also maps electronic sounds and human voices onto rainforest sounds in order to mimic the behaviour of natural phenomena.

Douglas Quin – *Forests: A Book of Hours* (1999)
A mix of rainforest field recordings augmented with a variety of human, instrumental and electronic sounds which both imitate and harmonise with them, encouraging us to hear the musicality of the rainforest soundscape.

David Monacchi – *Fragments of Extinction* (2002-present)
An ongoing project focused upon the soundscapes of the earth's three remaining areas of primary equatorial rainforest, utilising high-definition ambisonic recordings both for the

preservation of the fast-disappearing rainforest soundscapes, and for use as sonic material within 'eco-acoustic' compositions. The project's latest development utilises Monacchi's patented 'eco-acoustic theatre', combining his recordings and compositions with live spectrogram visualisations to realise educational and artistic presentations which engage with the dynamics of the rainforest soundscape.

David Dunn – *Autonomous Systems: Red Rocks* (2003) / *The Sound of Light in Trees* (2006)
Autonomous Systems: Red Rocks constitutes audio documentation of a project in which an automated electronic system creates a sonic feedback loop shaped by the interaction between the technological system and the living ecosystem; while *The Sound of Light in Trees* is an album of recordings of the sounds made by the pine bark beetle which is decimating the population of piñon pines in New Mexico – recordings which, Dunn has discovered, can also be utilised as an environmentally-friendly form of pest control to help combat the problem.

Adrian Newton – *Heartwood* (2014)
A site-specific work addressing the issue of dieback disease affecting the ash trees of the South Dorset Ridgeway, featuring audifications of the internal soundworld of one of these trees, and incorporating a variety of sensors which cause the sound to be directly affected by listeners' physical interactions with the tree.

Leah Barclay – *Rainforest Listening* (2015-present)
A site-specific installation realised using the free Recho app, in which field recordings of the Amazon rainforest are geotagged to specific locations and made available to listeners via their mobile devices. The work was developed in partnership with the Rainforest Foundation, to whom listeners are able to donate while they explore the soundscapes.

Mikel R. Nieto – *Dark Sound* (2016)
An album of field recordings which documents the destructive effects of the oil industry upon the natural ecosystem of the Amazon rainforest in Ecuador, moving from the sounds of frogs, insects, birds and underwater creatures to those of engines, pumps, generators and drills; while the accompanying book further explores and interrogates the issues involved, including the effects upon the rainforest's human inhabitants, and even the ecological footprint generated by the production of the work itself.

1.4.3 Rivers and seas

Softday – *Nobody Leaves till the Daphnia Sing* (2009) / *Marbh Chrios (Dead Zone)* (2010)
Two sonification-based approaches to water pollution issues in Ireland. *Nobody Leaves till the Daphnia Sing* focuses upon the issue of contaminated domestic drinking water supplies in Galway and West Limerick, combining live sonifications of the activity of *daphnia magna* water fleas, insects commonly used for the analysis of water and soil toxicity, with the performance of a musical score generated from eighteen years of data from water samples around Ireland. *Marbh Chrios (Dead Zone)*, meanwhile, takes a similar approach to the investigation of the dramatic increase in oceanic 'dead zones' (areas of seafloor with too little oxygen for most marine life), featuring the live sonification of ecological data from two such zones off the coast of Donegal, combined with the performance of a computer-generated score based on eight years of related marine and environmental data.

Matthew Burtner – *Microplastic PET* (2012)
One of Burtner's 'ecoacoustic' compositions, which addresses the problem of the plastics and other rubbish polluting the oceans and coasts in a work composed from the sounds of amplified and computer-processed plastics along with a text listing the most common rubbish objects found in the ocean.

Leah Barclay – *The Dam(n) Project* (2011-present) / *River Listening* (2014-present) / *Sonic Reef* (2017-present)
Three ongoing interdisciplinary art-science projects, each taking a variety of different approaches towards ecological issues around water. *The Dam(n) Project* focuses upon the displacement of communities in North India due to the damming of the Narmada river by hydroelectric companies. Barclay's sound works, composed from recordings of the river along with stories and songs of local people gathered in a non-violent protest against the damming, have been presented both as site-specific sound installations, and as the soundtrack to a contemporary dance work and a documentary film, each entitled *Zameen*. *River Listening* and *Sonic Reef*, meanwhile, take a multifaceted approach including the scientific study of aquatic soundscapes as a means to learn about the operation of their ecosystems and measure their ongoing health and biodiversity; public hydrophone and field recording workshops; and 'augmented reality' audio walks in which audiences experience a combination of field recordings, soundscape compositions, interviews and live feeds from hydrophones which aim to engage audiences and communities to learn about and connect with the rivers where they live in the former work, and the ecosystem of the Great Barrier Reef in the latter.

Jana Winderen – *Silencing the Reefs* (2011-14)

A project which explores the changing soundscapes of the earth's remaining coral reefs and their ecosystems through field recordings, compositions, concerts, installations and workshops, promoting greater understanding of these environments and how they are being negatively impacted by human actions.

Peter Cusack – *Soundscapes of Water Use and Abuse* (2012-present)

An ongoing project of 'sonic journalism' exploring the implications of various ways in which humans make use of this precious natural resource, including the consequences of damming of the Tigres and Euphrates rivers in Turkey by hydroelectric companies, and the ecological damage caused by the dredging of the Thames estuary, as well as more positive actions such as the flooding of an island close to Southend to recreate the original saltmarsh habitat.

Graciela Muñoz – *El Sonido Recobrado* (2014)

A work which deals with the issue of water rights in Chile. Muñoz recorded the sounds of the Baker, Chile's largest and most powerful river, which faces exploitation from a proposed hydroelectric plant, then played the recordings over twenty-eight speakers set in the bed of the Petorca, a river which has been completely dry since the 1990s as a consequence of being illegally dammed and drained by mining and agriculture companies, causing ongoing problems for local communities.

1.4.4 Atmosphere and climate

Andrea Polli – *Heat and the Heartbeat of the City* (2004) / *Airlight* (2006-7)

Heat and the Heartbeat of the City is an interactive work which allows the listener to explore projected temperature increases in Central Park caused by global warming through their sonification; while the *Airlight* series involves the sonification of data from air quality monitoring stations in Taipei, Socal and Boulder to create a real time aural representation of the levels of various atmospheric pollutants.

Peter Cusack – *Sounds from Dangerous Places* (2006-12)

A 'sonic journalism' project investigating the soundscapes of places which have undergone major ecological damage, including the Chernobyl exclusion zone, the Caspian oil fields, and sites in the UK affected by nuclear power stations, military actions, and greenhouse and landfill waste gases.

Wesley Goatley and Tobias Revell – *Breathing Mephitic Air* (2017)

An installation based on six months of air pollution data gathered in the area surrounding Somerset House, where it was presented, consisting of a surround-sound soundscape containing sonifications of three different air pollutants – nitrogen dioxide, nitric oxide and PM10 particles – whose volume corresponds to their level in the air, accompanied by the sounds of traffic, a catalytic converter and a refinery, and a visual display which dynamically depicts the data reflected in the soundscape.

James Wyness - *If We Do Nothing* (2017-present)

An ongoing series of sound installations featuring various approaches toward the sonification of climate change data. The first model combines a slowly rising electronic tone mapped to CO2 emissions with a falling tone mapped to glacier ablation spanning the years 1880-2050, with the predicted tipping points coinciding with the limits of human hearing; while the second model maps recordings of stories and myths in the native languages of the Arctic region and scientific texts on climate change onto scientific and ethnographic data. Two other models, currently in the planning stage at the time of writing, will involve the sonification of data measuring the disappearance of Arctic sea ice, and comparisons of rural and urban pollution levels in Scotland.

1.4.5 Extinct and endangered species

Various – *Suspended Sounds* (2006)

A collaborative work created for the inaugural Ear to the Earth festival in New York, in which sound artists Joan La Barbara, Joel Chadabe, Alvin Curran, David Monacchi, Aleksei Stevens, and Rama Gottfried composed 8-channel sound works from recordings of the sounds of extinct and endangered species, which were played back in an immersive sound environment designed by Alban Bassuet.

Sarah Peebles – *Resonating Bodies* (2008-present)

Conceived by Peebles and realised in collaboration with a number of other artists and ecologists, this ongoing project focuses upon pollination ecology, and particularly upon bees, whose rapidly declining numbers carry serious ecological consequences. Combining multimedia installations, community outreach projects and educational initiatives, works to date include *Bumble Domicile* (2008), an installation combining a live audio and video feed from inside a hive, a soundscape made from audio transformations of the bees and Peebles's improvisations on the shō, and live data visualisations based on the DNA sequences of the pollen; and *Audio Bee Booths* (2009-present), a series of nesting cabinets for wild solitary bees incorporating a

magnified viewing panel and headphones through which listeners can hear the sounds they are making.

Maya Lin – *What Is Missing?: The Listening Cone* (2009) / *Sound Ring* (2014)
A multidisciplinary art project, two of the central works in Maya Lin's 'last memorial' *What Is Missing?* are sound sculptures. *The Listening Cone* takes the form of a large wood and brass sculpture in the shape of a megaphone, while *Sound Ring* is a large wooden ring containing an array of eight speakers, with both sculptures providing a means for audiences to experience the sounds of a variety of extinct and endangered species and habitats.

Sally Ann McIntyre – *Collected Silences for Lord Rothschild* (2012) / *Huia Transcriptions* (2012) / *Collected Huia Notations (like shells on the shore when the sea of living memory has receded)* (2015)
Three works focused upon the extinction of birds native to New Zealand. *Collected Silences for Lord Rothschild* consists of recordings of the silences of stuffed specimens of five species of birds rendered extinct as a result of the European colonisation of New Zealand; *Huia Transcriptions* is a recording of a music box placed in a forest, playing a reproduction of the song of the Huia bird, rendered extinct in 1907, based on a written transcription from the late 19th century; and *Huia Notations (like shells on the shore when the sea of living memory has receded)* features the bird's song played on piano and cut to wax cylinder (the only sound recording medium available while the bird was alive), which is then played back on an Edison phonograph, a fragile medium which will eventually destroy the sound through its own playback.

Krista Caballero and Frank Ekeberg – *Birding the Future* (2013-present)
An installation exploring the extinction of bird species from particular regions. For each location where the work is presented, an immersive soundscape is created featuring the calls of extinct and endangered birds specific to that region. The calls of the endangered species are modified to create Morse code messages warning of their impending fate, while those of the extinct species are presented unmodified as a memory of what has already been lost; while the density of the bird calls steadily decreases over the course of the installation, in line with projected rates of extinction to the end of the century.

Softday – *Amhrán na mBeach (Song of the Bees)* (2014)
A performative work focused upon the life of honey bees and the ecological threat posed by colony collapse disorder, combining 8-channel recordings captured by a special microphone array placed inside a hive with electroacoustic transformations of the sounds, and the performance of a musical score based on scales which are 'in tune' with the bees.

Bernie Krause – *The Great Animal Orchestra:* symphony (2014) / ballet (2015) / exhibition (2016-17)

Krause has made a career from recording the sounds of the natural world; however, in recent years his recordings, along with the theories outlined in his book *The Great Animal Orchestra: Finding the Origins of Music in the World's Wild Places* (2012), have given rise to an orchestral work with composer Richard Blackford, *The Great Animal Orchestra Symphony* (2014); a ballet choreographed by Alonzo King, *Biophony* (2015); and, most recently, an exhibition at the Fondation Cartier in Paris, *The Great Animal Orchestra* (2016-17). The exhibition featured works by a number of artists engaging with the theme of animals and biodiversity in a variety of media; however, the central attraction was a large darkened room in which audiences could listen to Krause's recordings, many of which feature endangered or extinct creatures and habitats, combined with visuals by United Visual Artists consisting of a huge wrap-around spectrogram visualisation which demonstrated his acoustic niche hypothesis, with a pool of water which reflected the spectrogram while being visibly rippled by the low frequencies of the sounds.

Conclusion

As the polar ice recedes, forests continue to disappear, rivers are dammed and polluted, weather patterns grow increasingly erratic, air quality deteriorates and species continue to go extinct, the importance of a cultural engagement with the global ecological issues of which humanity is both a perpetrator and a victim becomes increasingly obvious. As Bill McKibben notes, "[w]e can register what is happening with satellites and scientific instruments, but can we register it in our imaginations, the most sensitive of all our devices?" (McKibben, 2005). As the first chapter of this thesis has demonstrated, since the 1960s an increasing number of artists have been doing just that, creating works which respond to contemporary ecological issues. In addition, in more recent years, the cultural response to ecological issues has gained increasing significance and recognition due to being engaged with both by critics, through the adoption of ecocritical approaches to the arts, and by curators, through the establishment of distinct 'ecological' genres. This trend has been evident across a range of different art forms, including visual art, literature, film, theatre and music; however, the fast-growing contemporary medium of sound art is almost entirely absent from this cultural trend, with no ecocritical engagement with sound works, and no curatorial approaches towards identifying and defining a distinct movement of ecologically-engaged sound art. This chapter has also outlined the serious consequences of this lack of ecological engagement within sound art scholarship, which means that it is currently excluded from the wider discourse surrounding the cultural response to contemporary ecological issues; while the increasing number of ecologically-engaged works of sound art are being denied both

the promotion and the focused critical engagement which the curatorial establishment of ecological genres has brought to equivalent works in other art forms.

These two distinct gaps in sound art scholarship – one critical, and the other curatorial – are what the research detailed within this thesis will address. The first steps toward addressing the second of these gaps have already been taken in the final two sections of this chapter, by first establishing the generic terminology and basic definition for the new genre of 'ecological sound art', and then using this as the basis for identifying an initial selection of potential ecological sound works relating to five key ecological areas or tropes. This initial curatorial process has resulted in the compilation of a selection of over fifty works by more than thirty artists or groups of artists, a fact which amply demonstrates the validity of – indeed, the need for – this endeavour. The following chapters will proceed to take further steps toward addressing each of the two gaps identified here by developing a new ecocritical framework specifically designed for sound art, and employing it in two distinct sets of ecocritical listenings to works of sound art, with the first focusing upon a selection of canonical and contemporary sound works, before turning the ecocritical ear towards some of the proposed works of ecological sound art identified above.

Chapter 2
An Ecocritical Framework for Sound Art

Introduction

As explored in Chapter One, since its consolidation as a school of literary theory in the early 1990s, ecocriticism has been widely adopted as a critical approach within a number of different art forms, with an increasing number of studies emerging in ecocritical art history, ecocritical film and theatre studies and ecomusicology, and with the emerging field of eco-aesthetics also offering a wider perspective upon how contemporary ecological issues manifest within arts and culture. This has enabled a significant contemporary discourse to develop around the cultural response to some of the most pressing socio-political issues of our time – a discourse from which sound art is currently excluded. Chapters Three and Four will take the first steps towards addressing this by conducting a series of ecocritical listenings to works of sound art, with Chapter Three focusing upon a selection of canonical and contemporary sound works, while Chapter Four turns its attention to those works which have been proposed as falling within the new genre of ecological sound art. In order to undertake these two sets of ecocritical analyses, however, a new ecocritical framework suitable for the analysis of works of sound art must first be developed; and this will be the core objective of the present chapter.

Ecocriticism is a wide and inherently interdisciplinary field which, as Greg Garrard notes, "draws on literary and cultural theory, philosophy, sociology, psychology and environmental history, as well as ecology" (Garrard, 2012, p. 14). Allen and Dawe make a similar observation regarding ecomusicology, stating that "an enclosure for ecomusicology is difficult to construct. With connections between music/sound, culture/society, and nature/environment, the field straddles the arts, humanities, social sciences, and sciences" (Allen and Dawe, 2016, p. 7). In addition to this interdisciplinarity, ecocriticism is still a relatively young field which, as Peter Barry states, "is still distinctly on the academic margins … and … still does not have a widely-known set of assumptions, doctrines, or procedures" (Barry, 2009, p. 239). Nevertheless, as the initial step towards the formulation of an ecocritical framework for sound art, this chapter will first proceed to determine some of the fundamental principles which underpin ecocriticism across different forms of art and culture.

2.1 Ecocritical principles

2.1.1 Purpose

As noted in the previous chapter, the first texts to engage with ecocritical issues emerged concurrently with the growth of the environmentalist movement in the 1960s and 70s; and it was the concerns of this movement which lay firmly at its core. William Rueckert's 1978 essay *Literature and Ecology: An Experiment in Ecocriticism*, in which the term 'ecocriticism' was first used, was written to address the question: "how can we apply the energy, the creativity, the knowledge, the vision we know to be in literature to the human-made problems ecology tells us are destroying the biosphere which is our home? … Let experimental criticism address itself to this dilemma" (Rueckert, 1978, p. 121). This question has been at the heart of ecocriticism ever since, giving it the fundamental purpose to reveal, analyse and evaluate the ways in which works of art and culture might inform our understanding of, and response to, contemporary ecological issues. In the field of literature, Richard Kerridge states that "[m]ost of all, ecocriticism seeks to evaluate texts and ideas in terms of their coherence and usefulness as responses to environmental crisis" (Kerridge, 1998, p. 5); while Greg Garrard notes that "[e]cocriticism is … an avowedly political mode of analysis … Ecocritics generally tie their cultural analyses explicitly to a 'green' moral and political agenda" (Garrard, 2012, p. 3). In the visual arts, meanwhile, Alan C. Braddock states that "ecocriticism promises to make art history more sustainable by raising new questions and fostering greater awareness about the visual background to one of the most pressing concerns of our day" (Braddock, 2009a, p. 27), and that an ecocritical art history represents a move to "reassess and redirect scholarly enquiry on some level, in the hope that this move would foster solutions through a transformation of environmental perception and historical understanding" (Braddock and Irmscher, 2009, p. 2). Ecocritical film studies, states Paula Willoquet-Maricondi, aims to "serve as a tool for activist viewing in the service of greater awareness and real-life engagement with ecological and environmental justice issues" (Willoquet-Maricondi, 2010, p. xii); while Aaron S. Allen argues that ecomusicology "encourages the consideration of sound and music as part of nature – as something that can both inform cultural understanding of the environment and help us reflect on humanity's place in nature. Doing so can contribute to improving environmental education in particular and to addressing the environmental crisis in general" (Allen, 2012, p. 195). The core purpose of ecocriticism across all forms of art and culture can thus be summed up as the analysis and evaluation of how cultural works might help us to understand and respond to contemporary ecological issues; and it is to this purpose that the ecocritical analysis of sound art undertaken in this thesis will also be directed.

2.1.2 Perspectives

While all ecocriticism is fundamentally united in its core purpose regarding the development of understanding around ecological issues, its precise focus is determined by a variety of different ecological philosophies and perspectives: Greg Garrard states that "no single or simple perspective unites all ecocritics" (Garrard, 2012, p. 15), while Paula Willoquet-Marricondi notes that "[n]o common specific political agenda can be said to unify the various manifestations of ecocriticism, ranging from deep ecology to social ecology, animal rights, and environmental justice" (Willoquet-Marricondi, 2010, p. 2). In his 2005 book *The Future of Environmental Criticism: Environmental Crisis and Literary Imagination*, Lawrence Buell proposes the recognition of two distinct 'waves' of literary ecocriticism in order to represent its shifting nature and progressive adoption of different types of eco-philosophy, arguing that "one can identify several trend-lines marking an evolution from a 'first wave' of ecocriticism to a 'second' or newer revisionist wave or waves increasingly evident today" (Buell, 2005, p. 17). In first wave ecocriticism, Buell explains, "'environment' effectively meant 'natural environment'" (ibid., p. 21), and its focus was largely confined to nature writing by white western men, which was analysed according to its success in promoting a harmonious relationship between humankind and the natural world, aligning it with one of the core principles of deep ecology. Buell contrasts this with a more recent 'second wave' of ecocriticism which has developed roughly since the turn of millennium, and which problematises the divisions between 'human / nature' and 'culture / nature', explores urban environments as well as natural ones, and places greater emphasis upon a political ecology which incorporates perspectives such as ecofeminism and social justice. An example of this can be found in the collection *Ecocriticism: The Essential Reader* (2014), edited by Ken Hiltner, whose chapters are divided into 'First Wave', featuring key texts from the 1960s-90s covering subjects such as Shakespeare, Deep Ecology, and ideas of wilderness and nature, and a much more extensive 'Second Wave', whose chapters cover themes such as environmental justice, race, feminism, postcolonialism, the problematising of 'nature', and contemporary ecological politics.

In her introduction to 1996's *The Ecocriticism Reader*, Cheryl Glotfelty had noted that "[e]cocriticism has been predominantly a white movement. It will become a multi-ethnic movement when stronger connections are made between the environment and issues of social justice, and when a diversity of voices are encouraged to contribute to the discussion" (Glotfelty, 1996, p. xxv). Despite second wave ecocriticism's analysis of works by women and non-western writers, however, the problem has remained that the vast majority of ecocritics themselves are still white western males – a fact pointed out by Joni Adamson and Scott Slovic in their introduction to a special themed issue of the journal MELUS (Multi-Ethnic Literature of the U.S.) on ethnicity and ecocriticism, in which they comment that "until recently the

community of ecocritics has been relatively non-diverse and also has been constrained by a perhaps overly narrow construing of 'white' and 'nonwhite' as the primary categories of ethnicity" (Adamson and Slovic, 2009, p. 6). In response to this, Adamson and Slovic propose the identification and promotion of "a new *third* wave of ecocriticism, which recognizes ethnic and national particularities and yet transcends ethnic and national boundaries; this third wave explores all facets of human experience from an environmental viewpoint" (ibid., pp. 6-7). In a later article, Slovic expands upon third wave ecocriticism, explaining that some of the new concerns it explores include local vs global concepts of place; post-national and post-ethnic conceptions of human ecological experience; the new wave of 'material' ecofeminism, and other gendered approaches including eco-masculinism and green queer theory; a greater focus upon non-human subjectivities and animal rights; a more pronounced self-reflexivity, or 'critiques from within'; and a more directly activist tendency (Slovic, 2010, p. 7). This third wave is gradually becoming more evident, with collections such as *Feminist Ecocriticism: Environment, Women, and Literature* (2012), edited by Douglas A. Vakoch, providing a much-needed ecofeminist perspective, with essays from mainly female ecocritics; and *Ecocriticism and Indigenous Studies: Conversations from Earth to Cosmos* (2016), edited by Salma Monani and Joni Adamson, collecting ecocritical essays by mainly non-western writers from a number of different countries. The contemporary coexistence of all three waves within literary ecocriticism is perhaps exemplified by *The Oxford Handbook of Ecocriticism* (2014), edited by Greg Garrard, whose diverse collection of thirty-four essays is divided into four parts: 'History', which contains chapters examining ecological themes in Medieval, Renaissance, Romantic, Modern, and Postmodern eras; 'Theory', covering subjects such as representation, environmental justice and indigenous literature, feminism, posthumanism, queer studies, phenomenology, deconstructionism, and postcolonialism; 'Genre', including humour, nature writing, lyric poetry, children's books, film studies, digital media, and 'old-time' country music; and 'The View From Here', which contains chapters on ecocriticism in Japan, India, China, Germany, and South African and African-American culture.

An examination of ecocritical art history, meanwhile, reveals that it has addressed many second wave ecocritical concerns right from its beginnings in the early 1990s, preceding their recognition in literary ecocriticism – due in part, perhaps, to the fact that the development of an ecocritical art history was predominantly down to female curators and critics such as Suzi Gablik, Barbara C. Matilsky, Dominique GW Mazeaud, Sue Spaid, Amy Lipton, and Linda Weintraub. The fields of ecocritical film and theatre studies and ecomusicology, meanwhile, have also combined first and second wave concerns from the start, possibly due to their more recent establishment around the turn of the millennium when such issues were already being adopted by the literary ecocriticism upon which they were modelled. In recent years, a growing number of examples of third wave ecocritical concerns have also become evident in these fields, such as in Gustafsson and Kääpä's collection *Transnational Ecocinema: Film Culture in an Age*

of Ecological Transformation (2013), which features essays on trends in global ecocinema by ecocritics from several continents; Denise Von Glahn's *Music and the Skillful Listener: American Women Compose the Natural World* (2013), an ecocritical examination of the work of twentieth century American female composers which takes many of its cues from contemporary material ecofeminism; Sacha Kagan's *Toward Global (Environ)Mental Change: Transformative Art and Cultures of Sustainability* (2012), which argues for the adoption of a queer ecological perspective within eco-aesthetics; and T.J. Demos's *Decolonizing Nature: Contemporary Art and the Politics of Ecology* (2016), which provides a highly political ecocritical survey of works by artists from many different areas of the globe, with a particular focus on indigenous artists and those from the Global South. In order to ensure relevance to this variety of contemporary ecological concerns, therefore, the ecocritical framework for sound art will strive to incorporate the wide range of perspectives from all three waves of ecocriticism, and will particularly keep its ears open for those aspects of sound works which speak to the various issues and concerns detailed above.

2.1.3 Approaches

Having identified the core purpose of ecocriticism and the range of principles which may inform it, the next question is how exactly these things are made manifest within the ecocritical analysis of cultural works. In his overview of literary ecocriticism, Peter Barry makes the key observation that ecocriticism need not be restricted to works with explicitly ecological subject matter:

> An ecocritical reading of a literary text is, simply, one which in some way incorporates a consideration of … [ecological] issues and concerns … Often, it is just a matter of approaching perhaps very familiar texts with a new alertness to this dimension … Ecocritical readings of canonical texts … begin by adding a different perspective, and are not limited to works which are self-evidently about nature. (Barry, 2009, p. 250)

Barry goes on to identify five key traits common to an ecocritical analysis: the application of broadly conceived ecological thinking to all aspects of a work, such as the process of its growth, its overall form and structure, and the manner in which it operates; an awareness of how the factual may be combined with the imaginative to achieve a quality of 'truth-to-life' that is favoured over the simply 'true'; the identification and analysis of explicit ecological content; the rereading of past works in light of present ecological concerns; and an eclectic approach which remains open to a diverse range of issues and types of evidence, and which means that

"ecocriticism itself is a diverse biosphere" (ibid., p. 259). Reading into this list of traits, meanwhile, reveals two main approaches which an ecocritical analysis may take: the first involves the analysis of ecological themes within a work's subject matter; while the second approach involves the identification of ecological principles within a work's form, structure and operation. These two distinct ecocritical approaches will thus be used as the guiding principle for this chapter's investigation into the key elements which might be incorporated into a new ecocritical framework for sound art.

Having thus established the core purpose of ecocriticism, the range of principles which inform it, and the two main approaches towards its application, the following sections will proceed to identify the specific elements which might be included within an ecocritical framework for sound art. It will begin by identifying some of the key components in terms of ecological subject matter through an examination of some of the major tropes that emerge from existing ecocritical texts in other art forms, before proceeding to an investigation of the ways in which ecological principles might be reflected within the form and operation of sound art as a medium, and listening as a means of engagement with a work.

2.2 Ecocritical approach I: Ecological subject matter

For the purposes of developing an ecocritical framework, the core concerns of an ecocritical engagement with a work's subject matter can be usefully divided into two main categories: the exploration of humanity's relationship with the environments and ecosystems of the earth; and the various ecological abuses, problems and crises of which humans are both a perpetrator and a victim. Ecocritical theory also tends to divide the first of these two categories into two fundamental types of environment: the natural environment, including all of the various elements considered to form part of a natural ecosystem; and the urban environment, including our human-made technologies.

2.2.1 The natural environment

I. Pastoral

Humankind's relationship with the natural world forms the dominant focus of first wave ecocriticism, where it is represented by two main tropes: pastoral, and wilderness. The former is the focus of Leo Marx's pioneering 1964 text *The Machine in the Garden: Technology and the Pastoral Ideal in America*, in which he identifies the pastoral as being born from the yearning to live a simpler, quieter life in harmony with nature, as opposed to a busy, technology-driven

urban existence. He also makes a key distinction between two different modes of pastoral which may arise from this desire: the 'popular and sentimental' kind, which manifests in naïve and romantic portrayals of rural idyll, and which may lead to a rather reactionary primitivism; and the 'imaginative and complex' kind, which demonstrates a more reflective and clear-minded manifestation of the same urge, and which may yield valuable insights as opposed to vague and undefined fantasies. In his comprehensive exploration of the pastoral, meanwhile, Terry Gifford identifies three different uses of the term: the historical form, which depicts the lives of pre-industrial humans dwelling in the countryside; a broader use, denoting any literature which celebrates country life in contrast to the urban; and, more recently, its development as a pejorative term to describe the kinds of unrealistically idealised portrayals of rural life found in Marx's 'popular and sentimental' pastorals (Gifford, 1999, pp. 1-2). Greg Garrard, meanwhile, also identifies three temporal orientations which pastoral may take: "the *elegy* looks back to a vanished past with a sense of nostalgia; the *idyll* celebrates a bountiful present; the *utopia* looks forward to a redeemed future" (Garrard, 2012, p. 37).

Ecocritics have frequently noted that the emergence of the pastoral mode in the arts in various times and places correlates to periods of large-scale urbanisation and industrialisation. Garrard identifies the origins of the pastoral in Theocritus's *Idylls*, a series of poems which celebrate the tranquillity and simplicity of rural life through the figure of the shepherd, written in the third century BCE during a period of large-scale urbanisation; and notes that Virgil's *Eclogues* from the first century BCE made reference to the environmental problems, particularly deforestation, resulting from the era's continued urban expansion. Barbara C. Matilsky (1992) notes the emergence of the first landscape paintings from Roman artists of the same period, arguing that they represented a means of connecting city-dwellers to the natural world from which they had become separated. The pastoral reached its height of popularity during the Romantic period of the eighteenth and nineteenth century, a fact attributed by many ecocritics to the increasing environmental despoilation brought about by the Industrial Revolution. Also during this period, Terry Gifford (2012) notes the emergence of a different strain of works which critique these idealised portrayals of rural life, which he terms *anti-pastoral*, and which serve as an important counterbalance to the pastoral by providing an unidealised vision which emphasises realism, displays tensions and inequalities, and challenges literary distortions and mythologies (Gifford, 2012, p. 55).

The Romantic period also saw the development of the pastoral symphony in music. Aaron S. Allen's (2011) ecomusicological analysis of a number of key examples demonstrates how, far from being the 'absolute' or 'abstract' music some critics have claimed them to be, the pastoral symphony relates clear ideas about nature which changed over time, identifying a progressive shift in tone from the 'popular and sentimental' to the 'imaginative and complex' pastoral through the eighteenth and nineteenth centuries. David Ingram, meanwhile, cites the pastoral as "the main mode by which the eco-utopian potential of music has been articulated in American

popular music since 1960" (Ingram, 2010, p. 52), noting that it primarily takes the form of either elegy – "a lyrical meditation on its loss" (ibid., p. 52) – or satire – "a denunciation of those deemed responsible for that loss" (ibid., p. 52). He identifies examples of Marx's complex pastoral in the folk songs of Woody Guthrie, Pete Seeger and Bob Dylan, and finds the anti-pastoral expressed in the country and blues songs which tell of hard toil on the land, as well as identifying a strong tradition of African-American pastoral running through hip hop and jazz.

Ecocritics also identify numerous problems with the pastoral mode. Greg Garrard (2012) points out that, despite coinciding with the Industrial Revolution, the Romantic pastoral rarely depicts nature as something that is under threat, and thus may be seen as hiding, even denying, the ecological problems and abuses taking place in the outside world; and that its exclusive focus upon the majestic and the beautiful may result in the neglect of less aesthetically grand but potentially more ecologically important places that are under threat, such as marshland. Lawrence Buell also explores the complexity of the pastoral's relationship with ecological issues, noting that "[h]istorically, pastoral has sometimes activated green consciousness, sometimes euphemized land appropriation. It may direct us toward the realm of physical nature, or it may abstract us from it" (Buell, 1995, p. 31). Despite its many problematics, however, Buell argues that modern works are shifting pastoral towards more ecocentric concerns, observing that "[a]s this ecocentric repossession of pastoral has gathered force, its center of energy has begun to shift from representation of nature as a theater for human events to representation in the sense of advocacy of nature as a presence for its own sake" (ibid., p. 52). Gifford also finds modern pastoral moving into more complex and nuanced territory, with the development of a form which he terms *post-pastoral*, characterised as "works that successfully suggest a collapse of the human/nature divide while being aware of the problematics involved. It is more about connection than the disconnections essential to the pastoral" (Gifford, 2014, p. 26). Post-pastoral works, Gifford argues, also tend to engage more explicitly with contemporary ecological issues: he cites the recent spate of works with apocalyptic themes as examples of one form of post-pastoral text, which explores questions around what the world might be like if humans continue on their current destructive course, as well as how we might learn to survive, and to rebuild our relationship with the natural world, in the face of the harsh environmental conditions that might result.

II. Wilderness

While the pastoral involves portrayals of humans dwelling within the natural world, the trope of wilderness focuses upon depictions of nature without humans: uninhabited, majestic, and even dangerous. Greg Garrard (2012) identifies three modes of wilderness writing: 'Old World' wilderness, such as that represented in the Bible, in which it constituted a place of threat, exile,

and temptation, but which could also bring eventual freedom, redemption and purity; the sublime, which found expression in the Romantic poetry of Wordsworth and Shelley, in which pleasure is taken in feelings of being awed and overwhelmed by nature's vastness and power; and the 'New World' wilderness of nineteenth century North American nature writers such as John Muir, who framed uninhabited, wild nature as a fundamental part of his cultural identity, and whose writing and political activism played a significant role in the creation of the first National Parks. Garrard identifies some of the key figures in early twentieth century wilderness writing as Mary Austin, whose *Land of Little Rain* (1903) gives voice to a female experience of wilderness; Aldo Leopold, author of *A Sand County Almanac* (1949), in which he outlined his influential 'land ethic', based on the core biocentric principle that "[a] thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold, 1949, pp. 224-5); and Edward Abbey, whose 1968 book *Desert Solitaire*, detailing life in Arches National Monument, forms a classic narrative of the redemptive power of the wilderness. Garrard finds contemporary wilderness writing, by writers such as Anne Dillard, Barry Lopez and Gary Snyder, is more disposed to focus upon threats to wilderness, acting as explicit calls for conservation and political reform rather than mere rhapsodic celebrations.

In the visual arts, Andrew Brown (2014) observes how European landscape paintings of the nineteenth century reacted against the increasing industrialisation of life and of the landscape by depicting grand scenes of the natural world as sublime wilderness, designed to inspire awe and respect at its beauty and power; and Barbara C. Matilsky (1992) comments that they represented a rediscovery of the sacred and spiritual in nature. The work of nineteenth century American wilderness painters such as Thomas Moran, along with the first generation of nature photographers led by Ansel Adams, formed the visual counterpart to Muir's New World wilderness writing; while others travelled to the tropical rainforests of Central and South America in order to record the many exotic plants, animals and tribes they saw there in paintings which, Matilsky observes, "recognized the importance of the rainforest as a vast encyclopedia of knowledge and a source of beauty long before the current public concern for its preservation" (Matilsky, 1992, p. 18).

Wilfrid Mellers's ecomusicological study *Singing in the Wilderness: Music and Ecology in the Twentieth Century* (2001) examines the various portrayals of wilderness in twentieth century classical music, from the use of the tangled forest as a metaphor for human consciousness in works by Delius, Debussy and Janáček, and Koechlin and Milhaud's musical evocations of actual rainforests, to the contrasts and connections between the jungle and the city in works by Villa-Lobos and Chávez, the relationships between wild nature and human technology in the work of Ruggles, Varèse, Partch, Reich and Sculthorpe, and finally, the reconciliation of wilderness and civilisation in the jazz-infused compositions of Duke Ellington, and Gershwin's *Porgy and Bess*. Denise Von Glahn's *The Sounds of Place: Music and the American Cultural*

Landscape (2003), meanwhile, explores how various aspects of the American landscape have been portrayed in music, from its famous wild landmarks such as Niagara Falls, the Grand Canyon and the Hudson Valley, to its cities. Her ecomusicological analyses reveals a gradual shift from a general reverence for wilderness to a more conscious exploration of the human relationship with the landscape, and the ways in which we have impacted upon it.

Ecocritics also identify a number of problematics in cultural visions of wilderness. Peter Barry (2009) finds an inherent anthropocentrism in wilderness writing's conception of the natural world as something that exists in order to be entered and explored by those who wish to 'find' themselves; while both Brown and Matilsky note that, while the work of nineteenth century North American artists might have encouraged a greater awareness and respect for the wilderness, they could also be interpreted as expressions of the principles of 'Manifest Destiny', the belief that the New World pioneers were being divinely guided to possess and conquer every part of the continent, ignoring the realities both of the environmental exploitation that resulted, and of the native human population that had already been living there for over ten thousand years. Matilsky also notes that landscape paintings depicting unspoilt wilderness were commonly collected by the rich industrialists who were also engaged in its destruction, as it allowed them to believe that their actions did not matter since there was still plenty of untouched nature still out there. She also observes that the majority of landscape painters ignored the realities of conquest and exploitation in their work, and pointed out the contradictions inherent in their welcoming of increased access to the natural world afforded by the railroad. Greg Garrard (2012), meanwhile, observes the artifice at work in many presentations of nature as 'pure' wilderness, such as Ansel Adams's use of coloured filters in his photographs, and notes that the notion that wilderness is only 'authentic' if it is free from humans can result in the historical and cultural erasure of the indigenous people who actually live there. Further, he argues, the implication that wildernesses constitute the only spaces worth protecting may serve to legitimate ecologically irresponsible behaviour in other environments, particularly the places in which we live. He warns that ecocriticism often perpetuates this unhelpful and unrealistic ideology of authenticity; and that turning from this to focus upon responsibility – what we *do*, rather than what we *are* – would provide more helpful narratives of our relationship to wild nature.

2.2.2 The urban environment and human technologies

Perhaps the most fundamental truth revealed through an examination of the common ecocritical tropes of pastoral and wilderness is the fact that they are based upon the establishment of the natural world in direct opposition to the urban environment, which is characterised as the destructive, alienating, 'unnatural' world from which we should be endeavouring to escape, and

in which our healthy relationship with nature is being replaced by an unhealthy relationship with our own human-made technologies. This implicit set of values has often been shared and reproduced by first wave ecocritical texts; however, a handful of second and third wave ecocritical studies have begun to engage more fully and openly with urban environments, questioning their portrayal as the negative flipside of the natural world, and investigating works which suggest how they might have a positive role within an ecologically progressive and responsible society. In literary ecocriticism, the first text to comprehensively challenge this trend was Michael Bennett and David Teague's collection *The Nature of Cities: Ecocriticism and Urban Environments* (1999), whose stated aims were "to point to the self-limiting conceptualizations of nature, culture, and environment built into many ecocritical projects by their exclusions of urban places … [and] to remind city dwellers of our placement within ecosystems and the importance of this fact for understanding urban life and culture" (Bennett and Teague, 1999, p. 4), and whose chapters investigate subjects such as urban nature writing, city parks, the urban 'wilderness', and ecofeminist perspectives on the city.

In addition to reappraisals of the ecological significance of the urban environment, ecocriticism has also begun to explore cultural portrayals of human technology as a positive ecological force. The visual arts lead the way in this regard, with a significant strand of ecocritical art history exploring the 'restorationist' works which propose innovative technological solutions to ecological problems, such as Hans Haacke's *Rhinewater Purification Plant* (1972), Mel Chin's *Revival Field* (1990), and SUPERFLEX's *SUPERGAS* (1996-ongoing). In ecomusicology, meanwhile, David Ingram's *The Jukebox in the Garden* (2010), explores the use of technology to create ecologically-engaged works in a number of different musical genres, such as electronica which makes use of recordings of environmental sound, and the sixties rock music which employed electric guitars and synthesisers to make music which sought to 'get back to nature', resulting in a form which Ingram terms 'electronic pastoral'; while Sabine Feisst's paper 'Negotiating Nature and Music through Technology' (2016) explores the ecological resonances of electronic works by Maggi Payne and Laurie Spiegel.

Another aspect of this topic which is increasingly being engaged with by ecocriticism is the incorporation of a strong awareness of the problematics of using modern technology to create ecologically-engaged works which, themselves, have an ecological footprint. In this regard, ecocriticism takes its lead from the field of eco-media studies, which investigates the sustainability (or otherwise) of modern forms of media production and consumption, such as in Maxwell and Miller's *Greening the Media* (2012), and *Finite Media: Environmental Implications of Digital Technologies* (2017), in which Sean Cubitt investigates the problematics of modern media production which, on the one hand, involves the consumption of vast amounts of matter and energy, "[t]he environmental and human consequences [of which] tell a dark tale of colonialism, genocide, devastated ecology, toxicity, extinctions, and a shameful legacy that will take more than decades to put right" (Cubitt, 2017, p. 10), but which on the other is the best

means we have of realising 'mediations' between humankind and the earth's ecosystems in a way which might have genuine political and ecological impact. Within the visual arts, Linda Weintraub positions the sustainable use of materials as one of the key factors which determines the validity of a given artwork's claim to 'ecocentrism' (Weintraub, 2012); while T.J. Demos raises the issue of the ecological impact of eco-art exhibitions, noting that "even as they seek to address climate change and work towards creative solutions … they contribute to the very problem of global warming by virtue of their own carbon footprint, the results of transporting artworks, maintaining the exhibition space's climate control and printing catalogues" (Demos, 2009, p. 19). Demos concludes, however, that "exhibitions focusing on art and ecology nonetheless remain urgent at this time" (ibid., p. 28), and that their ability to encourage ecological engagement and to propose imaginative solutions to ecological problems makes it imperative that they continue to be staged while striving to "somehow meet the requirements of a just sustainability" (ibid., p. 28).

As might be expected, meanwhile, the issue of sustainability has become increasingly significant within both ecocritical film studies and ecomusicology. In *The Cinematic Footprint: Lights, Camera, Natural Resources* (2012), Nadia Bozak notes that "[a]fter oil refining, the production of motion pictures is Los Angeles's worst environmental offender" (Bozak, 2012, p. 4), and undertakes a critical examination of the ecological impact of the resource extraction, usage and waste caused by filmmaking, investigating the ecological implications of the shift from celluloid-based cinema to digital filmmaking, and critiquing practices such as carbon offsetting which claim to be making the industry more sustainable. In *Eco-Sonic Media* (2015), meanwhile, Jacob Smith investigates the ecological impacts of various forms of music recording and production, as well as implementing a 'green-media archaeology' to uncover forgotten or disused forms of sonic media technologies which could provide clues to more sustainable alternatives for the future. And Mark Pedelty's *Ecomusicology: Rock, Folk and the Environment* (2012) takes an anthropological approach to the issue of sustainability in popular music recording, performance and touring, with Pedelty combining a critique of the practices of other musicians with an account of his own experiences of playing in an ecologically-conscious rock band, providing a first-hand account of the problematics of attempting to make such an activity ecologically sustainable, and the question of whether the ecological benefits can ultimately be considered to justify the costs.

2.2.3 Nature / culture

The ecocritical tropes discussed above can perhaps be summed up as the study of the relationships between human culture – including both our art, music and literature, and our cities and technologies – and the natural world; and indeed, this is how many ecocritics have

defined the field. In her introduction to *The Ecocriticism Reader*, Glotfelty states that "[e]cocriticism takes as its subject the interconnections of nature and culture" (Glotfelty, 1996, p. xix); and in his contribution to the same volume, entitled *Some Principles of Ecocriticism*, William Howarth defines an ecocritic as "a person who judges the merits and faults of writings that depict the effects of culture upon nature, with a view toward celebrating nature, berating its despoilers, and reversing their harm through political action" (Howarth, 1996, p. 69).

This assertion, however, is predicated upon a binary division between human culture and nonhuman 'nature', which some have accused of perpetuating precisely the estrangement from the natural world that it is ostensibly seeking to remedy. Howarth recognises this, problematising his definition as soon as he has made it with the observation that "although we cast *nature* and *culture* as opposites, in fact they constantly mingle, like water and soil in a flowing stream" (ibid., p. 69). Other ecocritics, meanwhile, have gone even further by calling into question the very existence of a thing called 'nature' itself. This has become a prominent question in second wave ecocriticism; however, it is by no means a new question. In 1989, before ecocriticism had become recognised as a school of critical theory, Alan Liu made the following bold statement in his text *Wordsworth: The Sense of History*:

> *There is no nature* … To believe that nature 'is' in the way a tree 'is' is to abstract the notion of essence while concealing the abstraction. Nature is an idea validating the *rightful* existence of the reservoir, brook, field, forest … More broadly, nature is the name under which we use the nonhuman to validate the human, to interpose a mediation able to make humanity more easy with itself. (Liu, 1989, p. 38)

Liu argues that 'nature' is merely a linguistic construction which has been used to place the rest of the world into a category distinct from ourselves, separating the world into 'humanity' and 'nature', 'us' and 'them'. Liu's position has since been disputed by a number of ecocritics who argue that, while his argument may be valid from the point of view of semiotics, the rigidity of his position is unhelpful when it comes to the way in which we think about the ecological issues facing the thing we call 'nature': Jonathan Bate states that "'[n]ature' is a term that needs to be contested, not rejected. It is profoundly unhelpful to say '*There is no nature*' at a time when our most urgent need is to address and redress the consequences of human civilization's insatiable desire to consume the products of the earth" (Bate, 1991, p. 56); while Terry Gifford argues that "[w]hile Liu is right to identify the word *nature* as 'a mediation', he is wrong to deny the general physical presence that is one side of that mediation. There has to be a nature to be called 'nature' … Ultimately this should lead to a debate about which notions are most useful to our survival and that of the planet" (Gifford, 2000, p. 175). Kate Soper, meanwhile, conducts a

thorough investigation into the issue of constructions of nature in her text *What is Nature? Culture, Politics, and the Non-Human*:

> It is true that we can make no distinction between the 'reality' of nature and its cultural representation that is not itself conceptual, but this does not justify the conclusion that there is no ontological distinction between the ideas we have of nature and that which the ideas are about: that since nature is only signified in human discourse, inverted commas 'nature' *is* nature, and we should therefore remove the inverted commas. In short, it is not language that has a hole in its ozone layer; and the 'real' thing continues to be polluted and degraded even as we refine our deconstructive insights at the level of the signifier. (Soper, 1995, p. 151)

Soper's argument represents the generally accepted position in most contemporary ecocriticism: that while 'nature' must on one level be acknowledged as a linguistic construction, it must *also* be recognised as signifying something tangible, which we are inflicting very real damage upon through our neglectful and destructive actions. This argument implies that if we were to go along with Liu and reject 'nature' as a *wholly* linguistic construction with no basis in reality, it would have negative consequences for how humanity regards and responds to ecological problems – something which would run counter to the core purpose of ecocriticism.

However, this supposes that 'nature' is the *only* way in which we might usefully conceive of the collective of things which are the subject of ecological concern – a position which is fundamentally challenged by Timothy Morton, who revives Liu's argument that "*[t]here is no nature*", contesting that to do away with the term altogether is, in fact, precisely what is needed in order to effectively respond to current ecological crises. In *Ecology Without Nature: Rethinking Environmental Aesthetics*, Morton employs his own deconstructive mode of ecocriticism, termed *ecocritique*, to explore the ways in which cultural works influence our understanding of the nonhuman world and our relationship to it, and uses it as a means to expose the artificiality and unhelpfulness of the category of 'nature', arguing that "'nature' is an arbitrary rhetorical construct, empty of independent, genuine existence behind or beyond the texts we create about it" (Morton, 2007, pp. 21-22). Further, Morton argues, our idea of nature is "the one thing that maintains an aesthetic distance between us and them, us and it, us and 'over there'" (ibid., p. 204), and thus perpetuates the conceptual detachment which allows humankind to continue its ecologically destructive behaviour; therefore, he concludes, "the very idea of 'nature' which so many hold dear will have to wither away in an 'ecological' state of human society. Strange as it may sound, the idea of nature is getting in the way of properly ecological forms of culture, philosophy, politics, and art" (ibid., p. 1).

However much we might agree with Morton's argument, we must perhaps question how realistic his desire that we do away with the term 'nature' altogether actually is. As T.J. Demos points out, "in my view, rejecting the term nature is not an option, even while I agree with efforts geared toward its conceptual reorientation in order to undo nature's objectification and ontological isolation. Even more, it's crucial to acknowledge nature's significance as a rallying cry within the contemporary resurgence of Indigenous and environmentalist activism, which also insists that humans are fully integrated in and part of the natural realm" (Demos, 2016, pp. 20-2). In thus acknowledging the importance of challenging essentialist conceptions of the term whilst also arguing for its preservation as a useful concept for environmentalism, Demos leans towards a position of strategic essentialism with regard to nature.

Strategic essentialism was originally conceived by literary theorist Gayatri Chakravorty Spivak as a political tactic whereby ethnic or minority groups could provisionally accept a shared identity in order to be able to mobilise as a collective entity and achieve certain socio-political goals, but without submitting to a wholly essentialist view which robbed them of their individualism (Spivak, 1988). A similar concept was outlined by feminist theorist and philosopher Luce Irigaray in her 1985 book *This Sex Which is Not One*, in which she advocated an approach which she termed 'mimesis', a strategy whereby women would playfully adopt female stereotypes in order to engage with, deconstruct and, ultimately, thwart them (Irigaray, 1985). And, indeed, it is to Irigaray that Morton turns in his 2015 paper 'This Biosphere Which Is Not One: Towards Weird Essentialism', in which he uses her work as a starting point to develop his own ecologically-focused take on strategic essentialism, arguing that "[t]he reason to admire Irigaray in particular, and employ her thought in an ecological sense, is that her use of paraconsistent logic provides an excellent foundation for thinking ecological beings" (Morton, 2015, p. 144):

> When we think the biosphere, we come close to Irigaray's thinking of Woman. It is to Irigaray that we might turn for a weird essentialism, not hamstrung by the intrinsically patriarchal metaphysics of presence, nor by the sclerotic nihilisms or reductive materialisms that are its alternatives in modern philosophy – nor by the (albeit nonviolent) refusal to speak at all of things, a refusal exemplified by deconstruction … According to weird essentialism, things are real but not insofar as they are onto-theologically more real than other things. They are real insofar as they are playful: they lie and tell the truth about themselves at the same time … This is the same as saying that reality does not come with a dotted line and a picture of scissors saying Cut Here to separate, as Plato puts it, the eidos into its components like a good butcher (Phaedrus). Butchering reality becomes impossible. Instead, the job of philosophy is to be a kind of medicine that allows me not to have an allergic reaction to a thing, a

> reaction that would cause me to butcher it to find out what it is, no matter how skillfully and 'along the joints' as Plato puts it. (ibid., pp. 142-3)

Morton's 'weird essentialism' thus establishes a position in which terms like 'nature', 'environment' and 'biosphere' are used playfully, in a way which doesn't deny the existence of the things which they refer to, but allows us to talk about them whilst also recognising that the reality of the things themselves cannot be wholly contained within the boundaries of the terminology. While this might offer one possible solution to the problematics surrounding the term 'nature', and the separation from humanity and human culture which some argue its usage inherently implies, however, it is unlikely to represent the final word on what remains one of the central and most hotly-contested issues in contemporary ecocriticism.

2.2.4 Ecological issues

So far, this section has discussed the key tropes which emerge from ecocriticism's exploration of cultural portrayals of humankind's relationship with the world we live in, demonstrating its ability to engage with a wide variety of works from throughout history in order to identify aspects which might be reappraised in the context of contemporary ecological issues. However, ecocriticism also engages with works which deal more directly and explicitly with historical and contemporary ecological issues, including those which fall within curated genres such as eco-art, eco-fiction and eco-film, with analysis focused upon the precise nature and overall success of the work's engagement with those issues. Greg Garrard (2012) identifies how this area of ecocritical concern may include both works with an explicit environmentalist message, such as Rachel Carson's book *Silent Spring* or Al Gore's film *An Inconvenient Truth*, and those which incorporate references towards ecological issues as part of a wider dramatic narrative, such as Don DeLillo's novel *White Noise*, or the Hollywood films *On Deadly Ground* and *Erin Brockovich*. Ecocriticism may also be used to highlight instances in which cultural works have concealed ecological abuses, such as Alan C. Braddock's (2009b) investigation into the late nineteenth century painter Thomas Eakins, which reveals his exclusion of any sign of Philadelphia's water pollution crisis from his otherwise 'realist' paintings of the city. Barbara C. Matilsky (1992) also notes how many North American painters of the early twentieth century, such as Charles Sheeler, depicted idealised versions of American industrial society, designed to inspire pride in its achievements and gloss over its environmental impacts, while other artists, mostly in developing countries, portrayed its harmful effects, such as in Mexican artist David Alfaro Siqueiros's 1937 painting *Echo of a Scream*.

This last example also highlights another topic which has begun to receive greater attention in second and third wave ecocriticism: that of ecological justice issues, which investigate the

ecological problems suffered by developing countries due to the actions of colonisers, businesses and governments from developed countries. One historical example of such an issue is the ecological aspects of the violence visited upon the Native American people by white Western settlers. In her ecocritical art history, Barbara C. Matilsky discusses George Catlin's 1888 painting *The Last of the Buffalo*, which depicts Native Americans hunting the animal which is central to their survival, its title referring to the fact that both are in danger of extinction due to their mass slaughter by white settlers; while Greg Garrard also explores examples such as James Welch's 1986 novel *Fools Crow*, and the 1990 film *Dances with Wolves*. While acknowledging this kind of narrative's basis in undeniable and important historical and cultural facts, however, Garrard cautions against the cultural stereotype of the 'Ecological Indian', which assumes that indigenous cultures possess a superior ecological virtue and understanding derived from spiritual animistic beliefs, and sets them in opposition to the environmentally destructive white Western male. Garrard notes that this stereotype is predominantly one of European origin, and that while aspects of it may be based in truth, its idealistic, and perhaps patronising over-simplifications and generalisations about indigenous peoples may serve to perpetuate unhelpful tropes of ignorance and primitivism. One solution to this problem is the encouragement of greater acknowledgement and appraisal of works by non-Western artists. A key text in this regard is T.J. Demos's *Decolonizing Nature: Contemporary Art and the Politics of Ecology* (2016), whose ecocritical analyses of visual art from developing countries such as Mexico and India frequently emphasise the fact that the ecological problems they are facing are very often due to the actions of first-world countries and colonisers. As Demos argues, political ecology is an important aspect of contemporary ecological issues to which the arts have significant potential to contribute:

> Since environmental stresses can be both a driver and consequence of injustice and inequality – including poverty, racism, and neocolonial violence – political ecology recognizes that the ways we regard nature carry deep implications and often unacknowledged ramifications for how we organize society, assign responsibility for environmental change, and assess social impact … My conviction is that environmentally engaged art bears the potential to both rethink politics and politicize art's relation to ecology, and its thoughtful consideration proves nature's inextricable binds to economics, technology, culture, and law at every turn. (Demos, 2016, pp. 7-8)

In addition, as noted earlier, a central part of the mission of third wave ecocriticism has been to encourage critical perspectives from non-western voices. While the third section of Glotfelty and Fromm's *The Ecocriticism Reader* contains two essays by indigenous critics, Native American writer Paula Gunn Allen, and Laguna Pueblo writer Leslie Marmon Silko, who each

examine ecological themes in the literature of their own cultures, in the main ecocriticism is still an overwhelmingly first-world, white, Western-dominated discourse. However, the recent collection *Ecocriticism and Indigenous Studies: Conversations from Earth to Cosmos* (2016), containing contributions from a range of indigenous writers from different parts of the world, represents an important step forward in this regard; and it is to be hoped that more texts might follow which open ecocriticism up towards being a truly inclusive global conversation.

As the arts respond to the large-scale ecological crises being faced by the whole of humanity, one of the major rhetorical techniques identified by ecocriticism is the apocalyptic narrative, in which dystopian visions of the future are used to dramatically illustrate the consequences of our irresponsible and destructive actions. In *The Environmental Imagination* (1995), Lawrence Buell comments:

> Apocalypse is the single most powerful master metaphor that the contemporary environmental imagination has at its disposal. Of no other dimension of contemporary environmentalism, furthermore, can it be so unequivocally said that the role of the imagination is central to the project; for the rhetoric of apocalypticism implies that the fate of the world hinges on the arousal of the imagination to a sense of crisis. (Buell, 1995, p. 285)

Greg Garrard traces the use of apocalyptic themes back to the writings of the Iranian prophet Zarathustra in around 1200 BCE, and notes its importance in Judaeo-Christian religion; while in secular writing, he finds a confluence of environmental and apocalyptic imagery in the writings of D.H. Lawrence. Garrard also notes the apocalyptic rhetoric of many key ecological texts, such as Rachel Carson's *Silent Spring* (1962), Paul Ehrlich's *The Population Bomb* (1968), James Lovelock's *Gaia: A New Look at Life on Earth* (1979), and Bill McKibben's *The End of Nature* (1989); while Buell cites examples of fictional works with ecologically apocalyptic narratives as including John Brunner's *The Sheep Look Up* (1972), Ernest Callenbach's *Ecotopia* (1975), Leslie Marmon Silko's *Ceremony* (1977), and Jonathan Schell's *The Fate of the Earth* (1982). In ecocritical art history, meanwhile, both Barbara C. Matilsky (1992) and Angela L. Miller (2009) identify one early example of an ecologically apocalyptic narrative in Thomas Cole's *The Course of Empire* (1833-36), a series of five paintings charting the course of human civilisation's presence in a landscape, from wilderness, through pastoral, to empire, then its destruction and finally desolation, when nature reclaims the landscape. Matilsky states that the paintings may have been inspired by the warnings of overpopulation given by Thomas Malthus in his 1798 book *An Essay on the Principle of Population*, reflecting its message that uninhibited 'progress' may not be in the best interests of humanity.

In contemporary culture, meanwhile, it is climate change which has become the dominant focus for apocalyptic narratives, with various ecocritics noting how this has given rise to a spate

of apocalyptic fiction in literature, such as Cormac McCarthy's *The Road* (2006) and Margaret Atwood's *The Year of the Flood* (2009), as well as in films such as *The Day After Tomorrow* (2004), *Wall-E* (2008) and *2012* (2009). However, the apocalyptic trope also comes with its own problems: Greg Garrard points out that it can provoke polarised responses, and that works may leave themselves open to being dismissed or ridiculed if they make dramatic predictions which fail to materialise; while Pat Brereton cautions that "Hollywood has made environmental apocalypse seem perversely attractive, as we frequently observe wild nature simply getting its own back on humans" (Brereton, 2016, p. 189). In music, meanwhile, the apocalyptic overtones of John Luther Adams's Pulitzer and Grammy award-winning symphony *Become Ocean* (2013) are identified by the composer in a note in the score which reads, "Life on this earth first emerged from the sea. As the polar ice melts and sea level rises, we humans find ourselves facing the prospect that once again we may quite literally become ocean" (Adams, in Ross, 2013, p. 92); while the work was described by music critic Alex Ross in *The New Yorker* as "the loveliest apocalypse in musical history" (Ross, 2013, p. 92). Aside from this example, however, apocalyptic narratives have generally not featured in ecomusicology in the same way as in ecocritical studies of other art forms. In considering this fact, Alexander Rehding observes that "the narrative arts have an obvious advantage over music in this regard. As so often, the complexities of the materiality and modes of representation of music make it difficult to adapt the same sense of crisis to the musical sphere" (Rehding, 2011, p. 410). Given the difficulty of conveying a sense of urgency about impending ecological crises, Rehding recommends that composers instead try to "appeal to the power of memory, which is one area in which music is known to excel" (ibid., p. 412), arguing that being prompted to think of the wonder of natural environments of the past can impel us to a strong ethical desire to preserve them for the future, and noting that "[a]mong ecological topics, nostalgia is the quieter sister of the attention-seeking apocalypse … which [may] enlist the commemorative and community-building powers of music in the service of ecological approaches" (ibid., p. 413).

In recent years, attempts to find new ways to think about the global ecological changes being caused by human actions have given rise to the concept of the Anthropocene. Originally coined by biologist Eugene F. Stoermer in the early 1980s and popularised in the early twenty-first century by chemist Paul Crutzen (Steffen *et al*., 2011), the Anthropocene refers to a proposed new geological epoch which recognises the significance of human behaviour upon the earth's atmosphere. Scientists currently disagree about when this new epoch should be measured from: some argue that it should be dated back thousands of years to the rise of agriculture (Ruddiman *et al*., 2015), others that it should begin with the invention of the steam engine and the beginning of the Industrial Revolution in the late eighteenth century (Crutzen, 2002), and still others that it should begin in 1945 with the testing of the first atomic bomb, as well as the beginning of the rapid post-war growth in population, consumption and technological development (Zalasiewicz *et al*., 2015). Despite this lack of consensus on a start

date, as well as not having yet been officially approved as a new geological epoch, the Anthropocene has nevertheless gained widespread use in contemporary culture as a way of thinking about the influence that humankind is having upon the functioning of the earth's ecosystems. It is not without its critics: some argue that the concept places too much emphasis upon the power of humanity, reproducing the very hubris and notion of dominion over the earth which has led to this situation in the first place; while others point out that it negates ecological injustices by implying that all of humankind is equally culpable in causing the ecological crisis, when in fact it is overwhelmingly the result of the actions of First World developed countries – specifically wealthy, white western men and the structures of capitalism, colonialism and patriarchy.

Despite these criticisms, however, the Anthropocene continues to be a hugely popular and influential cultural concept; and as such, it has also begun to be adopted within ecocriticism. In *Ecocriticism on the Edge: The Anthropocene as a Threshold Concept* (2015), Timothy Clark presents the new geological epoch as a challenge to ecocriticism, arguing that traditional or institutional modes of criticism risk becoming a form of denial if they do not open themselves to change in the face of the scale, complexity and ambiguity of the ecological phenomenon that the Anthropocene represents, and coining the term 'Anthropocene disorder' to describe "a general crisis of tone and of proportion … a sense of the destructive incongruity of given norms of behaviours and thinking, without, as yet, any clear sense of an alternative" (Clark, 2015, p. 54). What is needed, states Clark, is a revision of how ecocriticism is conducted and a re-evaluation of the claims it makes, arguing that if it is to remain relevant it must adopt both a self-reflexivity which remains aware of the tendency towards denial, and a brutal honesty regarding the limits of cultural works and criticism as a force for ecological change.

In the introductory essay to *Art in the Anthropocene: Encounters Among Aesthetics, Politics, Environments and Epistemologies* (2015), meanwhile, Heather Davis and Etienne Turpin argue that "art, as the vehicle of *aesthesis*, is central to thinking with and feeling through the Anthropocene … To approach the panoply of complex issues that are aggregated within and adjacent to the Anthropocene, as well as their interconnections and interactions, it is necessary to engage with and encounter art" (Davis and Turpin, 2015, pp. 3-4). Part of the reason for this, they argue, is because of its engagement with us on a sensorial level, since "the Anthropocene is primarily a sensorial phenomenon: the experience of living in an increasingly diminished and toxic world" (ibid., p. 3); while another aspect is art's ability to help us to consider events on different timescales, since "[t]ime is central to the conceptualization of the Anthropocene, for it forces evolutionary and geological considerations into Western thought … Attuning ourselves, through poetry, art, and description, to pay attention to other times; developing techniques to begin to think through the limits of our temporal frameworks, and then thinking beyond them—these are crucial practices; in fact, they are matters of survival" (ibid., p. 12). Historian Dipesh Chakrabarty, meanwhile, argues the rise of the Anthropocene is reflective not just of how we

think about the ecological crisis, but of how feel about it, stating that "our use of the word 'Anthropocene' reflects a general mood that humans are becoming too dominant. And that mood is important to the discussion" (Koot and Chakrabarty, 2015, p. 102). An awareness and understanding of our feelings, or 'moods', is a vital to discussions around the Anthropocene, argues Chakrabarty, since it is this which ultimately determines how we respond to the science; and this is where the arts can play a pivotal role:

> Even before I make a rational proposition, I'm oriented towards the problem through my basic moods. It's something that makes me anxious, or makes me fearful, or makes me feel bad. This thought seems really important to our discussion of planetary change. Because the moment you tell people the story of how the world might become worse, more stressed, with more thunderstorms, more food insecurity, water scarcity, what they immediately experience are moods. It can be a mood of fear, it can be a mood of determination, it can be a mood of denial. Heidegger teaches us to think about these moods – they can inform thoughts that in turn inform our political, rational, or policy decisions … What actually helps people to think about these moods and experience them is precisely art. Performance, photography, paintings, films. That's where you can see that the humanities must be central to our discussion of planetary change. Science cannot address these moods that are fundamental to human action … Art gives you a kind of simulated experience, which speaks to your mood. It's entirely legitimate to say that I'm worried about climate change, and that's a mood … When I think about it, I ought to tremble with fear, I ought to feel sad. That's why moods are very important. (ibid., 2015, pp. 102-3)

The quotations above come from an interview with Chakrabarty in *The Geologic Imagination*, a book published to accompany the 2015 edition of the Sonic Acts festival, which itself formed the centrepiece of the three-year *Dark Ecology* project, which ran from 2014-16 and saw artists, scientists and academics come together in a series of expeditions, workshops, conferences and commissions, exploring ways in which the arts might help us to wrap our heads around the implications of the Anthropocene. The title of the project is taken from the ecological theory of Timothy Morton, who played a key role in the project (and whose ideas relating to ecology and the arts will be explored further in the following section), and who argues in his book *Dark Ecology: For a Logic of Future Coexistence* that "[t]he ecological era we find ourselves in – whether we like it or not, and whether we recognise it or not – makes necessary a searching revaluation of philosophy, politics and art" (Morton, 2016, p. 159). The realities of the Anthropocene, he argues, make it imperative that we are able to conceive of alternative futures, to re-imagine how things could be; and, states Morton, "[a]rt is thought from the future.

Thought we cannot explicitly think at present. Thought we may not think or speak at all. If we want thought different from the present, then thought must veer towards art" (ibid., p. 1). Malcolm Miles expresses a similar sentiment in *Eco-Aesthetics: Art, Literature and Architecture in a Period of Climate Change*, asserting that "art inflects life, just as life inflects art. Representations of ideas establish them" (Miles, 2014, p. 11), and going on to reflect that "[p]erhaps I *am* lost in a dreamworld if I imagine a postcapitalist, environmentally just and sustainably joyful society, yet unless I can imagine it I have no way to contribute to it … art … is an imaginative as well as an interruptive project, requiring a re-visioning of the world's value structures" (ibid., pp. 29-30).

The above overview indicates some of the key areas of subject matter that will be incorporated into the ecocritical framework for sound art, as it examines the ways in which works either reproduce or challenge these tropes in its views of the natural world, whether cast as pastoral idyll or dangerous wilderness; of the urban, and of human technology; of the nature/culture dualism which underpins the separation between these categories; and of the various ecological abuses, problems and crises of which humanity is frequently both a perpetrator and a victim. However, as noted earlier, this constitutes only one aspect of the ecocritical analysis of cultural works; therefore, the next section will proceed to investigate how an ecocritical framework for sound art might incorporate an examination of the ways in which the form and operation of sound works reflects ecological principles.

2.3 Ecocritical approach II: Ecological form and operation

2.3.1 Ecology and ecocriticism

The second of the two main approaches taken by ecocriticism is the identification and analysis of ecological principles in the form and operation of cultural works. The importance of coming to a proper understanding of the basic principles of ecology is outlined by Barry Commoner in his 1971 book *The Closing Circle: Nature, Man and Technology*, in which he sets out to provide the foundations for "a deeper public understanding of the origins of the environmental crisis and its possible cures" (Commoner, 1971, p. 4). Commoner argues that humanity's ecologically destructive actions stem from a fundamental conflict between the governing principles of the earth's ecosystem (the 'ecosphere') and those of human society:

> Biologically, human beings *participate* in the environmental system as subsidiary parts of the whole. Yet, human society is designed to *exploit* the environment as a whole, to produce wealth. The paradoxical role we play in the

> natural environment – at once participant and exploiter – distorts our perception of it. (ibid., p. 14)

According to Commoner, humanity's ability to address the growing ecological crisis is therefore dependent upon our ceasing to behave according to the principles of capitalist society, and learning instead to act in a way which is sensitive to the underlying principles which govern the functioning of the ecosphere. These ecological principles are summarised by Commoner in his Four Laws of Ecology:

1. Everything Is Connected to Everything Else

   > It reflects the existence of the elaborate network of interconnections in the ecosphere … the system is stabilized by its dynamic self-compensating properties; these same properties, if overstressed, can lead to a dramatic collapse.

2. Everything Must Go Somewhere

   > Nothing 'goes away'; it is simply transferred from place to place, converted from one molecular form to another, acting on the life processes of any organism in which it becomes, for a time, lodged.

3. Nature Knows Best

   > …any major man-made change in a natural system is likely to be *detrimental* to that system … the structure of a present living thing or the organization of a current natural ecosystem is likely to be 'best' in the sense that it has been so heavily screened for disadvantageous components, that any new one is very likely to be worse than the present ones.

4. There Is No Such Thing as a Free Lunch

   > Because the global ecosystem is a connected whole, in which nothing can be gained or lost and which is not subject to over-all improvement, anything extracted from it by humans must be replaced. Payment of this price cannot be avoided; it can only be delayed. The present environmental crisis is a warning that we have delayed nearly too long.

   (ibid., pp. 16-23)

Since the publication of his influential book, Commoner's Four Laws of Ecology have remained a cornerstone of ecological theory; and the identification and analysis of the ecological principles they describe within the form, structure and operation of cultural works has been a

core element of ecocritical analysis right from the beginning. In the aforementioned 1978 essay whose title coined the term 'ecocriticism', William Rueckert employs the analogy of the processes of photosynthesis and respiration carried out by green plants to characterise poetry as a renewable source of life-sustaining energy, in which creative energy is transferred from the imagination of the poet to that of the reader through its capture and storage by the poem, and its release through reading and critical discourse. Cheryll Glotfelty picks up this theme in her introduction to *The Ecocriticism Reader*, asserting that "[i]f we agree with Barry Commoner's first law of ecology, 'Everything is connected to everything else,' we must conclude that literature does not float above the world in some kind of aesthetic ether, but, rather, plays a part in an immensely complex global system, in which energy, matter, *and ideas* interact" (Glotfelty, 1996, p. xix).

In music, meanwhile, the notion of the embodiment of ecological principles in works of art might be summed up by John Cage's famous statement (which he paraphrased from Ananda K. Coomaswary, but whose origin can be traced back, via Thomas Aquinas, to Aristotle and Plato), that "the function of Art is to imitate Nature in her manner of operation" (Cage, 1967, p. 31). In the introduction to *Current Directions in Ecomusicology: Music, Culture, and Nature* (2016), Aaron S. Allen and Kevin Dawe identify the first academic text to specifically explore the relationship between music and ecology as William Gardiner's 1832 book *The Music of Nature; Or, An Attempt to Prove That What is Passionate & Pleasing in the Art of Singing, Speaking, & Performing Upon Musical Instruments, Is Derived from the Sounds of the Animated World*; and the musical imitation, reflection and expression of ecological principles and dynamics is what underpins most contemporary ecomusicological analysis of instrumental music (Mellers, 2001; Ingram, 2010; Von Glahn, 2013). And it is also a principle evident in abundance in ecocritical art history, such as in Linda Weintraub's examination of how certain works of visual art mirror ecosystems in exploring "how their forms create patterns, how these patterns congeal into constructions, how these constructions comprise networks, and how these networks function as systems" (Weintraub, 2012, p. 33).

The ecocritical analysis of works of sound art demands a similar engagement with the ways in which ecological principles are reflected within the form, structure and operation of works; and this will therefore be incorporated as a key element of the ecocritical framework for sound art. However, whereas the core areas of ecocritical subject matter identified in the previous section remain the same whichever medium is being used to explore them, and can therefore be incorporated into the framework with little or no modification, in this case the direct adoption of the ecocritical principles developed for other art forms would not be appropriate, since this would risk overlooking the particular attributes of sound as a medium, and of listening as a means of engagement with the work. Rather than continue with a detailed analysis of the ways in which ecocriticism has approached the identification of ecological principles in the form and operation of works in other art forms, therefore, the following section will examine the

relationships between some of the principles of contemporary ecological theory and of sound studies, in order to uncover some of the ways in which sound and listening in particular might exhibit those ecological principles, and which might therefore provide the basis for this aspect of an ecocritical framework for sound art.

2.3.2 The perception of ecological interconnectedness

The first of Commoner's Four Laws of Ecology – 'Everything Is Connected to Everything Else' – is perhaps the most fundamental principle of ecology. It is this principle which is the starting point for Timothy Morton's 2010 book *The Ecological Thought*, in which he terms the vast network of interconnections between everything 'the mesh', noting that "[t]he mesh of interconnected things is vast, perhaps immeasurably so … Nothing exists all by itself, and so nothing is fully 'itself'" (Morton, 2010, p. 15). Morton further explains that the mesh does not just include living or organic forms, but every 'thing' on the planet, and that "each being in the mesh interacts with others. The mesh isn't static. We can't rigidly specify anything as irrelevant" (ibid., pp. 29-30). Morton characterises our understanding of this principle as 'thinking the ecological thought':

> The ecological crisis we face is so obvious that it becomes easy – for some, strangely or frighteningly easy – to join the dots and see that everything is interconnected. This is *the ecological thought*. And the more we consider it, the more our world opens up. (ibid., p. 1)

Morton argues that striving to properly comprehend and internalise the principle of interconnectedness – 'thinking the ecological thought' – is the key to achieving the sort of ecological understanding necessary to be able to adequately address the urgent and complex ecological crises we face. However, as Morton acknowledges, this is far from straightforward:

> Thinking the ecological thought is difficult: it involves becoming open, radically open – open forever, without the possibility of closing again … We must face some puzzling questions. What is an environment? Is there such as thing as *the environment*? Is everything 'around' us? At what point do we stop, if at all, drawing the line between *environment* and *non-environment* … Does the environment include or exclude us? Is it natural, or artificial, or both? … Along with the ecological crisis goes an equally powerful and urgent opening up of our view of who we are and what we are. (ibid., pp. 8-10)

Given the complex puzzling nature of these ecological concepts, then, how do we engage with it in a way which might ultimately prove productive regarding the urgent ecological crises occurring in the real world? Morton has a suggestion as to what might assist us in further absorbing the underlying principles of the ecological thought – art:

> Studying art provides a platform, because the environment is partly a matter of perception. Art forms have something to tell us about the environment, because they can make us question reality … Since the ecological thought is so new and open, and therefore so difficult, we should expect art to show us some of the way. (ibid., pp. 8-12)

Morton is clear that the sort of art which might help us to 'think the ecological thought' is not necessarily that with explicit ecological subject matter, but rather that which demonstrates ecological principles in its form and operation; and it is therefore of paramount importance that ecocriticism applies itself to revealing these aspects of cultural works:

> What, therefore, is environmental art? If what we inadequately call the environment entails a radical openness, how does this appear in art forms? … Ecological art, and the ecological-ness of all art, isn't just about something (trees, mountains, animals, pollution, and so forth). Ecological art *is* something, or maybe it *does* something … We will soon be accustomed to wondering what any text says about the environment even if no animals or trees or mountains appear in it. (ibid., pp. 10-11)

Morton proceeds to further explore the characteristics of cultural works which embody the ecological in their form and operation, and which can thus help us to think the ecological thought of interconnectedness. The majority of Morton's examples are drawn from his own specialist field of Romantic literature – something which appears somewhat at odds with his assertion that one of art's key strengths in communicating the ecological thought is that it "gives voice to what is unspeakable elsewhere, either temporarily – one day we will find the words – or intrinsically – words are impossible" (ibid., p. 12). However, in the course of his discussion he does also reference paintings, sculptures and films – along with a handful of works of music and sound art:

> Hiding in plain sight in postmodern art is the mesh. When we … hear the intense timbres of Eliane Radigue, we become aware of an environment. And because causality works backward, we can look back and see that what was eluding us was there all the time … Ambience points to where we are right now. We are

> here. Keith Rowe, guitarist of the free improvisation band AMM, says that silence in music is 'un-intention.' The blank page, the open canvas, the silence (or quiet or, more properly, noise) around and within the music displays the medium in which and through which we're reading, listening, looking, participating … La Monte Young experimented with 'just intonation', designing tones that include many more, and more highly varied, sounds (harmonics) than the traditional equal-temperament and Christian-derived ones … Alvin Lucier experiments with the way resonance is about the material out of which sound comes and the material environment in which sounds vibrate. John Cage's *4'33"* is deliberately environmental, as its four and a half minutes of silence was written for an open-air amphitheatre. (ibid., pp. 103-8)

The examples he selects, and his focus upon the characteristics of intense timbres, harmonics and resonances, as well as the silence which frames the sound, indicates that for Morton, sound works convey a sense of the ecological through their directly sensorial highlighting of the vibrant materiality both of the resonating object itself, and of the surrounding atmosphere through which the sound travels, thus facilitating our awareness of the interconnected ecosystem of forces at play all around us.

This ability to reveal the ecosystem of dynamic relationships and interconnections between things in our environment is also a fundamental tenet of much theory within sound studies. In *Sonic Possible Worlds: Hearing the Continuum of Sound* (2014), Salomé Voegelin states that "[s]ound is the invisible layer of the world that shows its relationships, actions, and dynamics … [and] augments, expands and critically evaluates how we see the world and how we arrange ourselves to live in it" (Voegelin, 2014, p. 2). Voegelin explains that sound does not result from the mere fact of something's existence, but from the occurrence of a dynamic event; it therefore indicates not what *is*, but what is *happening*, in our environment, assisting our perception of the network of relationships between things:

> Sound … [indicates] phenomena that function not as objects or subjects, as entities, but sound the temporal connections between objects and subjects as things thinging, contingently … We do not hear entities but relationships, the commingling of things which generate a sonic world. (ibid., p. 162)

In her paper 'Geopolitics and the Anthropocene: Five Propositions for Sound', meanwhile, Anja Kanngieser explores some of the ways in which sound and listening might facilitate our ecological understanding, as well as helping us to "challenge hegemonic and violent forms of subjectivation; forms that have produced this Anthropocene moment" (Kanngieser, 2015, p. 1). Kanngieser begins the first of her propositions, *inequality*, by asserting, like Voegelin, that

"[s]ound comes from relations of things"; however, she proceeds to elaborate that "[s]ound does not just connect things; it changes them. It displaces bodies and matter – unequally and sometimes savagely … Sound brings into the world novel relations, it shifts paradigms and builds new formations" (ibid, p. 2). In its highlighting of the inequalities and imbalances that characterise the functioning of the network of ecological relationships in the Anthropocene, Kanngieser further argues that listening to sound can help to counteract one of the central problematics of this proposed geological epoch – namely its implication that all of humankind is equally responsible for an ecological crisis that has, in fact, predominantly been caused by the actions of wealthy white men in developed First World countries:

> Sound can help to differentiate the sweeping universality – and hence the seeming unchangeability – that the Anthropocene poses. In positing the effects of 'humankind' on geophysical life, it is imperative not to gloss over the very asymmetrical possession of economic-technological means for resource extraction and accumulation. The Anthropocene is predicated on exploitation, colonialism, slavery, and genocide, and any claim to an equitably 'responsible' humanity subjugates these structural brutalities. By listening to places and spaces, it is possible to discern uneven, often-obscured, and gradual processes, such as extinction and dispossession. (ibid., p. 2)

Listening to sound, then, can help us to perceive the network of relationships – the principle that 'Everything Is Connected to Everything Else' – which is fundamental to our ecological understanding, as well as indicating the inequalities that exist within those relationships. But where does this position the listener in relation to this dynamic ecological network? Are we set apart, listening in from the outside; or does sound also possess the ability to make us feel embedded within it?

2.3.3 The experience of ecological embeddedness

In *Ecology Without Nature: Rethinking Environmental Aesthetics* (2007) – the book to which *The Ecological Thought* is positioned as a 'prequel' – Morton develops his own deconstructive form of ecocriticism, termed *ecocritique*, in order to investigate the manner in which cultural works portray – and, to an extent, create – our ideas around nature and ecology. Morton begins his investigation by focusing primarily upon the classic ecocritical subject of nature writing; however, aspects of the ecocritical framework he develops point towards ways in which sound might represent a medium which possesses a particularly strong ability to evoke a sense of connection to a surrounding environment. Morton terms the core rhetorical device of nature

writing *ecomimesis*, dividing it into *weak* ecomimesis, which involves the description of an environment, and *strong* ecomimesis, which directs our attention outside the frame of the work towards the environment within which the writing itself is happening, in an attempt to evoke a sense of environment that feels unmediated. By way of example, Morton opens the first chapter of *Ecology Without Nature* with three short passages of strong ecomimetic writing, each of which involves the description of his own sensorial perceptions of a different environment in which he claims to be writing. If we break down these ecomimetic passages, however, we find that one sense in particular predominates: listening. Whether deliberately or unconsciously, Morton lists ten sounds over the course of his three ecomimetic examples, compared to only three sights, three smells, and two physical sensations. Morton makes no reference to this clear bias towards sound and listening as the predominant element in his ecomimetic writing; however, it perhaps suggests that descriptions of sonic events are the most effective way to achieve a strong ecomimesis, since – as noted in the previous section – they tell us not only what *is*, but what is *happening*, in an environment, evoking not just a collection of objects 'over there', but dynamic events happening 'right here, right now', and thereby placing us not only in space, but also in time.

Morton proceeds to explain that ecomimesis "involves a poetics of *ambience* … [which] denotes a sense of a circumambient, or surrounding, *world*" (ibid., p. 33). Morton divides this ambient poetics into six key elements: *rendering*, the end result of an ambient poetics, in which an environment is simulated so that we temporarily suspend our disbelief and perceive it as real rather than as an artificially constructed and mediated effect; the *medial*, which is the element of a message which foregrounds the medium through which, and the environment within which, it is delivered; the *timbral*, which is the focus upon the particular quality of a sound rather than its meaning, and which again draws our attention from the message towards the medium from which it comes; the *aeolian*, which gives the sense of dynamic environmental events occurring without the need for an author or subject; *tone*, which is the specific quality of the vibrations or events that serves to generate an overall mood or atmosphere; and the *re-mark*, which is the element of a sign which tells us that it is a significant sign, that it is foreground rather than background. Once again, the predominance of sound in Morton's deconstructive ecocriticism is notable, with three of the six elements of ambient poetics – the timbral, the aeolian, and tone – borrowed directly from the language of sound, and Morton also relying heavily upon sonic examples in his explorations of both the medial and the re-mark. All of this reaching towards sound and listening in Morton's deconstructive ecocritique of nature writing suggests that, to a large degree, ambient poetics represents writing's attempt to attain the ambient qualities possessed and exemplified by sound; something which leads us to the proposition that sound might represent the medium with the most potent ability to conjure up, or 'render', the sense of an immediate and surrounding environment.

Numerous texts within sound studies support this hypothesis: in *The Tone of our Times: Sound, Sense, Economy, and Ecology* (2014), Francis Dyson notes that "[s]ensation is heralded by noise – the noise of movement, not of things. Sensation flickers on the skin and gathers up the body, pulls it out of its tempestuous inner monologue, and presents it with the world" (Dyson, 2014, p. 109); while in his acoustic ecology-based text *Acoustic Communication* (2001), Barry Truax states that "[l]istening … is the primary interface between the individual and the environment … Moreover, listening habits create a *relationship* between the listener and the environment … the interlocking behavior of sound, the listener, and the environment [are understood] as a *system* of relationships, not as isolated entities … With sound, everything interacts with everything else" (Truax, 2001, pp. xviii-xix). Comparable observations can also be found in ecomusicology: in *Music and the Skilful Listener: American Women Compose the Natural World* (2013), Denise Von Glahn observes that the fact that music "surrounds us and enfolds us in space simulates our relationship within the all-embracing natural world" (Von Glahn, 2013, pp. 6-7), and argues that the act of listening to it encourages a mode of being in the world based on "growing into an environment rather than insisting upon reshaping it" (ibid., p. 322). In *The Jukebox in the Garden: Ecocriticism and Popular Music Since 1960* (2010), meanwhile, David Ingram explores the notion of 'eco-listening', "the claim made by some eco-philosophers and musicians that the activity of listening itself has a special role to play in the formation of ecological awareness" (Ingram, 2010, p. 16), and which suggests that the aural might have the potential to communicate the principles behind the ecological thought more effectively than the visual:

> The notion that music is the art form best suited to fostering the ecological self is a corollary of the long-standing suspicion of visuality in Western culture, which holds that the dominance of the visual sense in human beings encourages a sense of separation between subject and object, or human perceiver and things in the world, which has had disastrous consequences for the health of the environment … For some ecophilosophers, the sense of hearing overcomes the limitations of sight by enacting the fundamental ecological principle of holistic interconnectedness. (ibid., p. 59)

According to Ingram, notions of eco-listening fall into two broad camps: 'immersive listening', conceived as "a means of attaining a new, apparently enlightened state of consciousness in which the individual self merges with the rest of the natural world" (ibid., p. 59); and the scientific notion of rhythmic 'entrainment', "the mutual phase-locking of two or more oscillating bodies" (ibid., p. 68), which has been used by some to outline "the role that [music] can play in fostering a sense of 'community' that is expanded to include not only human beings but also the natural world itself" (ibid., p. 65). Ingram also points out, however, that the way in

which we listen to and interpret sound and music is not fixed, and tends to be largely context-dependent or socially determined; thus, "for the act of listening to music to lead to greater integration with one's environment will depend on the listener's pre-existing knowledge of, and support for, the theory of the ecological, relational self on which the theory depends" (ibid., p. 70).

Nevertheless, notions of eco-listening are adopted by numerous composers to express their hope that listening to music can provide a way for us to experience a connection with the earth's ecosystems. Classical composer John Luther Adams claims that "music can contribute to the awakening of our ecological understanding. By deepening our awareness of our connections to the earth, music can provide a sounding model for the renewal of human consciousness and culture" (Adams, 2009, p. 1); while jazz musician David Rothenberg hypothesises that "music might be an avenue toward taking in the ecology, as visual acuity has trained the human look outward upon the world we claim. If we treat each sound we hear as a part of a potentially meaningful sonic world, then the environment might have a place for us humans after all" (Rothenberg, 2009, p. 6). Sound artist David Dunn, meanwhile, proposes that music might prove to be "a conservation strategy for keeping something alive that we now need to make more conscious, a way of making sense of the world from which we might refashion our relationship to nonhuman living systems … [and which might] provide us with clues to our future survival" (Dunn, 2009, p. 97), while electronic composer Walter Branchi, argues that listening to the environment is a means of unlocking our ecological consciousness:

> I shall never tire of repeating that by learning to listen to the environment we can begin to create an awareness of our surroundings. Listening seems the most natural thing in the world, but it is actually a voluntary process that consists in choosing what we wish to underscore in a network of interrelated events … If humankind continues on the path so far undertaken, new threats for the environment and for the inhabitants of the planet will appear. The only real solution is to change ourselves and our approach to the world. We must stop thinking of the world as centered around man and realize that we are simply part, no more no less, of the environment … we must rediscover the marvels of everyday life and attune our ears to the complexity of the soundscape around us, to feel that we are all one and the same, to see in order to be seen. (Branchi, 2012, pp. 144-8)

Another text to explore the notion that our sensory experience of the earth's ecosystems might facilitate a sense of our own embeddedness within them is *The Spell of the Sensuous*, in which David Abram argues that "[h]umans are tuned for relationship" (Abram, 1996, p. ix) with the world through our five senses, and that "from all of these relationships our collective

sensibilities are nourished" (ibid., p. ix). Echoing Barry Commoner's argument that capitalist society "distorts our perception" of the earth's ecosystem and our place within it, Abram observes that in our modern, city-dwelling lives, "[w]e consciously encounter nonhuman nature only as it has been circumscribed by our civilization and its technologies … 'Nature,' it would seem, has become simply a stock of 'resources' for human civilization, and so we can hardly be surprised that our civilized eyes and ears are somewhat oblivious to the existence of perspectives that are not human" (ibid., pp. 27-8). The solution to this problem, Abram argues, lies in the rediscovery of our ecological interconnectedness with the natural environment through the cultivation of our sensorial perception of it: he states that "we must renew our acquaintance with the sensuous world in which our techniques and technologies are all rooted … [if we hope] to make sense of, and alleviate, our estrangement from the animate earth" (ibid., pp. ix-x). To cultivate our sensorial perception in this way, argues Abram, is to "enter into a sympathetic relation with the perceived … Perception, in this sense, is an attunement or synchronization between my own rhythms and the rhythms of the things themselves, their own tones and textures" (ibid., p. 54). Thus, he concludes, our sensorial perception leads us to an embodied understanding of our interconnectedness with the natural environment, and our place within the earth's ecosystem:

> As we return to our senses, we gradually discover our sensory perceptions to be simply our part of a vast, interpenetrating webwork of perceptions and sensations borne by countless other bodies … It is, indeed, nothing other than the biosphere – the matrix of earthly life in which we ourselves are embedded. Yet this is not the biosphere as it is conceived by an abstract and objectifying science … it is, rather, the biosphere as it is experienced and *lived from within* by the intelligent body – by the attentive human animal who is entirely a part of the world that he, or she, experiences. (ibid., p. 65)

One of the key elements which Abram identifies as facilitating this feeling of embeddedness within this ecological network is an awareness of the materiality of the atmosphere, and of our physical immersion within it. He observes that in Navajo culture, "the Air or Wind is the very medium in which the other natural forces live and act" (ibid., p. 236), and that similarly, "[i]n the oral, animistic world of pre-Christian and peasant Europe, all things – animals, forests, rivers, and caves – had the power of expressive speech, and the primary medium of this collective discourse was the air … The invisible atmosphere was thus the assumed intermediary in all communication, a zone of subtle influences crossing, mingling, and metamorphosing" (ibid., pp. 253-4). In contemporary culture, he argues, in which so much of our oral communication has been replaced by the written word, we have lost this awareness of the

atmosphere which surrounds us; and it is this which allows us to continue polluting it as if there were nothing there at all:

> Phenomenologically considered – experientially considered – the changing atmosphere is not just one component of the ecological crisis … our disregard for the very air that we breathe is in some sense the most profound expression of this oblivion. For it is the air that most directly envelops us; the air, in other words, is that element that we are most intimately in. As long as we experience the invisible depths that surround us as empty space, we will be able to deny, or repress, our thorough interdependence with the other animals, the plants, and the living land that sustains us … Only as we begin to notice and to experience, once again, our immersion in the invisible air do we start to recall what it is to be fully a part of this world … we feel ourselves enveloped, immersed, caught up within this sensuous world. This breathing landscape is no longer just a passive backdrop against which human history unfolds, but a potentialized field of intelligence in which our actions participate. (ibid., p. 260)

Abram's focus upon the replacement of oral communication with the written word as the root cause of our disregard of the atmosphere is, of course, ultimately speculative; and it must also be questioned how useful it is, since it is neither possible nor desirable for us to return to a purely oral culture. At the root of Abram's argument, however, lies an acknowledgement of sound as the medium through which we might regain our awareness of the surrounding atmosphere, as the sound waves generated by the movement of something distant from us penetrate our body, evidencing the materiality of the medium through which they travel, and which thus leads to an experiential sensation of embeddedness within an ecosystem of dynamic objects and forces.

2.3.4 Enabling the appreciation of nonhuman agency

Our ability to perceive the dynamic, vibrant nature of the nonhuman beings and things with whom we share the earth's ecosystems constitutes another aspect of Abram's argument for the ecological power of sound. While the visual tells us about the outside surfaces of things, Abram states, sound facilitates our perception of "the interior substance of things. For the audible resonance of beings varies with their material makeup, as the vocal calls of different animals vary with the size and shape of their interior cavities and hollows. I feel their expressive cries resound in my skull or my chest, echoing their sonorous qualities with my own materiality, and thus learn of their inward difference from myself" (ibid., p. 128). This ability to 'hear' the

interior characteristics of things does not just apply to living beings, however, but extends to inanimate, and even to ostensibly silent, objects:

> There is an expectancy to the ears, a kind of patient receptivity that they lend to the other senses whenever we place ourselves in a mode of listening – whether to a stone, or a river, or an abandoned house. That so many indigenous people allude to the articulate speech of trees or of mountains suggests the ease with which, in an oral culture, one's auditory attention may be joined with the visual focus in order to enter into a living relation with the expressive character of things. (ibid., pp. 129-30)

The proposition that we should begin listening to trees or mountains may appear counterintuitive; however, this sentiment is echoed by Anja Kanngieser, who emphasises the ecological importance of cultivating our awareness of the vibratory nature of all nonhuman beings – even those which are, in a practical sense, inaudible:

> Sound is not just about hearing and responding, or communicating. It is about becoming aware of registers that are unfamiliar, inaccessible, and maybe even monstrous: registers that are wholly indifferent to the play of human drama. Sound is not only of the human, it undermines human exceptionalism; everything vibrates on some frequency and is touched by vibration, regardless of how imperceptible to human sensibility this might be. Although this might come across as rather enigmatic, it has much political significance. (Kanngieser, 2015, p. 2)

In the second of her five propositions for sound, *imperceptibility*, Kanngieser provides some clues as to how we might begin to cultivate our awareness of these unfamiliar registers of the nonhuman: the act of listening, she argues, can help us to become attuned to the sorts of "gradual and less visible processes" (ibid., p. 3) involved in ecological change, and which therefore require a quiet and patient attentiveness. Additionally, Kanngieser argues, a careful listening to the imperceptible necessitates an acceptance of that which does not operate on human terms, encouraging a "pushing away from a sense of oneself … [in which] it might be possible to become sensitive to that which humans have no claim to, or over, and to which humanity is of no concern" (ibid., p. 3).

Cultivating our awareness of the agency of nonhuman beings and our ecological relationships with them is explored in depth by Jane Bennett in her book *Vibrant Matter: A Political Ecology of Things*. Like Abram, Bennett attributes humanity's ecological destructiveness to a deficiency in our perception of the nonhuman; however, while Abram limits

his focus to nonhuman 'nature' and the 'biosphere' of planetary life, Bennett shares Morton's conception of a vast ecological 'mesh' comprising every 'thing' on the planet, whether living or nonliving, 'natural' or human-made, and argues that a truly ecologically enlightened perspective necessitates becoming attuned to the agency of, and therefore our ecological interconnectedness with, all things – indeed, all *matter*:

> The quarantines of matter and life encourage us to ignore the vitality *of* matter and the lively powers *of* material formations … my hunch is that the image of dead or thoroughly instrumentalized matter feeds human hubris and our earth-destroying fantasies of conquest and consumption. It does so by preventing us from detecting (seeing, hearing, smelling, tasting, feeling) a fuller range of the nonhuman powers circulating around and within our bodies … The figure of an intrinsically inanimate matter may be one of the impediments to the emergence of more ecological and more materially sustainable modes of production and consumption. (Bennett, 2010, pp. vii-ix)

To indicate the inherent agency of things, Bennett adopts Bruno Latour's term *actant*, which recognises the identity of any given thing not merely in terms of its individual material existence, but also in terms of the impact it has upon other things. Bennett's own definition of the term notably includes humans as just another actant among many, stating that "an actant is a source of action that can be either human or nonhuman; it is that which has efficacy, can *do* things, has sufficient coherence to make a difference, produce effects, alter the course of events" (ibid., p. viii). In conjunction with this term, Bennett employs Deleuze and Guattari's term *assemblage* to indicate any given grouping of actants, the sum total of whose interactions and interrelationships results in a given outcome or event. The implications of this acknowledgement that everything, whether living or nonliving, possesses agency, and that we humans are merely one actant among many in an interconnected and interdependent system, states Bennett, means that "[t]he ethical task at hand here is to cultivate the ability to discern nonhuman vitality, to become perceptually open to it … This sense of a strange and incomplete commonality with the out-side may induce vital materialists to treat nonhumans – animals, plants, earth, even artifacts and commodities – more carefully, more strategically, more ecologically" (ibid., pp. 14-18).

Moreover, Bennett makes it clear that the pathway towards discerning this vitality is not only intellectual, but also sensorial: she advocates "a cultivated, patient, sensory attentiveness to nonhuman forces" (ibid., p. xiv) as the key to our awareness of their agency, arguing that "[s]uch a newfound attentiveness to matter and its powers … can inspire a greater sense of the extent to which all bodies are kin in the sense of inextricably enmeshed in a dense network of relations. And in a knotted world of vibrant matter, to harm one section of the web may very

well be to harm oneself" (ibid., p. 13). Bennett does not specifically investigate listening as a method of sensory attentiveness which might facilitate our perception of a vibrant materialism; however, the enormous potential possessed by the medium of sound, as both the direct product and the sensorial evidence of the vibration of matter, is readily apparent; and it is suggested in Bennett's explanation of how discerning the vibrant agency of nonhuman actants requires learning how to engage with the world in new ways:

> If human culture is inextricably enmeshed with vibrant, nonhuman agencies … [w]e need … to devise new procedures, technologies, and regimes of perception that enable us to consult nonhumans more closely, or to listen and respond more carefully to their outbreaks, objections, testimonies, and propositions. For these offerings are profoundly important to the health of the political ecologies to which *we* belong. (ibid., p. 108)

Bennett's advocating of practicing a close and careful listening to the articulations of nonhumans is also echoed by Anja Kanngieser. In the third of her propositions for sound, *translation*, Kanngieser argues for learning to listen to a diversity of articulations from other beings without succumbing to the temptation of trying to interpret or translate them into our own language, asserting that to do so can help us to move towards a more genuine, first-hand ecological understanding:

> Listening to other articulations can help draw out ways that various divided natural or social entities, materials, processes, and systems are constitutive of one another. Giving weight to the articulations of others, even when agnostic or irreconcilable, can contribute to intersections of struggle that do not demand equivalence or unity, and that remain reflexive to the violence and limitations at the heart of translation. (Kanngieser, 2015, p. 4)

The fourth of Kanngieser's propositions, meanwhile, articulates the fact that if we learn to recognise our embeddedness within the earth's ecosystems, our interconnectedness with the nonhuman elements we share them with, and the agency of those nonhuman elements, we will find ourselves in a shared space of interdependent coexistence: in other words, a *commons*. Kanngieser positions listening as a path towards an awareness of the earth as a space which we do not own, but share with other species, beings and matter, explaining that "[i]n cutting across matter and beings, sound renders apparent that the world is not *for* humans. The world is rather *with* humans" (ibid., p. 4). Kanngieser emphasises the fundamental principles of coexistence in this conception of the world, asserting that "[c]ommons are resources that commoners govern together, the emphasis being on the social reproductions and relations in the acts of governing"

(ibid., p. 4); however, she also points out that this does not mean that the all such commoners have the same or equal roles, and that the commons requires thinking about "how individual interests constellate into collective interests without demanding equivalence" (ibid., p. 4). Sound can help us to think about how to approach this, she argues, since it both "emerges out of exchange" and "envelops affectively, thoroughly, but also singularly; sound has general affordances, but these are contingent and always nonidentical. This is how commons must be approached, with a keen sensitivity to polyphony" (ibid., p. 4). Kanngieser further explores this topic in a paper written with Nicholas Beuret entitled 'Refusing the World: Silence, Commoning, and the Anthropocene' (2017), in which she argues that the realisation of a true ecological commons necessitates that we learn to embrace a state of passivity and silence, in order that we might allow space for the more-than-human to sound – and for us to listen.

Francis Dyson also emphasises the importance of listening to sound in creating an ecological commons: only a new sensibility, she argues, grounded in the direct sensing of the world, can hope to furnish us with the true 'common sense' necessary for the task:

> What this implies is a need to understand, to sense, and to form common sense differently – not through discourse or information, however compelling, but through sensing: and this is where sound and listening play a pivotal role … Sound's ephemeral and atmospheric nature is, like the environment, something that circulates outside of exchange, and refocuses attention on the space and the environment of the subject rather than the subject per se. The aural opens avenues toward an understanding that is arational, that evokes a grain (or rather tone) of thought and an aesthetics of listening that, I would argue, offers some entry into the dilemma of how to hear the world and in hearing, also be able to act, with the aim and existential condition of the 'in-common'. From here, it might be possible to move toward a shared sensibility, a 'communism of the senses' that builds sense, the common, and common sense simultaneously. (Dyson, 2014, p. 149)

Moreover, Dyson advocates sound art as an ideal means by which this ability to form 'common sense' can be realised, arguing that "the sounds of music, art, and resistance may in fact be changing, if not the face of the currency, then certainly its sound. In doing so, they foreshadow both a withdrawal from the self-centred but also permanently indebted individual, and an occupation of space that is at once physical, cognitive, and sensual, which is 'common' in all meanings (senses) of the word" (ibid., p. 154). Moving towards this notion of the earth's ecosystems as a commons, meanwhile, also represents one aspect of the final key ecological trait of sound and listening: that of helping us to imagine – and even to experience – new directions for the future.

2.3.5 Proposing new directions for ecological futures

In the last of her five propositions for sound, *future*, Kanngieser argues that sound can help us to imagine alternative ways of approaching relationships with the nonhuman within an ecological commons, and which remain fluid, open and cognisant of the inherent complexities and ambiguities of the ecological crisis:

> By using sound to explore political relations, matter might be brought into contact with ideology in ways that do not try to make them fit, or so that one might negate the other. Rather, it becomes possible to see how those political relations can help to build creative terrains for human and more-than-human negotiations … This is a political position, a sounding position, a position of listening and hearing, a position perhaps as competent for approaching the lichen and the deep time poetry of the volcanic rocks as for unsettling the ongoing colonization and exploitation of resources and bodies by capital. (Kanngieser, 2015, p. 5)

Salomé Voegelin also explores the ways in which listening to sound can help us to conceive of alternative ecological futures by influencing our perception not only of what the world *is*, but also, crucially, of what it *could be*:

> Listening to the landscape's pluralities and possibilities, hearing the dense multiplicity of its mobile production, allows us to challenge the singularity of actuality and articulate a different sense of place and a different sense of self that lives in those possibilities and shows us how else things could be … Sound slices through the visual frame and organisation to propose others: temporary, invisible, and ephemeral re-framings that demand our participation and re-frame the listener also. (Voegelin 2014, p. 22)

When we listen to sound, Voegelin argues, we become submerged in a 'sonic possible world', which is created and recreated by what we hear, and "which we grasp not by inference nor by synthesizing various viewpoints, but by centering, decentering, and recentering ourselves from moment to moment in the complex continuity of sound" (ibid., p. 162). Furthermore, when we emerge from the possible world that has been generated through our listening, we do not do so into the version of the world we inhabited previous to its sounding – indeed, we cannot – because the world we now inhabit will have been altered by the thoughts, perceptions and sensations that we have experienced, resulting in "a different actuality linked to and infected by new possibilities" (ibid., p. 31). Of particular importance in Voegelin's argument is thus the element of *actualising* the possible worlds created by sound works, which are intended not as

fantasies, but as a multiplicity of *possible realities*:

> The imaginary force of the sonic artwork, rather than suggesting a parallel world, autonomous from the actual world, and thus without ramification or impact on reality, presents the phantasm of the real world and lets us inhabit it as the world of 'what could be' or indeed of 'what is' if only we listened. (ibid., p. 49)

For Voegelin, this "has not only an aesthetic but also a social and political significance in that it has an impact on ideas about what the world and what the subject is presumed to be and what else they could be" (ibid., pp. 2-3); in other words, becoming submerged in the possible world of the sound work challenges the notion of any single 'correct' version of the world:

> A sonic sensibility reveals the invisible mobility beneath the surface of a visual world and challenges its certain position, not to show a better place but to reveal what this world is made of, to question its singular actuality and to hear other possibilities which are probable too, but which, for reasons of ideology, power and coincidence do not take equal part in the production of knowledge, reality, value, and truth. (ibid., p. 3)

In this respect, Voegelin argues, works of sound art are 'generative', in that they activate the creation of new and original worlds, which becomes a collaborative act between the listener and the work as "we inhabit this materiality intersubjectively, reciprocating its agency in the sensory-motor action of listening as a movement towards what it is we hear" (ibid., p. 51). Thus, the effect of the sound work is to create not only a new possible world, but a new possible listener with a renewed relationship with the world that is inherently ecological; as Voegelin explains, "[t]he listening subject inhabiting the sensorial sense of the work is not a humanist subject but a post-humanist subject who lives in equivalence and reciprocity with her environment and understands her role as one of responsibility instead of superiority" (ibid., p. 141). Furthermore, the fact that these new possibilities are generated neither by the sound nor the listener alone, but rather by the interaction of the sound with the consciousness of the listener, reveals:

> … that the outside is not overwhelming and infinite, but is the intertwining of himself, his agency, with the agency of nature, equivalent, reciprocal, and generative … that he does not work from a separate interiority into the world that thus appears strange, forbidding, and awesome, but that he is in the world and the world is through his being in it … Such a worldview is more equal and

> does not grant the power of conquest but the responsibility of togetherness. (ibid., p. 118)

Drawing together the various points from ecological theory and sound studies outlined above thus allows us to identify some of the ways in which ecological principles might be made manifest within the form and operation of works of sound art, and of listening as a means of engagement. It reveals how sound and listening might reveal the dynamic and shifting mesh of the earth's ecosystem, helping us to 'think the ecological thought', through its evidencing of the relationships between things, and how they interact and affect one another; how it might help us to experience our own embeddedness within that mesh, and our own interconnectedness with, and interdependence upon, the various other nonhuman elements within our environment; how it might evidence the vibrant agency of the nonhuman, and facilitate our recognition of our coexistence within the space of the commons; and how it can create new 'sonic possible worlds' which allow us to experience and reimagine how things could be.

2.4 An ecocritical framework for sound art

Over the course of this chapter, a wide variety of principles, approaches and tropes of ecocriticism have been explored. These will now be brought together to formulate a new ecocritical framework specifically designed for sound art, which will be used as the basis for the ecocritical analyses of sound art which will follow in Chapters Three and Four. One of the key objectives of this new framework will be to ensure that these analyses incorporate the same diversity of issues, perspectives and problematics which are tackled by ecocriticism in other art forms, so that ecocritical studies in sound art may be considered in dialogue with them. However, to simply transfer the ecocritical tools developed for other art forms to sound art would also be to risk overlooking the unique characteristics which set sound art apart from other art forms; therefore, its other purpose will be to facilitate the opening up of ecocriticism to new facets which are specific to sound art as a medium, and to listening as a means of engagement, in order to determine what sound art in particular has to contribute to contemporary ecocritical discourse which works in other media may not.

The framework takes the form of eight categories, which will be used as a guide to ensure that all relevant aspects of the work are considered. Each category represents a distinct facet of the ecocritical analysis of a work: the ecologically resonant themes it contains; the ecological issues it addresses; the different perspectives it exhibits; the presences and subjectivities it represents; the nature of relationships within the work; the audience's aesthetic experience of the work; the contexts surrounding its creation and presentation; and any problematics it raises. Each of these categories has then been further broken down into three sets of key ecocritical

questions, which will serve as prompts for the detailed interrogation of each analysis. In addition, a fourth question added to each category focuses upon the specific roles that sound and listening play in how the various different ecocritical considerations are made manifest by the work.

1. **Themes**

- What does the thematic material of the work express regarding the environments and ecosystems we live in, and the ways in which we perceive and interact with them?
- What kinds of environments does it focus upon? Is it concerned with natural or urban environments? What perspectives, judgements or tropes does it demonstrate regarding those environments? Does it reproduce or problematise the common tropes of pastoral or wilderness?
- What kind of perspective does it demonstrate regarding the ecological implications of urban environments and human-made technologies?
- *What role does sound and listening play in the engagement with these themes?*

2. **Issues**

- Does the work exhibit a connection with, or relevance to, contemporary ecological issues? Is this connection explicit or implicit within the work? Does it require explanation or programme notes?
- What perspective does it take regarding these issues? Does it demonstrate any of the concerns of first, second or third wave ecocriticism? Does it resonate with the concept of the Anthropocene?
- Does the work help us to think about, understand, connect with, or know how to respond to, contemporary ecological issues? Does it suggest any possibilities for a more ecologically sound future?
- *What role does sound and listening play in the portrayal of these issues?*

3. **Perspectives**

- Does the work exhibit an anthropocentric or ecocentric perspective?
- Does it represent the artist's own perspective? Does it provide a platform for the perspectives of others? Does it feature perspectives other than that of the white, western male? Does it investigate more-than-human perspectives?
- What perspective does the listener experience the work from?
- *What role does sound and listening play in the expression of these perspectives?*

4. Presences

- What different elements, presences or subjectivities – human or nonhuman – are evident within the work? How are their actions and articulations perceived, interpreted or translated?
- Who or what are the more dominant presences? Who or what is heard or silenced?
- What kind of agency do the different presences have within the work? Is agency ascribed to nonhuman elements – are they regarded as passive, or do they function as actants, as vibrant matter?
- *What role does sound and listening play in the dynamics of these presences, subjectivities, and their agency?*

5. Relationships

- What is the nature of the relationships between the different elements within the work? What implications or insights do these relationships have regarding our ecological understanding? Do they reflect Commoner's Four Laws of Ecology?
- How does the work portray, embody, or complicate the interactions and interrelationships between 'nature' / 'culture', 'human' / 'environment', 'natural' / 'unnatural'? Does it suggest an essentialist perspective (strategic, weird or otherwise) with regard to these categories?
- Does the form and operation of the work embody or portray ecological principles? Does it facilitate our perception of, or feeling of embeddedness within, an inclusive ecological mesh or ecological commons?
- *What role does sound and listening play in the enactment of these relationships, interactions, and connections?*

6. Aesthetics

- What is the nature of the listener's aesthetic experience of, and engagement with, the work? Is their experience active or passive; shallow or deep; educational or emotional? Does it facilitate an embodied, sensuous phenomenology, or perform the ecomimetic act of rendering a surrounding environment?
- Does the listening experience nurture the feeling of a renewed relationship or reconnection with an environment or ecosystem? Does it enhance our perception and understanding of the world we live in?
- What is the trajectory of the work? Does it take the listener on a journey – and where do we end up?
- *What role does sound and listening play in this aesthetic engagement?*

7. **Contexts**

- What is the context surrounding the work's creation? What is contained within its 'expanded field', and what are the implications arising from this?
- What is the significance of the environment within which the work exists and is encountered?
- What is the significance of the work's form, and the platform it is presented upon?
- *What role does sound and listening play in these environmental interactions, creations, and experiences?*

8. **Problematics**

- Is the work itself, or any aspect of its wider context, problematic from an ecological standpoint?
- Does the work create its own ecological footprint; and can this be justified by its ecological purpose?
- Does the subject chosen or approach taken suggest problematic motivations?
- *What role does sound and listening play in the nature and complexity of these problematics?*

Conclusion

At the time of writing, ecocriticism has now existed as a coherent field of critical theory for more than a quarter of a century, exploring a wide variety of issues relating to the artistic engagement with the ecological problems which have grown to become some of the most urgent ongoing global issues of our time. As such, it has become an increasingly vital part of attaining a genuinely holistic and up-to-date critical understanding of the relevance and meaning of human arts and culture within contemporary society; however, as this thesis has demonstrated, while it has been flourishing within literature, visual art, film and music, there has not yet been any attempt to engage ecocritically with the fast-growing medium of sound art.

As the first step towards addressing this gap in both ecocritical and sound art scholarship, this chapter has examined the key principles and approaches within ecocriticism, in order to develop a new ecocritical framework for sound art. It has identified its core purpose to be the analysis and evaluation of the ways in which works might help us to understand and respond to contemporary ecological issues, with ecocriticism functioning as a means to help to reveal and activate the ecological agency of works. It has also examined how this ecological purpose has been manifested through a variety of different philosophies and perspectives, whose evolution has been represented by the three 'waves' of ecocriticism: the first wave, which consisted mainly of studies of the relationship between humans and nature; the second wave, which has

developed roughly since the turn of the millennium, and which has seen a problematising of the division between 'nature' and 'culture', incorporated studies of urban environments, and placed a greater emphasis upon political ecology, ecofeminism and social justice; and the third wave, first identified in 2009, which encourages ecocritical perspectives from a variety of genders, ethnicities and nationalities, places a greater focus upon non-human subjectivities, incorporates a greater degree of self-reflexivity, and promotes a more directly activist approach.

Following the discussion of these overarching principles of ecocriticism, this chapter has proceeded to identify two main approaches towards ecocritical analysis: the exploration of ecological themes in a work's subject matter; and the embodiment of ecological principles in its form and operation. In terms of the first approach, it has explored the key themes and tropes which emerge from ecocriticism's analyses of portrayals of humanity's relationship with the environments and ecosystems in which we live, including those pertaining to the natural environment, the urban environment and human technologies, the debate around the nature / culture dichotomy, and the ecological abuses, problems and crises which we face, and for which we are largely responsible. These common tropes were found to remain the same whichever medium was being used to explore them, and could thus be incorporated into the ecocritical framework for sound art with little difficulty. When it came to the investigation of ecological principles within the form and operation of works, however, it was decided that to simply adopt the principles developed for other art forms would not be appropriate, since this would risk missing key features specific to sound art. In order to address this, it thus proceeded to bring together key elements of contemporary ecological theory and sound studies to reveal some of the ways in which ecological principles are embodied and reflected in the form and operation of sound art, including the perception of ecological interconnectedness, the experience of ecological embeddedness, the appreciation of nonhuman agency, and the proposition of new directions for more ecologically sound ways of existing in the future.

Finally, all of these elements have been compiled to produce a new ecocritical framework specifically designed for the analysis of works of sound art, formed of eight categories each containing three sets of key ecocritical questions, along with a fourth which focuses specifically upon the specific role of sound and listening within it. This new framework will now be used to conduct ecocritical listenings to works of canonical and contemporary sound art in Chapter Three, and to potential works of ecological sound art in Chapter Four, in the hope that this may go some way towards facilitating the inclusion of sound art within the vibrant contemporary ecocritical discourse detailed within this chapter.

Chapter 3
Ecocritical Listenings in Sound Art

Introduction

The first chapter of this thesis outlined the importance of ecocriticism in arts and culture, and identified a significant gap in sound art scholarship regarding the current lack of any ecocritical engagement with the field; while Chapter Two took the first steps towards rectifying this situation by examining some of the core principles and approaches of ecocriticism in other art forms, as well as investigating the ecological principles to be found within the form and operation of sound as a medium and listening as a means of engagement, and using this to develop a new ecocritical framework specifically designed for the analysis of works of sound art. In the present chapter, this new ecocritical framework will be used to carry out ecocritical listenings to a selection of eight works of sound art, in order to demonstrate how an ecocritical listening can unlock new facets of such works which allow them to speak to contemporary ecological issues. In doing so, it also provides a blueprint for the future ecocritical study of works of sound art, facilitating greater understanding of their meaning and significance in a world in which ecological issues represent some of the most urgent concerns currently facing the human race.

It was decided that the majority of these examples should be classic or 'canonical' works of sound art, constituting well-known examples of the art form which have already been extensively analysed elsewhere, in order that the analyses in this chapter might demonstrate how an ecocritical listening can result in new insights which have not been highlighted in previous critical appreciations of them. (In order to provide the opportunity to verify this, a selection of three previous critical analyses of each work have also been referenced in the footnotes). Such canonical works thus make up six of the eight works analysed in this chapter, each of which has been selected to exemplify a particular approach within sound art as well as to cover a wide spread of dates throughout the development of the medium during the second half of the twentieth century, comprising an electronic composition (Edgard Varèse's *Poème Électronique* (1957-8)); a sound sculpture (Robert Morris's *Box with the Sound of its Own Making* (1961)); a performative work (Christian Woolf's *Stones* (1969) and *Sticks* (1971)); an installation (David Tudor's *Rainforest IV* (1973)); a field recording-based work (Annea Lockwood's *A Sound Map of the Hudson River* (1982)); and a soundscape composition (Hildegard Westerkamp's *Kits Beach Soundwalk* (1989)).

In addition to these canonical works, two contemporary works have also been chosen, in order to demonstrate how an ecocritical listening can form an important part of the analysis and appraisal of new works of sound art, allowing them to be understood in the context of the

ecological issues which constitute such a significant part of the social, political and cultural climate in which they exist. The first of these, Susan Phillipsz's *Lowlands* (2010), has been selected due to its status as possibly the most well-known contemporary work of sound art, having gained the distinction of being the first (and, at the time of writing, still the only) work in the medium to have won the Turner prize; while the second, Raviv Ganchrow's *Long Wave Synthesis* (2015), serves as an example of a recent work which has not yet undergone any significant critical appraisal elsewhere, in order to demonstrate how an ecocritical listening can play an important role in unlocking the work's meaning, and assessing its significance within the context of contemporary ecological concerns.

The listenings detailed in this chapter, as well as those in Chapter Four, have been realised through a process of applying each of the ecocritical questions within the eight categories of the framework to each of the chosen works. Not all questions have proved relevant to every work, however; therefore, the listenings focus only upon those aspects of the framework which are most pertinent to that particular work. The resulting accounts will also not necessarily address these questions in the same order as they appear in the framework, since this approach was found not to be conducive to the realisation of a coherent written analysis.

Certain aspects of external information about works, such as the context in which they were presented and the technical details of their realisation, have also been considered within these ecocritical listenings, since they may be considered necessary to a basic understanding of what is happening in the work. However, any statements made by the artist regarding the way in which they intend their work to be interpreted or understood, whether made in programme notes, interviews or in any other context, have deliberately been disregarded. This decision was taken in part to ensure that each work is critically assessed on an equal footing: since some works are accompanied by extensive notes while others come with little or none, it would be unfair to allow an ecocritical listening to be informed by the artist's intention in one case but not in another. The other reason for this decision is to enable a more remote and independent interpretation of the selected works, in which their ecological significance is determined by the ways in which the works themselves, listened to in isolation from any outside interpretation from either the artists or from anyone else, resonate with the sorts of issues laid out within the ecocritical framework for sound art.

3.1 Ecocritical analyses I: Canonical works

3.1.1 Electronic composition: Edgard Varèse – *Poème Électronique* (1957-8)[4]

Poème Électronique, Edgard Varèse's first and only work composed entirely for tape, represents a key work in the history of electronic music. Composed specifically for the Philips Pavilion at the 1958 World's Fair in Brussels, the stereo mix which we are left with today must really be considered as partial documentation of a work which, within the structure of swooping parabolas designed by Le Corbusier and Iannis Xenakis, was diffused over a vast array of speakers (the exact number is unknown, but various sources estimate it to be between 350-450), which were positioned throughout the pavilion and switched on and off in sequence, causing the sounds to fly around the space both horizontally and vertically. The audience were surrounded by sound on every side, issuing from every direction, and travelling all around them. *Poème Électronique*, then, is not just a work about sound, but about the behaviour of sound in space, and about the ability of sound to create a dynamic, immersive environment.

Varèse uses a wide variety of sounds over the eight minutes of *Poème Électronique*, combining electronically synthesised sounds with concrete 'real-world' sounds, including a bell, organ, various percussion sounds, human voices, and what sounds at one point like slowed-down animal noises. There is no hierarchy to this diverse collection of sounds: even the human voices, making vocal noises and singing tones, are treated as just one more concrete sound amongst many other sounds. There is no differentiation between natural and artificial, acoustic and electronic; indeed, it is sometimes difficult to tell whether certain sounds are concrete or synthesised, and when concrete sound is electronically manipulated, the boundary between 'natural' and 'artificial' becomes even more blurred. In this sense, Varèse's work can be recognised as creating an inclusive and egalitarian sonic ecosystem which is akin to Timothy Morton's notion of the 'mesh', which challenges the portrayal of the earth's ecosystem as the 'biosphere', composed only of the natural or organic, in favour of its recognition as a vast, infinitely complex network containing everything that exists, making no distinction between living and nonliving, organic and artificial, 'natural' and human-created, and recognising the interconnections and interactions between everything.

In Varèse's arrangement of the sounds, meanwhile, we can recognise the deliberate creation of a strong sense of the surrounding environment. Rather than have sounds occurring constantly in a never-ending stream, he leaves spaces between them, giving the listener time not only to

[4] Other critical analyses:

1. Kendall, G.S. (2006) 'Juxtaposition and Non-Motion: Varèse Bridges Early Modernism to Electroacoustic Music', *Organised Sound* 11(2), pp. 159-171.
2. Mattis, O. (2006) 'From Bebop to Poo-Wip: Jazz Influences in Varèse's Poème Électronique', in Meyer, F. and Zimmerman, H. (eds.) *Edgard Varèse: Composer, Sound Sculptor, Visionary*. Woodbridge: Boydell and Brewer, pp. 309-317.
3. Oullette, F. (1973) *Edgard Varèse: A Musical Biography*, pp. 195-206.

process and think about the sound they have just heard, but also, crucially, to experience its natural reverberation around the space it is sounded within: the space around the sounds. This effect is heightened by the fact that sounds frequently come to an abrupt stop, which would have given the audience a chance to hear them resonate around the natural acoustics of the pavilion. This sonic activation of the space would have provided the strong sense of *ambience* which Morton argues is so crucial to a properly ecological art, since it "points to where we are right now. We are here … The blank page, the open canvas, the gallery space, the silence (or quiet or, more properly, noise) around and within the music displays the medium in which and through which we're reading, listening, looking, participating" (Morton, 2010, p. 103).

In the sonic environment created by *Poème Électronique*, then, all is culture, and all is nature; and while each individual sonic element exists as a distinct entity, yet everything becomes interconnected within the wider ecosystem of the work. In this way, too, an ecocritical listening can help us to recognise the connections between Varèse's pioneering work of electronic composition and the ecological theory of Timothy Morton, in which "[t]he ecological view to come … is a vast, sprawling mesh of interconnection without a definite center or edge. It is radical intimacy, coexistence with other beings, sentient and otherwise – and how can we so clearly tell the difference?" (ibid., p. 8). As the diverse sounds of *Poème Électronique* were diffused within the enclosed space of the Philips Pavilion, the listeners themselves would have become enfolded within just such a radical intimacy, both with the sounds as they whizzed around and through the space, but also with each other, as the space between bodies became filled with sound, creating both physical and experiential connections between listeners through a collective sonic experience. The listeners become *part* of the environment as the sound passes through every body, creating a state in which, just as the sound is absorbed by the body, the body becomes absorbed by the totality of the sound. This has the further effect of causing isolated individuality to be lost, connecting the listener with every other element within the self-contained ecosystem inside the collective space of the pavilion, creating a physical experience of the connected ecological self as part of a commons in which, as Frances Dyson observes, "the listening experience is shared within and through the atmosphere, almost as if the knowledge or understanding is parsed around the room along with the sound waves" (Dyson, 2014, p. 154).

While it may not have any direct link to contemporary ecological issues, therefore, an ecocritical listening to *Poème Électronique* can nevertheless unlock aspects which reveal it to be a strongly ecological work which demonstrates the power of sound as an ecological medium. Varèse's work, a pioneering example both of electronic composition and of spatialisation, creates an egalitarian sonic ecosystem whose mix of sounds exemplifies Timothy Morton's contemporary ecological notion of the mesh; whose arrangement and spatialisation creates a strong sense of environmental ambience; and whose activation of the space within the Philips Pavilion would have created exactly the sort of collective and immersive sonic experience which results in the death of the isolated self and facilitates the rebirth of the connected,

ecological self which we so badly need to find ways to rediscover in our contemporary age of ecological crisis.

3.1.2 Sound sculpture: Robert Morris – *Box with the Sound of its Own Making* (1961)[5]

Robert Morris's 1961 work *Box with the Sound of its Own Making* is widely regarded as a pioneering work of sound sculpture. It consists of a plain wooden box, made of six 9¾ inch square pieces of walnut wood, inside which is a speaker playing a three-and-a-half hour looped audio recording made during the process of the box's construction. In the first instance, Morris's use of the medium of sound recording to relate the story of the box's construction does more than tell us about that process: it allows us to experience it as an event in real time, collapsing boundaries of time and space so that the present – the constructed box, sitting in front of the spectator as a solid object in the here and now – coexists with the past – the sounds of the process of its construction, which we also hear in the here and now. The cognitive dissonance we experience as a result is testament to the power that sound holds over our perception, as something which we know happened in the past is still experienced as an event which is occurring in the present.

However, just as the sides of the box demarcate the physical boundaries of the box's form, so the start and end points of the sound recording, playing from the speaker which is physically enclosed within it, demarcate the temporal boundaries of the segment of the past we are granted access to. We realise that we are hearing only a portion of the box's history: specifically, the three-and-a-half hours during which Morris took a piece of timber, measured it, sawed it up, and fashioned it into a cubed box; a realisation which might then prompt us to think, both literally and figuratively, *outside* the box, and consider what parts of the box's past existence we have not being granted access to: what is the story of the box prior to the moment the tape recorder was switched on? If the recording were really to contain the *entire* history of how the box came to be, we might, for example, hear the sounds of the artist purchasing the wood from a timber merchant; of that piece of wood being sawn from the trunk of a tree; of that tree being felled; and then back through the long history of that walnut tree as it grew, perhaps standing alone, perhaps as part of a great forest, with all of the changing atmospheric conditions and weather events which influenced its growth and determined the grain of the wood; and right back to the planting of a seed, perhaps by a human, perhaps carried by a bird or animal, or perhaps simply

[5] Other critical analyses:

1. Kim-Cohen, S. (2009) *In the Blink of an Ear: Toward a Non-Cochlear Sound Art*. London: A&C Black, pp. 45-68.
2. LaBelle, B. (2006) *Background Noise: Perspectives on Sound Art*. London: Bloomsbury, pp. 81-85.
3. Sylvester, D. (2012) *About Modern Art: Critical Essays 1948-96*. New York, NY: Random House, pp. 243-248.

having grown where it fell from another tree. All of these events might be considered chapters in the story of the making of this particular box. Considered in this way, the fact that the only part of the box's history presented to us as relevant is that which involves the artist's interaction with the wood to change its shape from a plank to a box might be considered quite an anthropocentric perspective, suggesting that the only aspect of the making of this object worth knowing about is that which involved human agency, the artist imposing his will on the wood to decide what specific form it would take, and negating the organic process of the growth of the tree which, in being responsible for the very existence of the wood the box is made from, is an equally vital part of how and why this particular object came to be.

Fig. 1 Robert Morris – *Box with the Sound of its Own Making*

Furthermore, in being directed to think about the box's past through hearing the sounds of its construction, we may also perhaps be led to reflect upon its future, which we cannot hear. It has already undergone the transformation which we hear, from plank of wood to box, as well as the transformations we do not, from seed to tree to plank; who is to say its present form will also be its final one? It may, as long as there is human civilisation, be carefully preserved due to its status as an art object; but thinking about the future of objects prompts us to think in timescales not just beyond a human life, but beyond the human race. Thus, to think of the future of this box, and of when it may again change its form, necessitates that we project forward to a time when human civilisation no longer exists, and this box will finally be unprotected by our cultural reverence. Perhaps woodworm will eat holes in it; perhaps it will rot, break down, and provide food for fungi; or perhaps it will be burned and transformed into ash – which may, perhaps, fertilise the soil in which another tree grows.

Morris's work also interrogates the relationship between nature and culture, as the recording of the sounds of the box being made allows us to hear, in real time, the process during which 'nature' – a piece of wood – is, through human will and physical intervention, transformed into

'culture' – an art object. But however closely we listen, and however hard we try, we cannot hear the moment at which one becomes the other – at which nature becomes culture. This leads us to question where the boundary between the two lies: was the wood somehow a cultural object even before it was a box – even when it was a tree? Is the box still a natural object; or has it become unnatural through being transformed, by a human artist using tools, into this cubic form which, with its equal dimensions and clean lines, could never exist within nature? Or, since the living, breathing human artist is part of nature himself, is the product of his endeavour also still a natural object, whatever he does to it?

The awareness that the sound recording brings of what the box was before it was a box (i.e. wood from a tree) may also lead to the realisation that the act of creation which we are hearing is simultaneously an act of destruction: that the creation of the box necessitates – in many ways, *is* – the destruction of a walnut tree. This need not necessarily imply a moral judgement, or lead us to conclude that making things out of wood is wrong; however, it may lead us to reflect which of the things – the 'natural', living tree which is destroyed, or the 'unnatural', dead box which is created – we might personally place the greater value upon, an issue which leads to questions characteristic of those we face in the age of the Anthropocene. In terms of monetary value, the box, because of its status as an important work of art, is almost certainly worth more than the walnut tree which provided the wood; and we might argue that, as a pioneering work of sound art, its cultural value, too, is far greater than that of a single walnut tree. To compare their aesthetic value might be less clear-cut, since some might argue that a tree provides greater, and longer-lasting, pleasure than a plain wooden box. If we were to compare the two in terms of their ecological value, meanwhile, we might be hard-pressed to argue that the box holds greater value than the walnut tree, whose respiration absorbed carbon from, and released oxygen into, the atmosphere; whose trunk and branches may have provided a habitat for birds and animals; and whose walnuts provided food. On the other hand, it could also be argued that an ecocritical analysis of *Box with the Sound of its Own Making*, such as that presented here, reveals ecological resonances which endow the work with greater ecological value than a single tree.

The title of the work, *Box with the Sound of its Own Making*, draws our attention to two elements: the box, and the sound. But there are, of course, other elements of the work whose presence is essential, but which are hidden, and therefore effectively erased from it: the tape on which the sound is recorded, and the tape recorder on which it is being played, which are hidden inside the pedestal on which the box sits; and the speaker from which the sound issues, which is hidden inside the box. This means that the only thing we see is the wooden box; and the only things we hear are the sounds made by the artist's body, the tools, and the wood. Of course, if the listener were to listen closely to the recording and knew what they were listening for, they might also be able to identify the hum made by the tape recorder's motor as it made the recording; and if they were to place their ear to the pedestal, they might perhaps hear it as it plays the recording back. However, these sounds are clearly not the intended focus of the work,

and the majority of listeners will probably be unaware of them. This deliberate erasure of the electrical sound recording and playback technology from both the physical element of the work (the box) and its sonic element (the sound of its making) is a move which may, in some ways, be perceived as pastoral in focusing upon the relationship between human (Morris) and nature (wood), via the basic, primitive tools of saw and hammer, while hiding the modern, electrical technology of the tape recorder and speaker, which do not fit into the pastoral aesthetic. This may further be perceived as illustrative of the way in which our modern technology is often erased from our considerations of ecology, and our focus restricted to the human/nature relationship, when it may perhaps be precisely this technology – that which often has the greatest ecological impact in terms of the resources it uses and the pollution it creates – which need to be at the heart of our contemporary ecological considerations. In its erasure of modern technology from the exhibited work, Morris's *Box with the Sound of its Own Making* can thus be perceived as representative of the type of restricted conceptions of 'nature' which Morton's inclusive approach to ecological aesthetics, encapsulated by his notion of the mesh, is designed to combat; and we might conclude that it is only by taking our cherished romantic, pastoral ideals off their pedestal and exposing the 'unnatural' elements of technology which, though they may puncture the romantic illusion, are no less a part of the earth's ecosystem, that we might reach a clearer perception of the operation of that ecosystem, and a better idea of how we might act to ensure it continues to function.

Another outcome of Morris's hiding of the sound-producing technology involved in the work is the creation of the illusion that the sounds of the box's construction are being made by the box itself. This, in effect, turns the sound into the 'voice' of the box, which is thereby transformed into a sentient being which is speaking to us, a storyteller relaying the autobiographical tale of how it came to be, conjuring up a scene from the past and allowing us to be there in the workshop while it was happening. Received as an account of the box's first-hand experience of its own making, we no longer hear the sound of hammering from a detached, third-person perspective, but from the perspective of the thing being hammered upon – a fact which may lead us to experience it as a violent, painful, even abusive act. Of course, we know that the box is *not* a living being; however, we also know that the wood it is made from *was* once living, as part of a breathing, growing tree, whose life, in the biological sense, was ended when it was cut down. And while we also know that the sounds we hear are *not* issuing from the box itself, but from a speaker enclosed within it, we might also consider that in order for them to reach us, the sounds have had to first pass through the sides of the box; and that, understood in this way, the sound we hear *is* being made by the box, as the sound waves issue from the resonating wood. We might thus regard the box as a kind of zombie: the reanimated corpse of the once-living tree, forced to endlessly relive the three-and-a-half hours during which it was sawn up and hammered into a cube, like a person or animal with post-traumatic stress disorder who relives the original trauma as if it were happening to them in the present. That the sounds

of sawing and hammering are noisy, harsh sounds accentuates this sense of violence and trauma; indeed, it may be that we do not wish to listen to them for too long, since our own, deeply embedded instinct for self-preservation tells us to place distance between our own vulnerable bodies and the sorts of violent events that are the source of such sounds.

Again, it is important to stress that this interpretation of the construction of the box as a violent deed visited upon the wood need not lead us to the conclusion that it constitutes an immoral act, since – despite the illusion created by its sounding – the box is not a sentient being with memories and feelings. Some might argue, however, that the same cannot be said for the walnut tree that the wood came from: in his 2015 book *The Hidden Life of Trees*, forester Peter Wohlleben explains how his research led him to exactly these conclusions, commenting that "[w]hen you know that trees experience pain and have memories and that tree parents live together with their children, then you can no longer just chop them down and disrupt their lives with large machines" (Wohlleben, 2015, p. xiv). But even if we dismiss arguments for the sentience of trees, the violent nature of the sounds of the box's construction might still be considered resonant of the often violent and abusive manner in which humans have imposed their will upon the natural environment, with the fact that a living tree has been destroyed in order to create an art object symbolic of the way in which we have come to regard nature merely as a collection of resources which exist solely for us to take and use for our own purposes.

The two most prominent presences within the work are those of the box itself, which is both the physical object we see and the primary subject of the work's title; and of the artist, Robert Morris, who is named as the creator of the box, and of the work as a whole. The audio recording also gives a strong sense of each of these presences: the box is the thing we hear being constructed, and the artist is the person we hear carrying out the task, not just as the cause of the construction sounds, but also as a body which we hear moving around, breathing, and occasionally coughing. However, as we listen to the recording, we may become aware of other presences, other players who are equally crucial to the story: a hammer; nails; a saw; a pencil; a tape measure; a bench. It becomes clear that the process of the box's construction, as related by the sound recording, involves more than just the interaction of artist and wood – it involves the interaction of all of these different elements. As Tim Ingold writes in his account of carpentry:

> *The tool, as the epitome of the story, selects from the compendium of the hand the gestures proper to its re-enactment*. Yet the tool has its story only because it is set in a context that includes the trestle, the wood, and all the other paraphernalia of the workshop. And the hand has its gestures only because it has grown and developed within the organic synergy of practitioner, tool and material. The practice of sawing issues as much from the trestle and plank as from the saw, as much from the saw as from the carpenter, as much from the carpenter's eyes and ears as from his hands, as much from his ears and hands as

> from his mind. You only get sawing when all these things, and more, are bound together and work in unison. (Ingold, 2011, p. 58)

There may also be other elements, too, which we do not hear, but which have also played a no less crucial part in the making of this box: the timber merchant who sold Morris the wood; and perhaps Marcel Duchamp's 1916 work *With Hidden Noise*, which may or may not be partially responsible for Morris conceiving of his work in the first place. Considered from an ecological perspective, we realise that what we are hearing is, in fact, the sonic evidence of a dynamic ecosystem comprised of a number of different elements – people, objects, events and forces – whose interaction has resulted in the creation of the box. Heard in this way, Morris's work reveals an ecological assemblage of actants, the foundational concept in Jane Bennett's vibrant materialism, and one which, as Bennett argues, "can inspire a greater sense of the extent to which all bodies are kin in the sense of inextricably enmeshed in a dense network of relations. And in a knotted world of vibrant matter, to harm one section of the web may very well be to harm oneself" (Bennett, 2010, p. 13).

An ecocritical listening to Robert Morris's *Box with the Sound of its Own Making* thus opens up a number of different facets of the work which enable it to speak to the sorts of ecological problems which are characteristic of the age of the Anthropocene: from the ecological implications of both its past and future states of existence; its interrogation of the division between nature and culture in its transformation from wood into art object, prompting the further question of whether we judge that transformation to be a positive one; the pastoral aesthetic suggested by its deliberate erasure of its sound producing technology; the implications of ecological violence and abuse that stem from the 'first-person' nature of the box's narrative of its construction; and finally, its evidencing of the ecosystem of presences, events and forces, both heard and unheard, which function as an assemblage of actants whose interactions have resulted in this outwardly simple, yet ecologically complex, work of sound art.

3.1.3 Performative: Christian Woolf – *Stones* (1969) / *Sticks* (1971)[6]

Stones (1969) and *Sticks* (1971) are two text scores by Christian Wolff, both of which instruct the performers to explore the sounds of the indicated materials in as many ways as they can. Since the scores are relatively short, they are reproduced here for reference:

[6] Other critical analyses:
1. Gresser, C. (1996) 'Prose Collection: The Performer and Listener as Co-Creator', in Chase, S. (ed.) *Changing the System: The Music of Christian Wolff*. London: Routledge, pp. 204-205.
2. Kirkpatrick, R.J. (2008) 'Three Scores by Christian Wolff'. Available at: http://www.spiralcage.com/blog/?p=222 (Accessed: 2 January 2018).
3. Lucier, A. (2012) *Music 109: Notes on Experimental Music*. Middletown, CT: Wesleyan University Press, p. 126.

Stones

Make sounds with stones, draw sounds out of stones, using a number of sizes and kinds (and colors); for the most part discretely; sometimes in rapid sequences. For the most part striking stones with stones, but also stones on other surfaces (inside the open head of a drum, for instance) or other than struck (bowed, for instance, or amplified). Do not break anything.

Sticks

Make sounds with sticks of various kinds, one stick alone, several together, on other instruments, sustained as well as short. Don't mutilate trees or shrubbery; don't break anything other than the sticks; avoid outright fires unless they serve a practical purpose.

You can begin when you have not heard a sound from a stick for a while; two or three can begin together. You may end when your sticks or one of them are broken small enough that a handful of the pieces in your hands cupped over each other are not, if shaken and unamplified, audible beyond your immediate vicinity. Or hum continuously on a low note; having started proceed with other sounds simultaneously (but not necessarily continuously); when you can hum no longer, continue with other sounds, then stop. With several players either only one should do this or two or two pairs together (on different notes) and any number individually.

You can also do without sticks but play the sounds and feelings you imagine a performance with sticks would have.

(Wolff, undated, pp. 9-10)

These two text scores each encourage the exploration of the sonic possibilities offered by the natural materials of stones and sticks. *Stones* opens with two different ways of expressing this instruction: to "Make sounds with stones", but also, more interestingly, to "draw sounds out of stones". This instruction encourages the performer to think of the stone not only as an inert object which might be used to resonate other things, but as something with its own inherent sonic properties waiting to be released, explored and appreciated.

While he encourages the exploration of the stones' sonic properties through a variety of different methods, Wolff also expresses clear preferences for the ways they should be engaged with, stating that they should be sounded "for the most part discretely", and only "sometimes in

rapid sequences". This suggests that Wolff wishes to encourage a careful, focused listening to the sounds issuing from the stones: that he does not wish the performer and/or listener to become overwhelmed by too many sounds, but to be given the time and space to appreciate the distinct characteristics of each individual sound. In addition, while Wolff states that the stones may be used to strike other surfaces, and may be bowed or amplified rather than struck, he also expresses the preference that the sounds should be made "for the most part striking stones with stones", suggesting that he does not wish the focus to stray too far towards the sounds made by other objects or instruments, but to remain with the resonant qualities of the stones themselves.

One respect in which Wolff's scores might be held to run counter to an ecologically progressive attitude is the fact that the stones and sticks are literally turned into instruments for human manipulation, thus becoming exactly what Jane Bennett warns against when she declares that it is "the image of dead or thoroughly instrumentalized matter [which] feeds human hubris and our earth-destroying fantasies of conquest and consumption" (Bennett, 2010, p. vii). However, Bennett goes on to state that this is because it "prevent[s] us from detecting (seeing, hearing, smelling, tasting, feeling) a fuller range of the nonhuman powers circulating around and within our bodies" (ibid., pp. vii-ix) – something which clearly cannot be claimed about Wolff's scores, which encourage the performers to focus upon their sensorial engagement with, and experience of, the stones and sticks. Furthermore, while it is listening to the sounds made by the materials which is the focus of the work, in practice this will be experienced by the performers as a more holistic sensory experience in which their listening happens in tandem with a visual and tactile attentiveness, all of which may combine to produce, not only a deeper awareness of the material properties of the stones and sticks, but also a situation in which the agency of the performer is fused with the agency of the materials they are handling, blurring the boundary between performer and instrument. Wolff's scores thus present something of a challenge to Bennett's statement, raising the question of whether, sometimes, a certain degree of 'instrumentalisation' of matter – if carefully and conscientiously handled – can actually assist us in, rather than prevent us from, detecting the vibrant agency of the nonhuman.

Wolff's scores also encourage a respect for the materials being used: the score for *Stones* concludes with the instruction "Do not break anything", making it clear that the stones are not to be stuck with force sufficient to destroy each other or anything else, for in doing so the performer's focus would shift from the act of listening to the act of destruction. The performer must therefore remain conscious of the way they handle the stones and the amount of force they use in their interactions with them, something which requires an awareness of the physical relationship between their body and the stone, so that the stone is felt almost as an extension of their body.

Sticks contains a similar instruction, but goes into greater detail, stating "Don't mutilate trees or shrubbery; don't break anything other than the sticks; avoid outright fires unless they serve a practical purpose". In this Wolff expresses a clear desire for respect towards the living

plants which the sticks come from: to deliberately break sticks off trees or bushes would clearly run counter to the respectful ecological relationship which the work is encouraging the performer to develop and explore. However, interestingly, in *Sticks* this instruction is only extended to the living tree: the sticks themselves, having become detached from the tree, are no longer living, and may be broken in the service of engaging thoroughly with their sonic materiality, and in order to explore the sounds made by their interior as well as their exterior. Indeed, Wolff encourages their being broken in his suggestion that the piece "may end when your sticks or one of them are broken small enough that a handful of the pieces in your hands cupped over each other are not, if shaken and unamplified, audible beyond your immediate vicinity".

Each of Wolff's two scores are thus carefully contrived in various ways to encourage an attitude of concentration upon the inherent sonic qualities of stones and sticks, promoting the role of careful, focused listening in the formation of an ecological understanding of, and relationship with, these natural environmental elements. As such, they might be regarded as an exercise in the sort of ecologically-attuned sensorial phenomenology explored by David Abram in *The Spell of the Sensuous*, which, as we have seen, extends to objects such as trees and rocks:

> Trees, for instance, can seem to speak to us when they are jostled by the wind. Different forms of foliage lend each tree a distinctive voice, and a person who has lived among them will easily distinguish the various dialects of pine trees from the speech of spruce needles or Douglas fir … Certain rock faces and boulders request from us a kind of auditory attentiveness, and so draw our ears into relation with our eyes as we gaze at them, or with our hands as we touch them – for it is only through a mode of listening that we can begin to sense the interior voluminosity of the boulder, its particular density and depth. (Abram, 1996, p. 129)

In this passage, Abram describes precisely the sort of ecological dynamic that Wolff's scores facilitate in their encouragement to explore the sonic qualities of stones and sticks, listening carefully in order to gain an understanding of their unique dimensions and characteristics, their interior voluminosity, their density; and as this sense combines and works in conjunction with our other senses of sight and touch, to enter into a relationship with the stones or sticks through our exploration, not only of their physical form, but of their expressive character.

Wolff's score for *Sticks* also includes the suggestion that performers may "hum continuously on a low note; having started proceed with other sounds simultaneously (but not necessarily continuously); when you can hum no longer, continue with other sounds, then stop". As opposed to *Stones*, whose focus remains very much confined to the sounds of the stones themselves, this aspect of *Sticks* introduces the sounds of the human body into the performance.

From an ecological perspective, the specific nature of the sound the performer is instructed to make is significant: of all the vocal sounds the human body can produce, a low hum is perhaps that whose resonance is felt most strongly through the body, in the gut, chest, larynx, mouth, lips and skull, and which allows us to feel the interior voluminosity of our own body – precisely the characteristic the performer is also engaged in exploring in the stones or sticks. In thus engaging in the simultaneous exploration of the resonance of both the sticks and of their own body, the performer explores the relation between their own physical form and that of the natural environmental elements they are engaging with, enacting a similar principle to that described by Abram when he states of animal calls that "I feel their expressive cries resound in my skull or my chest, echoing their sonorous qualities with my own materiality, and thus learn of their inward difference from myself" (ibid., p. 128).

The final sentence of the score for *Sticks* offers an alternative option: Wolff states that "You can also do without sticks but play the sounds and feelings you imagine a performance with sticks would have". This option requires a different sort of ecological engagement from the performer: the absence of the sticks themselves necessitates deep and considered reflection upon their own past experiences of sticks, about their materiality, and particularly their resonant qualities, in order to be able to translate this into physical actions to be performed upon other instruments or objects. Notably, Wolff asks the performer to play not just the sounds, but the *feelings* they imagine a performance with sticks would have, thus further reinforcing the score's focus, not simply upon the sonic element of the performance, but upon the intimate, physical, and fundamentally ecological experience of the body of the performer connecting with the physical and sonic materiality of the sticks.

An ecocritical analysis of Wolff's two simple text scores thus reveals them as highly ecologically-attuned sonic exercises, encouraging the forging of a connection with these natural materials through careful exploration and focused listening, serving to facilitate precisely the sort of ecological experience that Abram speaks of when he argues that "we must renew our acquaintance with the sensuous world in which our techniques and technologies are all rooted … We need to know the textures, the rhythms and tastes of the bodily world … [if we hope] to make sense of, and alleviate, our estrangement from the animate earth" (ibid., pp. ix-x). However, it must be noted that many of the ecological elements discussed above would only be fully appreciated by the performers themselves as they explore the materials, something which cannot be adequately transferred to the audience; thus, it might be concluded that *Stones* and *Sticks* attain a large degree of their ecological resonance as a performative experience.

3.1.4 Installation: David Tudor – *Rainforest IV* (1973)[7]

Rainforest IV, perhaps the best-known in David Tudor's series of *Rainforest* sound installations, involves various different objects being fitted with audio transducers, turning them into sculptural loudspeakers which colour the audio signal being sent through them with their own unique resonant properties. The first version of *Rainforest* was created in 1968 to accompany Merce Cunningham's ballet of the same name; thus, the title was originally not Tudor's but Cunningham's, which Tudor decided to retain for subsequent iterations of the work. It used a collection of eight found objects as its 'speakers', including a cymbal, a wooden box, springs, a metal sheet, a wooden tray, a coil, string, and a metal box, each of which also had contact microphones attached to it to enable the sounds it produced to be amplified by regular loudspeakers. The audio signals which were sounded through the objects, meanwhile, were created by "oscillators that made animal-like and bird-like noises" (Tudor, in Driscoll and Rogalsky, 2004, p. 26); thus, in this first version of the work, Tudor deliberately aimed to imitate the sounds of the rainforest, later writing that the objects were "manipulated to produce sounds resembling those of nature" (ibid., p. 26). In subsequent iterations, however, Tudor moved away from this deliberate mimicry of rainforest sounds: in *Rainforest II*, vocal input was channelled through the objects; and in *Rainforest III*, a wide variety of recorded sounds were used, including animal sounds such as deer calls, whalesong, birdsong, and insect sounds such as a beetle walking, a wasp chewing, and mosquitoes buzzing in a jar, as well as water sounds, earth vibrations, recordings of satellite data communications, and laboratory sonifications of neural activity.

Rainforest IV, meanwhile, evolved from a workshop Tudor gave at the New Music in New Hampshire festival in summer 1973, for which, Tudor reports, he decided "I'm gonna give this piece away" (Fullemann and Tudor, 1984). In this iteration of the work, one or more sculptural speakers are selected or constructed by each individual performer and suspended from the ceiling. During performance, each performer selects and controls the audio that resonates their own particular sculptures; this may include electronically generated sounds, field recordings, voices, or other live audio, with Tudor's only restriction being that prerecorded musical material should not be used. The work has no 'score' as such: Tudor provided technical diagrams detailing the signal flow to aid in the setup of the work, but everything else is left up to the

[7] Other critical analyses:

1. Driscoll, J. and Rogalsky, M. (2004) 'David Tudor's *Rainforest*: An Evolving Exploration of Resonance', *Leonardo Music Journal* 14, pp. 25-30.
2. Miller, T. (2009) *Singular Examples: Artistic Politics and the Neo-Avant Garde*. Evanston, IL: Northwestern University Press, pp. 129-132.
3. Rogalsky, M. (2006) *Idea and Community: The Growth of David Tudor's* Rainforest*, 1965-2006*. PhD Thesis. City University of London. Available at: http://openaccess.city.ac.uk/8493/1/Idea_and_community_-_the_growth_of_David_Tudor%27s_Rainforest%2C_1965-2006.pdf (Accessed: 26 March 2017).

performers. Since each individual sculpture will have a different set of frequencies which it channels most effectively, the performer must experiment with their sculpture(s) to discover which sounds make the most of each one's unique resonant properties. The work thus becomes a collaboration or duet between each performer and their sculptural objects, in which the line between sound, instrument, speaker and performer is blurred.

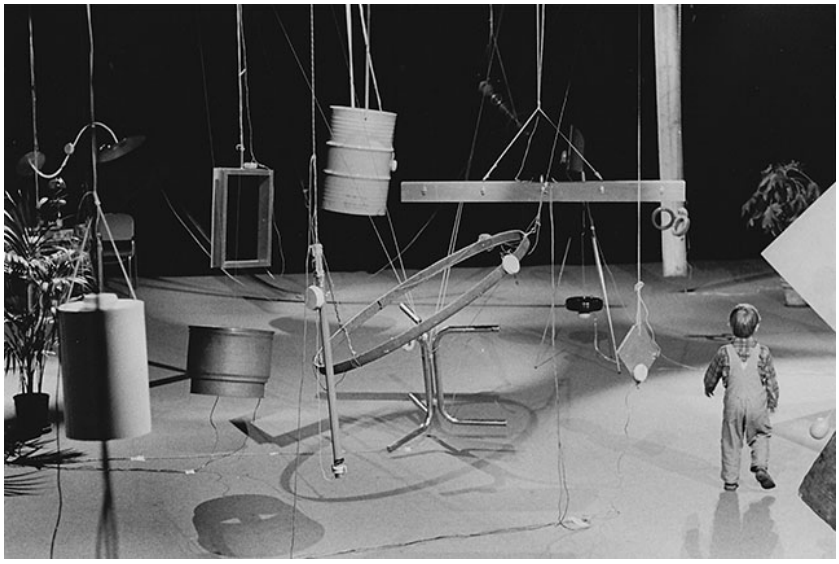

Fig. 2 David Tudor – *Rainforest IV*

In its perceived role as a conduit for, rather than the originator of, a sound, the loudspeaker is usually erased from our consideration: a speaker cone is generally designed to provide an accurate, 'lifelike' reproduction of a sound so that we do not think in terms of listening to the speaker, but to the source of the sound the speaker is channelling. By eschewing the speaker cone in favour of sculptural speaker-objects, however, Tudor places the listener's focus squarely upon the speaker itself, reconceptualising it as an instrument in its own right, and highlighting its vital role in an ecosystem of sound reproduction. The resonant characteristics of the sculptural speakers filter and colour the signal being passed through them to such an extent that they negate any conception of the resulting sound as the product of a singular, isolated source, in favour of a more ecological understanding of it as something which is shaped and formed by the numerous physical environmental factors that contribute to its final actualisation as the sound that we hear and/or feel.

In performance, despite Tudor's move away from the first version's deliberate reproduction of rainforest sounds, the title nonetheless remains apt, as the room full of sculptural objects suspended from the ceiling comes to resemble a forest of strangely-shaped trees, vines and creatures; while the diverse range of sounds emitted from the sculptures, from lengthy drones and high-pitched buzzing to rhythmic noises and sudden bursts of sound, still sounds like nothing more than the richly varied soundscape of a rainforest, reinforcing the conceptual connections between the dynamics of Tudor's work and those of the natural forest ecosystem.

The audience, meanwhile, is free to roam around the installation, and even to physically interact with the sculptural speakers. Indeed, in some cases this may be necessary: since the vibration of some of the objects may not be strong enough to transmit the sound waves to the eardrums through the air, it becomes necessary for the listener to touch the object to feel its vibrations, or even to bite it to allow the sound waves to resonate their skull, thereby enabling them to hear the sound. In this way, the audience also become active elements within this ecosystem of sound, as not only their eardrums, but their bodies, teeth and skulls become resonators and loudspeakers, additional elements in the chain of conduits for the sound waves to travel through.

Contact microphones affixed to each sculpture and transmitting its vibrations to regular loudspeakers add an additional element to the soundscape, placing the listener in the middle of a system which sounds and resounds all around them, where the sounds they experience through the sculptural speakers in one place and time are heard again in a slightly altered form over the regular speakers in another place and time, creating a sense of being immersed in a field of ongoing processes rather than isolated events. The performers also have the option to feed the sounds from the sculptural speakers back into the system by using the vibrations picked up by the contact mic on one object as the sound source for another, thus creating a truly interconnected, self-perpetuating and evolving ecosystem of sound in which the behaviour of one element directly impacts upon the behaviour of others. Thus, although each performer exerts a certain degree of control in selecting and controlling the sound sources which resonate their particular set of sculptural speakers, the final form of the work becomes more ecocentric in nature, as its focus shifts to the ecological network of interactions occurring within the 'rainforest' as a whole.

As in Robert Morris's *Box with the Sound of its Own Making*, the interconnected network of human and nonhuman agency created and activated by Tudor's *Rainforest IV* serves as an example of Jane Bennett's notion of an ecological assemblage of actants; however, in this case, the assemblage is not just illustrated, but is actualised for listeners as a participative experience, creating a dynamic, immersive environment in which they can actively practice the "cultivated, patient, sensory attentiveness to nonhuman forces operating outside and inside the human body" (Bennett, 2010, p. xiv) which Bennett argues is the key to a more developed ecological sensibility:

> The ethical task at hand here is to cultivate the ability to discern nonhuman vitality, to become perceptually open to it … Vital materialists will thus try to linger in those moments during which they find themselves fascinated by objects, taking them as clues to the material vitality that they share with them. This sense of a strange and incomplete commonality with the out-side may induce vital materialists to treat nonhumans – animals, plants, earth, even

> artifacts and commodities – more carefully, more strategically, more ecologically. (ibid., pp. 14-18)

The overall experience given by the totality of *Rainforest IV*, meanwhile, is one analogous to Bennett's exploration of the Chinese concept of *shi* in relation to the operation of ecological assemblages of actants:

> An assemblage owes its agentic capacity to the vitality of the materialities that constitute it. Something like this congregational agency is called *shi* in the Chinese tradition … *Shi* is the style, energy, propensity, trajectory, or élan inherent to a specific arrangement of things … the dynamic force emanating from a spatio-temporal configuration rather than any particular element within it. Again, the *shi* of an assemblage is vibratory; it is the mood or style of an open whole in which both the membership changes over time and the members themselves undergo internal alteration. (ibid., pp. 34-5)

These passages from Bennett's ecologically-driven text could almost be programme notes for *Rainforest IV*, the aesthetic experience of which is the epitome of this notion of *shi*: the energy and agency of a constantly shifting, open system, which undergoes both changes in overall form and in the internal characteristics of individual members, and in which the listener is not merely witness to a given element, but is immersed in a sensorial experience of the overall evolving form of the whole, the literally "vibratory" assemblage of actants.

To say that *Rainforest IV* is more than the sum of its parts would be a cliché; but one which, in this case, is perhaps justified. Tudor's groundbreaking performative, participatory, sculptural sound work functions as a compelling sonic demonstration of ecological principles, both through the vibrant characteristics of its individual parts, and through the sum of those parts as an interconnected assemblage of actants whose agency is revealed by the dynamic force of the sound emanating from the totality of the network of vibrating bodies, and which led Gordon Mumma to describe the work as "an ecologically balanced sound system" (Mumma, in Holzaepfel, 2006). Its title could not be more apt, perfectly reflecting both the visual image of a forest of suspended sculptural speakers, the diverse range of sounds they emit, and the evolving, generative functioning of its ecosystem. The work continues to be performed all over the world by Composers Inside Electronics, a collective established by Tudor in 1976 specifically to conduct performances of *Rainforest IV*; and it is to be hoped that this will long continue, since, as an ecocritical listening to Tudor's work reveals, it provides a perfect example of the way in which sound art might impart a direct and experiential understanding of the ecological principles which we so urgently need to find ways to internalise as we attempt to tackle today's complex ecological issues.

3.1.5 Field recording: Annea Lockwood – *A Sound Map of the Hudson River* (1982)[8]

Annea Lockwood's 1982 work *A Sound Map of the Hudson River* consists of a series of audio recordings from different points along the length of the Hudson, tracing the journey of the river from source to mouth. The work was originally presented as a gallery installation, with a two-hour looped soundscape composed of twenty-six separate recordings from different locations along the length of the river, accompanied by a numbered map which allowed the listener to pinpoint the location of each recording, and a separate pair of headphones through which listeners could hear interviews with people who work on the river. A condensed version of the work was subsequently released as a seventy-two-minute CD, containing fifteen of the original twenty-six location recordings, and with liner notes which featured a similar numbered map, but from which the interviews were absent. Since it is currently the only version available for listening, the following analysis will focus upon the content of the CD version of the work.

The main focus and major presence within the work is the river itself, which appears in many different forms over the course of its journey, from its source high up in the Adirondacks, to its mouth where it flows out into the Atlantic. Lockwood's overall structuring of the work as a chronological series of recordings gives it a narrative arc, in which we follow the river as it runs through different environments and landscapes on its journey from its source to its mouth. In the first of Lockwood's recordings, made at the river's source at Lake Tear of the Clouds near the peak of Mt. Marcy, we cannot hear the river at all: all we can hear is a background roar whose source is unclear, and the occasional chirp of a lone bird. This is a recording of the river before it becomes a river, when it is a lake which is so still that, though we know it is there because the map and the accompanying notes tell us that it is, we do not hear it. Because the lake is presented as the subject of the recording, however, we strain to hear it, and thus are drawn into the state of conscious, focused listening which will allow us to appreciate the complex detail in the sounds of the river when they do come.

The second recording fades in the sound of the river's highest tributary; and for this and the following five recordings, its rushing water is the only sound we hear. The sound of the river in Lockwood's recordings is at once both simple and complex; both static and ever-changing. Our ability to shift the focus of our listening allows us to zoom out to hear the overall noise and force of the rushing water, and then to zoom in to hear its incredible complexity, the multitude

[8] Other critical analyses:

1. Scott, D. (2011) 'Field Recordings of Former South London Windmills', *Organised Sound* 16(3), p. 232.
2. Street, S. (2015) *The Memory of Sound: Preserving the Sonic Past*. Abingdon: Routledge, pp. 99-100.
3. Young, J. (1989) *Source Recognition of Environmental Sounds in the Composition of Sonic Art with Field Recordings: A New Zealand Viewpoint*. PhD Thesis. University of Canterbury. Available at: https://ir.canterbury.ac.nz/handle/10092/4615 (Accessed: 9 June 2017), pp. 574-578.

of individual tiny sounds that coalesce to make that one big sound. Moreover, our ability to filter sound through our sense of the musical allows us to identify tones, pitches and rhythms, to hear it as music, to hear it sing, facilitating a heightened aesthetic appreciation of the sound of the river. In some of the later stages of its journey, meanwhile, the river becomes calmer and quieter, and other presences enter the work, taking us out of our immersion in the water, and expanding our awareness to take in other elements of the environment that the river travels through, as well as some of the roles it takes on in those environments.

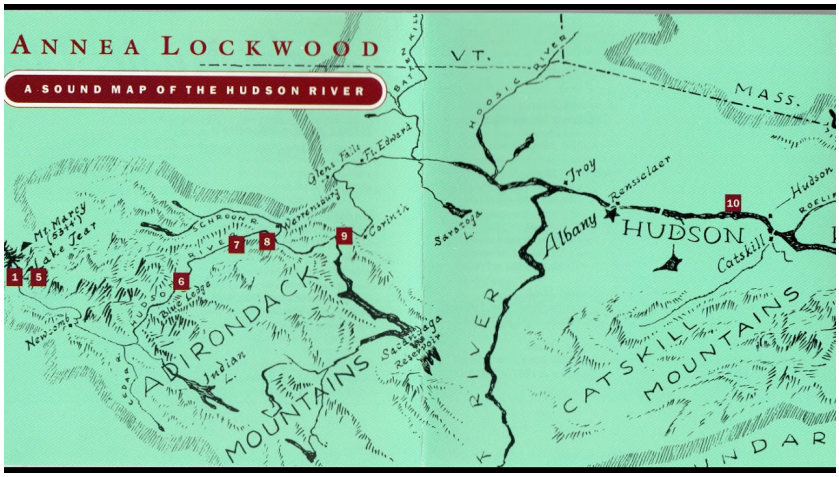

Fig. 3 Annea Lockwood – *A Sound Map of the Hudson River* (CD version map)

At the location entitled 'Garrison', we hear ducks quacking and splashing, reminding us of the river's role as a habitat for wildlife, containing a thriving ecosystem of insects, fish, animals and birds. At 'Stuyvesant', meanwhile, we hear evidence of human civilisation in the sounds of a train and a tugboat – a sudden, and perhaps unexpected, entry of mechanical sounds which remind us of the incursion of human technology into the natural landscape. The listener may have a variety of reactions to this: we may feel annoyed that we have been jolted out of our pastoral communion with the river by the 'unnatural' sounds of human technology, and regret their presence in the soundscape; alternatively, we may welcome the variety that these sounds bring, or feel a positive connection to these familiar sounds of human civilisation. Lockwood's work offers no opinion or judgement; it simply presents what is and allows the listener to make up their own mind as to what they feel about it. Indeed, it might be considered hypocritical if Lockwood were to portray the presence of human technology in the landscape as a negative thing, since the tape recorder has been a silent presence in all of the recordings as the technological medium through which the recordings are made.

The sound of the river changes dramatically over the course of its journey, as its form is changed by the physical characteristics of the landscape, just as it has changed them in turn by carving out its path. The still and quiet lake which forms the river's source gives way to a rushing and roaring as it flows down the mountainside, the force of gravity urging it on its way; then, as it gets close to the bottom and the gradient of the mountain becomes less steep, this

gives way to a quieter, softer babbling. At some points it becomes almost silent as it moves slowly and calmly through the land; and finally, at its mouth, it becomes part of the powerful, crashing waves of the Atlantic Ocean. The river's infinite adaptability, morphing into whatever form is required to continue flowing, is the essential factor in its ability to keep moving until it reaches the sea: it is not stopped by any obstacle, but simply changes its form to flow around it, through it, or over it. This adaptability to changing circumstances might perhaps be perceived as an ecological lesson which humans can learn from the river: that the only way in which we can hope to successfully continue our journey upon the earth is if we can learn to adapt to changing circumstances, altering the ways in which we behave in accordance with what we need to do to survive. The many different forms in which the river appears, from silent lake to trickling stream to roaring ocean, also carries resonances with aspects of the queer ecological theory which is emerging from third wave ecocriticism: Lockwood's work reveals that there is no 'correct' form for the river, no right or wrong way for it to be or to behave, and that we cannot impose any set notion upon what a river is, since it may appear in a vast multiplicity of guises and display a wide range of behaviours and characteristics, none of which is superior to any other, and all of which are equally valid ways for a river to be.

In using the medium of sound recording to portray the river, Lockwood's work allows the Hudson to 'speak' for itself, and to *be* itself, thus presenting a thoroughly ecocentric perspective which is particularly close to deep ecology in its implicit valuing of the river in and of itself, rather than as something which is defined by, or valued according to the priorities of, humans. Of course, Lockwood is also present in the work as the artist and sound recordist, who has selected the locations to record, positioned the microphone, and operated the equipment. As in many works of field recording, however, the listener shares the artist's perspective – we hear what Lockwood hears, her ears become our ears – with the result that she effectively disappears from our experience of the work, as her presence becomes subsumed into our own. This would be different if Lockwood were to make herself heard in the recordings; however, she remains a silent presence throughout, thus making the work wholly about the river rather than about herself, and thereby allowing the listener to make her experience of the river their own, to experience their own personal communion with it. This experience is made all the more potent because of a particular quality of field recordings in which, although we know that we are listening to the sounds of something that happened in the past, and in a different place, the fact that those sounds become, at the moment of playback, part of our own immediate sonic environment in the here and now creates the illusion that the events or phenomena behind them are also present, sounding in the here and now. In using field recording as the medium through which to portray the Hudson, Lockwood thus facilitates an embodied experience of the river which feels immediate and personal, rather than like a record of what somebody else experienced in another place and at another time – a distancing which is an inevitable part of ecologically-focused works in other art forms, such as nature writing or photography.

Lockwood's recordings were made by holding the microphone as close as possible to the water, resulting in a highly intimate aesthetic experience which brings the listener close to the river, collapsing the boundaries of time and space that separate us from it to such an extent that it feels almost as if there is no space between the river and us. The sound of the river fills our ears, so that the experience approaches that of becoming physically one with the river: we inhabit the sound, and through sound the river becomes part of us. This highlights the unique perspective brought by Lockwood's sound map: while a visual map can tell us precise locations, measurements, statistics, we remain detached, at a remove from the environment it describes; while the mapping of the river through sound allows us to engage with its sonic materiality, to inhabit its world, to get a far deeper sense of what the river itself it *like* than any visual map could provide. In facilitating the listener's feelings of personal connection to the river in this way, Lockwood's work encourages an experience which we might characterise as *ecophilia* – an adaptation of Edward O. Wilson's *biophilia*, defined as "the connections that human beings subconsciously seek with the rest of life" (Wilson, 1992, p. 350), which has begun to be used by some scholars (Hung, 2010; Moe, 2011) to incorporate nonliving elements of the natural environment into this desire for ecological connection. The way in which Lockwood brings the listener close to the sonic materiality of the river, immersing us in its sound and enabling us to travel with it on its journey, serve to promote such feelings of ecophilia – something which might be identified as the key ingredient in encouraging us to appreciate, value, and protect not just this particular river, but whatever rivers or waterways we may encounter in our own lives.

An ecocritical analysis of Lockwood's *A Sound Map of the Hudson River* thus reveals it as a fundamentally ecocentric work which facilitates a direct and personal communion with the river, allowing us to journey with it as it takes on a variety of forms and roles, to learn from its adaptability to changing circumstances, to alternately experience it as calm, powerful, or even musical, and encouraging feelings of ecophilia which may encourage us to ultimately place greater value upon this precious natural resource.

3.1.6 Soundscape composition: Hildegard Westerkamp – *Kits Beach Soundwalk* (1989)[9]

Hildegard Westerkamp's *Kits Beach Soundwalk* is a classic soundscape composition in which Westerkamp takes the listener on a journey from the soundscape of a Vancouver beach into her

[9] Other critical analyses:

1. Jordan, R. (2007) 'Case Study: Film Sound, Acoustic Ecology and Performance in Electroacoustic Music', in Sexton, J. (ed.) *Music, Sound and Multimedia: From the Live to the Virtual*. Edinburgh: Edinburgh University Press, pp. 138-141.
2. Kolber, D. (2002) 'Hildegard Westerkamp's *Kits Beach Soundwalk*: Shifting Perspectives in Real World Music', *Organised Sound* 7(1), pp. 41-43.
3. Voegelin, S. (2010) *Listening to Noise and Silence: Towards a Philosophy of Sound Art*. London: Continuum, pp. 32-35.

dreams of sound, employing deconstructive devices to explore what it means to listen to environmental sound. Somewhat unusually for a soundscape composition, it also features narration from the composer throughout, guiding the listener through the sounds we hear – beginning with Westerkamp simply describing where she is and what she can see:

> It's a calm morning. I'm on Kits Beach in Vancouver. It's slightly overcast, and very mild for January. It's absolutely wind-still. The ocean is flat; just a bit rippled in places. Ducks are quietly floating on the water. I'm standing among some large rocks, full of barnacles and seaweed. The water moves calmly through crevices. The barnacles put out their fingers to feed on the water.

If we compare Westerkamp's opening monologue with Timothy Morton's deconstruction of the rhetoric of environmental writing, we can hear in it a classic example of strong ecomimesis. It may be recalled how Morton opens the first chapter of *Ecology Without Nature* with three short examples of strong ecomimetic writing which focus overwhelmingly upon the sounds of the environments within which Morton purports to be writing. Westerkamp's opening ecomimetic passage, in contrast, contains no mention at all of sound (with the possible exception of the ducks "quietly floating on the water", which is really more an acknowledgement of an absence of sound). There is, of course, an obvious reason for this: Westerkamp has no need to describe what she can hear, since her ecomimetic description of her environment is delivered in tandem with her recording of the beach's soundscape, which means that we can hear it for ourselves. This serves to create a much stronger sense of environment than Morton's purely rhetorical descriptions: for while Morton's words can only attempt to describe sounds in order to trigger our memories of similar sounds that we have heard, and which might perhaps lead us to imagine a rough approximation of a few isolated elements of his overall sonic environment, Westerkamp's recording enables us to hear a reproduction of the entire soundscape as Westerkamp herself heard it on that particular morning on Kits Beach in January 1989 – making it, temporarily, our own sonic environment. It might thus be argued that the playback of recorded environmental sound achieves a form of ecomimesis that rhetorical description can never hope to match: for, while literary ecomimesis "purports to evoke the here and now of writing" (Morton, 2007, p. 32), the sonic ecomimesis achieved by an environmental sound recording physically reproduces the aural dimension of that 'here and now' so that it reoccurs for us in the here and now of our listening, creating the illusion that the environmental events and phenomena which are the sources of those sounds are also with us in the here and now.

This characteristic of recorded sound is described by R. Murray Schafer in his conception of 'schizophonia', in which the technical ability to record sounds and play them back in another space and time has resulted in a situation in which "[a]ny sonic environment can now become any other sonic environment" (Schafer, 1977, p. 91). The term was, of course, originally

conceived by Schafer as having largely negative connotations; however, he also acknowledged that it could be utilised in a positive manner, especially with regard to our ecological understanding, in his proposition for a model of phenomenological radio broadcasting, in which the sounds of the natural world would be broadcast in real time. While still asserting that the schizophonic nature of radio made it "a fearful medium because we cannot see who or what produces the sound: an invisible excitement for the nerves" (Schafer, 1993, p. 292), he went on to argue that "[i]f modern radio overstimulates, natural rhythms could help put mental and physical well-being back in our blood. Radio may, in fact, be the best medium for accomplishing this. And when it's discovered that our continued existence on this planet depends on re-establishing this continuity with all living things, I suspect that radio will reflect the discovery and play its part" (ibid., p. 293). Returning to Westerkamp's work, we can perhaps conclude that, since the core purpose of both weak and strong ecomimesis in nature writing is to evoke a surrounding environment in order to prompt feelings of connection with the natural world being described, the much stronger evocation of an environment provided by a sound recording achieves an ecomimesis whose strength language can never hope to match.

Following her opening ecomimetic description of her physical environment, Westerkamp's narrative does turn to the soundscape, as she explains that "the tiny clicking sounds that you hear are the meeting of the water and the barnacles". Here too, however, there is a key difference between Westerkamp and Morton: for while Morton's examples of strong ecomimesis are descriptions of what *he* hears, Westerkamp's statement is an explanation of the source of what "*you*", the listener, are hearing for yourself, a fact which again highlights the difference between writing and sound works: while literary ecomimesis can only describe a sound happening in another time and place, a sound recording allows the listener to hear a reproduction of the sound itself, resulting in a stronger rendering of the environment than even strong ecomimesis – perhaps, we might venture, a *super*-ecomimesis. At this point we might turn to the eight categories proposed by Allen S. Weiss in his book *Varieties of Audio Mimesis: Musical Evocations of Landscape* (2008), which are based upon different combinations of three pairs of elements: a sound's *source*, which may be either 'concrete' (recorded) or 'notated' (performed); its *modality*, which may be either 'hyperreal' (true-to-life) or 'stylised' (modified or composed); and its *referentiality*, which may be either 'evocative' (simulating a real-life experience) or 'ambient' (creating a mood). Weiss notes that the highest form of mimesis which can be attained by language is through the device of onomatopoeia, in which a word phonetically imitates the sound it describes, and which thus falls into the category of notated/stylized/evocative; while a field recording such as Westerkamp's falls into the category of concrete/hyperreal/evocative, which Weiss describes as possessing the "maximal reality effect" (Weiss, 2008, p. 46). While this does not make field recording inherently superior to language, or to any other form of audio mimesis, in the context of Weiss's study, it might be

argued that it does make it inarguably more effective in achieving the key object of Morton's ecomimesis to realise an accurate and realistic rendering of a surrounding environment.

This fact is illustrated by Westerkamp in her next sentence, as she proceeds to do what Morton does, and attempts to render the sounds themselves in language by way of onomatopoeic descriptors, stating that "it trickles and clicks and sucks and…"; however, then she trails off as she runs out of suitable words. With this simple move, Westerkamp manages to subtly yet clearly highlight the fundamental inability of language to adequately reproduce the essence and experience of a sound, since in its translation into the stylised performance of the spoken word, so much of the character of the original sound is hopelessly lost. Rather than continue with this attempt, therefore, Westerkamp simply gives up, falling silent and letting the sound speak for itself, and providing further evidence of the superiority of a sonic reproduction over a purely linguistic ecomimesis in rendering an environment.

However, a rendering it still is – a fact Westerkamp reveals in her next deconstructive move. Having established the sounds of the natural environment, her narrative moves to draw our attention to the background noise coming from the city of Vancouver, noting that "the city is roaring around these tiny sounds, but it's not masking them". However, she then proceeds to pull the rug out from under our ears by stating that "I could shock you or fool you by saying that the soundscape is this loud", at which point she amplifies the city's roar; and then continues "but in fact it is more like this", attenuating it again accordingly. In doing so, Westerkamp deftly deconstructs the environmental rendering achieved by her recording of the soundscape in a way which is directly comparable to Morton's deconstruction of ecomimetic writing in *Ecology Without Nature*, in which, as discussed in Chapter Two of this thesis, he outlines the six key elements of an ambient poetics: rendering, the medial, the timbral, the aeolian, tone, and the re-mark. Westerkamp's manipulation of the mix of her soundscape recording results in a change in tone which suddenly imbues the city's roar with the quality of the re-mark, shifting it from the background to the foreground; while her explanation of what she is doing as she does it causes a shift of focus towards the timbral (the quality, rather than the meaning, of the sound), as well as foregrounding the medial element of the work (the medium of the recording, mixing and playback equipment involved in the preservation and reproduction of the soundscape), thus highlighting the mediation involved in what is revealed to be a rendering rather than a reality. Morton's deconstruction of the ambient poetics involved in literary ecomimesis is done with the objective of arriving at 'ecocritique', a more open and self-reflexive form of ecocriticism which will enable a more honest and clear-headed understanding of the ways in which the arts might facilitate the furthering of our ecological consciousness. In achieving a similar deconstruction of the ecomimesis of the soundscape composition, Westerkamp's narrated manipulation of her sound recording enfolds the act of ecocritique within the work itself, enabling it to work on multiple levels to facilitate a heightened ecological awareness.

Westerkamp then proceeds to attenuate the city noise still further; however, this time it is not an attempt to "shock you or fool you", but a representation of how the soundscape appears according to her own subjective listening, which is influenced by what she can see: "The view is beautiful – spectacular, in fact – so the sound level seems more like this. It doesn't seem that loud". However, it does not stay like this for long; the city sound is once again amplified as she continues to explain that as she tries to hear the tiny barnacle sounds in more detail, "suddenly the background sound of the city seems louder again. It interferes with my listening. It occupies all acoustic space, and I can't hear the barnacles in all their tininess. It seems too much effort to filter the city out". In this passage, Westerkamp reveals that it is not only the hand of the artist who may alter our perception of the environmental soundscape: it is also our own subjective and selective consciousness, choosing where to focus our attention (our thoughts, our gaze, our listening), prioritising or amplifying certain elements of our environment, while excluding or attenuating others. We realise that our environment is not only mediated in artistic renderings, it is also mediated by our own consciousness as we move through it, filtering and creating our own reality; and even if we were standing on Kits Beach ourselves rather than listening to Westerkamp's recording, our experience of that environment and its sound would still be more of a self-rendered ecomimesis rather than an absolute, unarguable 'reality'. We are thus left wondering which is the more 'real', 'honest', or 'natural' portrayal of the soundscape: the one we began with, played back (as far as we know) exactly as it was picked up by the tape recorder; or the manipulated version which is closer to what Westerkamp herself experiences.

Following this, Westerkamp fully and explicitly enters the realm of fiction, employing technical tools to solve the problem of the distracting city noise: "Luckily, we have bandpass filters and equalisers. We can just go into the studio and get rid of the city. Pretend it's not there. Pretend we are somewhere far away". Westerkamp now effectively erases the city from the recording altogether, so that all we can hear is the clicking of the barnacles – reflecting, perhaps, Westerkamp's background in acoustic ecology, and its favouring of hi-fi, rural and natural sounds over lo-fi, urban and industrial sounds. This moves the work into the realm of the pastoral, in which the city is positioned in direct opposition to the natural world, representing an undesirable, negative and oppressive force which is thus erased in order to create a pastoral fantasy. In *Kits Beach Soundwalk*, however, Westerkamp avoids the deception of the audience perpetrated by some other pastoral works – including many soundscape compositions – by being completely upfront about the fictional nature of what we are hearing, and making very sure we know that we are only 'pretending' that the city is not there. The work slips still further into pastoral territory as Westerkamp proceeds to relate some of the dreams in which she hears tiny sounds like those being made by the barnacles. The first two of these dreams – of "women living in an ancient mountain village … weaving the most beautiful silken fabric", and of "a stone cottage … [with] four generations of a peasant family sitting around a large wooden table, eating and talking" – are strongly pastoral scenes; and as Westerkamp describes them, the

soundscape gradually shifts from the clicking of the barnacles to stridulating insects, a babbling stream, and tweeting birds, until we suddenly find we are no longer by the sea, but in the countryside.

However, having lulled us into this appealing pastoral mode, Westerkamp proceeds to rupture it by relaying, in the same gentle, calm voice, a disturbingly violent and suggestively sexual dream, in which "I heard bullets tinkling, bouncing like tiny marbles. A man was pursuing me with a gun. I was frightened. But the bullets tinkled. Metallic, tiny seductive semen tinkling all around me". In this unexpected change in the tone of her dream imagery, Westerkamp opens up her – and therefore our – imaginative interpretation of the sounds of the barnacles to more than just romantic pastoral fantasies. Strong ecofeminist overtones become apparent in the stark contrast between the first dream, in which a group of women in a rural location are collectively engaged in an act of creation using traditional methods, and this one, in which an individual man uses the modern technology of a gun in an attempt to aggressively and violently destroy the female victim. However, Westerkamp then proceeds to fundamentally complicate this interpretation of the ecologically nurturing and creative female contrasted with the ecologically exploitative and destructive male by comparing the (male) bullets whose penetration of the (female) body destroys life, with the (male) semen whose penetration of the (female) egg results in its creation. Furthermore, in the language she uses – "Metallic, tiny seductive semen tinkling all around me" – Westerkamp makes her dream even more complex and ambiguous, appearing to suggest that while fantasies of pastoral innocence and the ecologically nurturing female may contain a certain degree of truth and usefulness, it must also be acknowledged that violence, sex and technology – and men – are just as much parts of the world, and of nature; parts which may, furthermore, become problematically intertwined, and be simultaneously both frightening and seductive, destructive and creative.

Another unexpected shift in tone occurs towards the end of the piece, when the city sounds return to the soundscape in bursts, sounding like a powerful force bursting in upon the gentle, tinkling, high-frequency soundscape that our ears have by now grown used to. Westerkamp's narrative again presents an ambiguous perspective, complicating what we think we are supposed to feel about this intrusion of the city, commenting that "as soon as I make space to hear sounds like this, or to dream them, then I feel the strength to face the city again, or even to be playful with it. Play with a monster; then I can face the monster". In these ambiguous and complex aspects of *Kits Beach Soundwalk*, Westerkamp's narrative moves into the sort of territory outlined by Timothy Morton in his conception of 'dark ecology' – "a new ecological aesthetics … [which] puts hesitation, uncertainty, irony, and thoughtfulness back into ecological thinking" (Morton, 2010, p. 16) – and the sorts of art which might embody it:

> A more honest ecological art would linger in the shadowy world of irony and difference. With dark ecology, we can explore all kinds of art forms as

> ecological; not just the ones that are about lions and mountains, not just journal writing and sublimity. The ecological thought includes negativity and irony, ugliness and horror. (ibid., p. 17)

In complicating and upsetting the pastoral ecomimesis she has set up with the disturbing and ambiguous image of being frightened by a man with a gun whose bullets are like "tiny seductive semen", and in concluding by being playful with the roaring "monster" of the city in order to be able to face it, Westerkamp moves towards Morton's dark ecological aesthetic, a more open and honest perspective in which her environment, and the workings of its ecology, is not idealised, but is curiously investigated in all of the irony and complexity which is an inescapable part of considerations of the Anthropocene.

In conclusion, while not wishing to define Westerkamp's work solely in terms of Morton's ecological theory, the numerous parallels between the two serve to illuminate how *Kits Beach Soundwalk* challenges traditional ecological narratives in ways which are conducive to a more progressive and enlightened consideration of our relationship with the world around us. Her transparent and narrated manipulation of the soundscape not only deconstructs and reveals the ecomimesis involved in the soundscape composition, but also the subjective ecomimetic rendering of the environment created by the operations of our own sensorial perception, realising an ecocritique both of the work and of our own environmental understanding. Her disruption of her pastoral dream narratives with more disturbing and ambiguous scenarios, and of the pastoral soundscape with the violent yet playful re-intrusion of the city, meanwhile, not only imbues her work with ecofeminist overtones but also moves it towards a dark ecological perspective, which may be precisely the sort of honest and open approach we need to learn to take as we attempt to tackle the complex realities of the ecological problems we face.

3.2 Ecocritical analyses II: Contemporary works

3.2.1 Susan Phillipsz – *Lowlands* (2010)[10]

Susan Philipsz's *Lowlands* is perhaps one of the best-known works of contemporary sound art, having gained the distinction of being the first ever sound work to win the Turner Prize. It features the artist singing three different versions of a melancholy sea shanty, *Lowlands Away*, whose lyrics tell of the narrator being visited in a dream by her lover, who has come to tell her that he has been drowned. The work has been exhibited in two different contexts: it was originally installed under three bridges over the River Clyde in Glasgow – the George V Bridge, the Caledonian Railway Bridge, and Glasgow Bridge, which are all situated next to one another – with a different version of the song playing under each. When it was nominated for the Turner Prize, however, it was installed in a white room at the Tate Britain, with each of the three versions played back over one of three separate speakers, positioned on three of the walls. Although the recorded sound in these two installations was the same, the two different contexts resulted in marked differences in the two versions of the work, revealing that it cannot properly be understood in isolation from the environment it is presented in. Straight away, this fact indicates the fundamentally and deeply ecological nature of the work: the differences in the two different installations reveal the recorded sound, which is the thing we can point to as having been created by the artist, as just one part of an ecosystem of different environmental elements, all of which combine and interact to produce the overall *experience* of the work. *Lowlands*, then, is not just about sound; it is, crucially, about the environment in which it is sounded and experienced by the listener, and the ecosystem of elements which interact within that environment.

In its original installation in Glasgow, the lyrics of the song have a clear relationship to the location: Glasgow is a port, with a long history of ships and sailors journeying in and out of the city, and we can imagine that the lover who sings the song has been waiting in this very city for her sailor to return. Her song, issuing from the speakers installed on the bridge, penetrates the waters of the Clyde beneath; thus, her voice is symbolically drowned in the river, to be carried out to sea to meet her drowned love, where they can be reunited by their mutual submersion

[10] Other critical analyses:

1. Bard-Schwartz, D. (2014) *An Introduction to Electronic Art Through the Teaching of Jacques Lacan: Strangest Thing*. Abingdon: Routledge, pp. 79-80.
2. Bulut, Z. (2014) 'Singing and a Song: The "Intimate Difference" in Susan Phillipsz's *Lowlands* (2010)', in Symonds, D. and Taylor, M. (eds.) *Gestures of Music Theatre: The Performativity of Song and Dance*. Oxford: Oxford University Press, pp. 178-190.
3. Ticca, E. (2014) *The Body of Sculpture in Twenty-First Century Cities: Alois Riegel's* Cults of Monuments *and Four Public Sculpture Artworks from Britain (2000-2013)*. MA Thesis. University of Leeds. Available at: http://www.academia.edu/9240560/The_Body_of_Sculpture_in_Twenty-First-Century_Cities_Alois_Riegl_s_Cults_of_Monuments_and_Four_Public_Sculpture_Artworks_from_Britain_2000-2013_ (Accessed: 27 May 2017), pp. 13-15.

within the water. The lyrical theme of drowning also emphasises the volatile and dangerous relationship between human and nature, reminding us of the dual nature of the water as both friend and enemy: for while the city of Glasgow has been built upon the human use of the river and the sea to carry cargo to and from other countries and create a prosperous economy, the drowning of the sailor highlights the fact that it is also a relationship which demands respect, for if our body leaves the safety of the ships – or bridges – we build to carry us safely across it, it will mercilessly swallow us up and take our life. Phillipsz's use of the medium of the folk song is also significant in this respect, since it is a form often associated with the pastoral mode, portraying a nostalgic, harmonious relationship between humans and nature which is resonant of deep ecology. This particular folk song, however, counterbalances the romance of the sea with the reminder of its dangerous power, bringing it closer to the trope of wilderness in which the sea represents a place of wild nonhuman nature in which we do not really belong, and in which we cannot survive. Even in the human-dominated environment of a city like Glasgow, when we come to a river, we must build bridges to pass over it at a safe distance. Deep ecology, it suggests, is all very well; but get too deep, and you will drown.

Fig. 4 Susan Phillipsz – *Lowlands* (Glasgow)

The work can also be heard as a haunting, as something which, in its realisation, enacts the haunting described in the lyrics of the song: just as the voice of the dead sailor haunts his lover back in the port, so the listener is haunted by the disembodied voice of Philipsz singing the song. It creates a situation in which the listener becomes aware of an environment which consists not just of isolated objects, but also of forces, some of which are invisible, but which impact upon us nonetheless, and perhaps with a much greater psychological and emotional force than anything we can see.

The fact that the song is presented in three different versions – one under each bridge, or, in its Tate Britain version, one issuing from each of three speakers on three of the room's four walls – also demonstrates the ecological nature of the song itself. In common with many folk songs, it is not a fixed entity, as its form – its lyrics and tune – is altered by a variety of forces as it moves through different times, places, situations, memories and voices, illustrating how, while words and notes can be written down, a song only really exists in the moment of its being sung, and that this will be different every time. Not only this, it will be heard differently by each individual listener, as it triggers their own unique combination of feelings, memories and associations, thus making the listener's own consciousness part of the ecosystem of interacting forces at play. Even in a recording, as it is presented in Phillipsz's work, each time the song is played back it will be slightly different depending upon the other environmental sounds it blends with, and the ways in which other bodies within the space affect the characteristics of the sound; for while the song issues from speakers attached to the bridges, this is not the only point from which the sound reaches the listener, as it also reverberates off different objects within the soundfield. In a sense, therefore, the Glasgow version of *Lowlands* is experienced as a choir composed of many parts: not just the three versions of the song issuing from the speakers, but those songs sung in turn by the bridges themselves, by the water, by the pavement, or by boats as they pass underneath. The reverberations created by the sound bouncing off, and also being absorbed by and resonating, these surfaces, allow the listener to hear the interaction of the sound with the environment, as different elements within it sing it back to us; and we hear the interconnectedness of those things as the sounding of a dynamic ecosystem in action.

Moreover, it is not just the various physical objects in the environment that give us this sense of the ecological, but the invisible medium through which they are connected: the air. As the medium through which the sound waves travel between objects, the air is transformed into a tangible substance which physically connects our body with the bridge, and with the water. The listener's body no longer simply passes *underneath* the bridge, or *between* bridge and pavement, but *through* the sound which fills the empty space – making us realise that it is not empty space at all, but the physical medium through which the sound waves are travelling, and within which we are completely immersed. This aspect of Phillipsz's work thus enacts the ecological principle which, David Abram argues, formed a key part of life in oral cultures of the past, in which "all things – animals, forests, rivers, and caves – had the power of expressive speech, and the primary medium of this collective discourse was the air … The invisible atmosphere was thus the assumed intermediary in all communication, a zone of subtle influences crossing, mingling, and metamorphosing" (Abram, 1996, pp. 253-4). The sound of Phillipsz's voice, coming from multiple directions as it echoes off the surfaces of the bridge, the ground and the water, turns the air back into just such a zone of mingling and metamorphosing communications, giving those objects and elements back their powers of expressive speech as we hear their acoustic characteristics imprinted upon the sound as it reverberates off them. The

feeling of total bodily immersion in the air also functions as a physical manifestation of the drowning described in the lyrics of the song: we are immersed in the atmosphere, made tangible by sound, just as the sailor is immersed in the water of the sea; and we drown with the sailor as we are swallowed up by the materiality of the vibrating air molecules that surround our body.

In terms of ecological theory, the soundfield created in Phillipsz's work might thus be conceived of as activating a form of deep ecology, in which the listener has an experience of embeddedness within, and connection to, an environmental ecosystem. Yet it is more than this: for while deep ecology tends only to focus upon our connection with the natural or organic environment, the sonic ecosystem created in Phillipsz's work includes metal and stone bridges, train lines and pavements, as well as the electronic speakers playing the digital recordings of the song. As in Varèse's *Poème Électronique*, therefore, this ecosystem might be more accurately recognised as an example of Timothy Morton's mesh, an interconnected network which includes both the living and nonliving, organic and mechanical, visible and invisible; while to pass through the installation and physically experience this sonic ecosystem brings the listener closer to an experiential understanding of Morton's ecological thought, in which we come to conceive of our ecological self in terms of our embeddedness within that mesh, and our interconnected – and therefore interdependent – relationship with every element it contains.

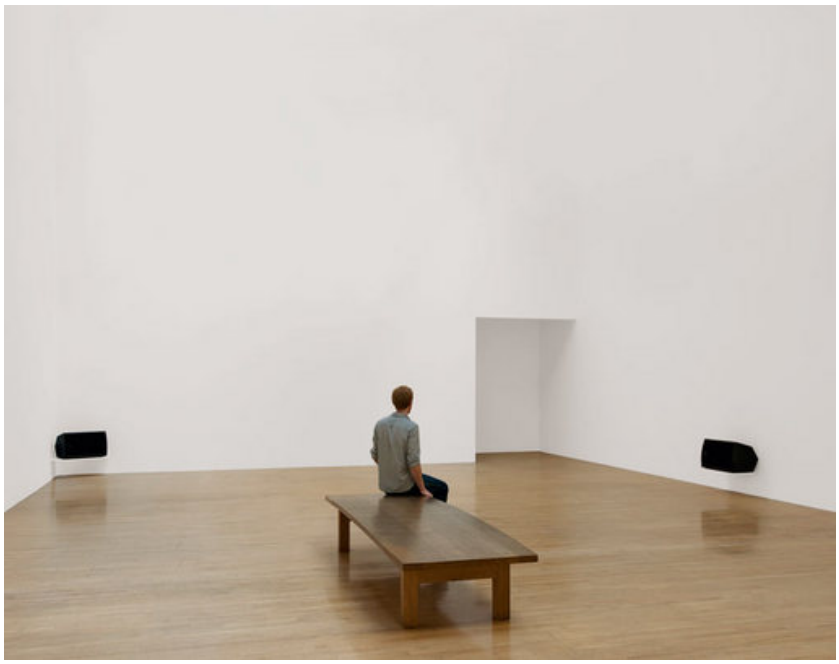

Fig. 5 Susan Phillipsz – *Lowlands* (Tate Britain)

The version of the work installed in the Tate Britain, of course, contains none of the sonic interactions with the River Clyde and its bridges; the three versions of the song play from three speakers positioned on three walls of a plain white room with a bench in the middle. This sort of gallery room is specifically designed to be a non-space, encouraging the audience to focus their attention on the artworks themselves rather than the room they are in; and while the sound still

interacts with the space in its reverberation off the surfaces of the room, these reverberations are much less pronounced than those beneath the Clyde's bridges, and do not have the same presence within the work. The surrounding soundscape is also radically different: whereas in Glasgow the songs mingle with a wide variety of environmental sounds from many different sources, which may sometimes overpower the sound of the song itself, the room at the Tate, while not soundproof, is still reasonably enclosed, meaning that there are fewer, quieter, and much less complex environmental sounds to mingle with the work. In this room, therefore, there is a much more concentrated focus upon the sound of the three songs, converging in the body and the ears of the listener. In this way, however, the Tate Britain installation perhaps results in an even greater focus on the materiality of the air; for, stripped of any other tangible environmental elements, there is nothing left but the sound and the listener, whose body becomes immersed in the surrounding air which the sound makes tangible.

The two different versions of Phillipsz's work thus each provide a different ecological experience: in the version installed under the bridges of the River Clyde, it is the immersion in an ecosystem, in which the sound reveals the interconnections between the different elements within it; whereas in the version in the small, enclosed white room at the Tate Britain, it is an immersion in sound itself, a drowning in the air, in which the whole body submits to the sound, resulting in the death of the isolated self, which is also the rebirth of the ecological self. Moreover, once we have undergone these experiences of ecological connection – once we have felt the interconnections between things, and the materiality of the air – we also become aware that this is how it always was: it just took sound to make it tangible, to make us aware of it. It is in this that the strong ecological dimension to Phillipsz's work lies: in activating an experiential awareness of the interconnected mesh of which all things, including humans, are a part, and in which the behaviour of one part affects all the rest, thus facilitating the thinking of Timothy Morton's ecological thought – the implications of which, on the evidence of our woefully inadequate response to the crisis of climate change, humanity still urgently needs to find ways to try to understand.

3.2.2 Raviv Ganchrow – *Long Wave Synthesis* (2015)[11]

Raviv Ganchrow's *Long Wave Synthesis* was created in response to a commission by Sonic Acts as part of their *Dark Ecology* project, and given its public premiere at their 2015 conference, *The Geologic Imagination*. Ganchrow's work is an installation involving eight

[11] Other critical analyses:
1. Martín, C. (2015) 'The Sound Nobody Hears'. Available at: http://a-desk.org/en/magazine/the-sound-nobody-hears/ (Accessed: 7 February 2017).
2. Vandsø, A. (2016) 'Listening to the Dark Side of Nature', in Schneider, R.J. (ed.) *Dark Nature: Anti-Pastoral Essays in American Literature and Culture*. London: Lexington Books, p. 205.

custom-built low frequency generators which create acoustic waves between 4-30Hz, creating largely infrasonic vibrations over approximately one square kilometre. In doing so, the work does not merely create a sound which is transmitted to the listener, but an expansive sound *field* which the listener can wander *through*. While the sound has a clear source in the shape of the eight low frequency generators, it is not directional: rather than coming from 'over there' to the listener, it surrounds and envelops them. It is thus no longer sound in the environment, but sound *as* environment, which, though it may originate within the generators, spreads out to fill every square inch of the air, becoming a tangible environmental force which the listener experiences primarily as physical vibrations rather than as cochlear sound. The lines between sound and air become blurred as we realise that we cannot meaningfully separate sound from the air that it moves through: it is a quality of the air, the way in which air behaves when a force acts to move it in pulsing waves, which we can sometimes hear, and sometimes, as in this work, feel as a physical, pulsing force upon our bodies.

Fig. 6 Raviv Ganchrow – *Long Wave Synthesis*

The physical sensation created by these low frequency waves thus gives the air a materiality, allowing us to perceive it as a physical substance which we are completely immersed in, and which has the power to physically affect our bodies. As in Susan Phillipsz's *Lowlands*, Ganchrow's work thus enables the listener to rediscover the fact of our physical immersion in the air, addressing our profound lack of awareness of the atmosphere which surrounds us. In Ganchrow's work, the physical sensation of being immersed within the pulsating force of the surrounding atmosphere gives the air materiality as a physical substance which both surrounds and penetrates our bodies, rather than as empty space which, as David Abram points out, allows us to continue polluting it as if there were nothing there at all. When we conceive of the air as empty space or invisible nothingness, it is the thing which places distance between different physical elements; but in its newfound materiality, activated through

Ganchrow's long waves, this distance is collapsed, the air now a field of forces which, far from separating things, becomes the very thing which *connects* them, the space in which they interact and impact upon the other, imparting a strong sense of ecological connectedness between the listeners and the wider environment.

Moreover, as it activates the air within the square kilometre around the generators, the sound interacts not only with the listeners within that square kilometre, but also with the topography of the landscape, and even with the atmospheric and meteorological conditions of the location at that particular time, which impact upon how the long waves travel through the space. In this sense, Ganchrow's long waves sonify the environment, both physical and climatic, as its features, conditions and dynamics shape the behaviour of the sound waves from moment to moment. This is particularly salient in the context of contemporary concerns about climate change: in *Long Wave Synthesis*, our awareness that the climate is affecting the sound turns it from an abstract concept to a dynamic force, which has a direct physical effect upon what the listener experiences in that moment. This aspect of Ganchrow's work makes *Long Wave Synthesis* a perfect example of the sort of work which Douglas Kahn argues is so important for the development of our awareness of the dynamic energy of the earth in an era of global warming:

> Amid our contemporary legacies of annihilations of space and time – with global warming and other forms of ecological destruction accelerated with the millisecond, metallic circuits of capital, and globally distributed Internet communities with no apparent natural habitat – it is clear that circuits need to be opened up to many earth returns in an evolving sense of planet. As we live within this panorama, the energetics and earth scaling of artists, musicians, scientists, and engineers become increasingly crucial. (Kahn, 2013, p. 258)

The philosophical implications of this sonification of the climate become even more compelling if we take *Long Wave Synthesis* as a jumping-off point for the consideration of waves at even lower frequencies than those created by Ganchrow's custom-built generators, which only reach as low as 4Hz (that is, around 85m long). In talks he has given to accompany his work, Ganchrow has explained that infrasound has no strictly defined lower limit, but that when the frequency of waves is slow enough, they interface with atmospheric pressure and meteorological phenomena; thus, in a very real sense, sound becomes weather. *Long Wave Synthesis* thus leads us to a place in which we need only allow ourselves a small degree of poetic licence to regard the earth's climate as the ultimate low frequency oscillator: a periodic force which we cannot directly perceive except through the ways in which it impacts upon other phenomena. Taking this metaphor as a way to consider current ecological issues, we might consider anthropogenic climate change as a detuning of the earth's own low frequency

oscillator, in which our alteration of the oscillations of the earth's climatic processes have a knock-on effect upon the oscillations of its meteorological phenomena, causing a progressive shift in tonality which may eventually become too out-of-tune with our social structures, our ways of life, and even our bodies, for it to be possible for us to learn to harmonise with it.

The fact that an ecocritical listening reveals these resonances with the ecological issue of climate change, however, must – especially when coupled with the fact of its wider context as part of Sonic Acts' Anthropocene-focused *Dark Ecology* project – lead us to also consider how the ecological footprint of Ganchrow's work might impact upon this same issue. Most obviously, there is the power required to run the eight large low frequency generators involved in the work for hours at a time; however, the resources used, waste created and carbon emitted over the full course of its creation and realisation, including the transportation both of the generators and of Ganchrow and the audience to the site of the installation in Amsterdam, must surely all add up to a significant ecological footprint. Of course, the degree to which we consider it to be a 'large' or 'small' footprint is relative: while it will likely be considerably greater than that of the average painting, for example, it will also be considerably smaller than that of the average Hollywood movie. However, it still remains an issue which cannot easily be dismissed, particularly since the fact that the carbon emissions created by the work are directly contributing to the very problem which an ecocritical listening causes us to associate it with.

An ecocritical listening thus reveals Ganchrow's *Long Wave Synthesis* to be an extremely ecologically resonant yet highly problematic work. Its use of infrasound, creating a space in which the listener is able to physically experience the materiality of the atmosphere which they are immersed within, highlights it as a dynamic field which connects, rather than separates, the various elements within the environment; and its sonification of the very ecosystem that surrounds us as it interacts with the landscape and with the climate implies a blurring of the boundaries between sound and weather, suggesting that we might perhaps regard the climate itself as a kind of low frequency oscillator, the tuning of which we must learn to take seriously if we are to prevent it from modulating to a frequency whose vibrations human civilisation can no longer survive. However, these resonances are complicated by the ecological footprint generated in the course of the work's creation, realisation and exhibition, creating a situation in which – from an ecological perspective, at least – it perhaps becomes difficult for *Long Wave Synthesis* to reasonably justify its own existence.

Conclusion

It is a truism that no work of art exists in a vacuum; and it is important to remember that this principle necessitates an understanding not only of the time in which works were originally produced, but also of the time in which they are encountered, since the ways in which any work

of art is experienced, understood and evaluated will inevitably be influenced by the social, cultural and political concerns which are contemporary to the audience. As this thesis has already noted, recent years have seen ecological issues such as biodiversity loss, pollution, sustainability, environmental justice and climate change grow to represent some of the most urgent global concerns currently facing humanity, representing a threat to our very ability to survive as a species, and demanding nothing less than a fundamental reassessment of how we live our lives, organise our societies, and relate to the world. The achievement of a comprehensive critical understanding of what art means to audiences in the twenty-first century therefore demands the incorporation of an ecocritical perspective which enables the assessment of its significance in the context of contemporary ecological concerns. As identified in Chapter One, in recent years ecocriticism has come to be adopted as an important critical approach within literary theory, art history, film studies and musicology; however, it has not yet been applied to sound art. The importance of addressing this situation is heightened by the fact that, as argued in Chapter Two, its unique characteristics as a medium makes sound art perhaps the most inherently 'ecological' of any art form.

This chapter has taken the first step in this direction by using the ecocritical framework for sound art developed in Chapter Two to carry out eight ecocritical listenings to canonical and contemporary works of sound art. These analyses have demonstrated how such an ecocritical approach can reveal numerous facets within such works which have not previously been acknowledged, and which allow them to speak to contemporary ecological issues in a variety of different ways. Some common themes which have arisen from these ecocritical listenings include the sense of ecological connectedness facilitated by the creation of a sonic environment in which sound activates and reveals the relationships between things; the endowment of the air that surrounds us with a tangible materiality, promoting the conscious ecological awareness of our bodily immersion in the invisible atmosphere; the interrogation of the binary divisions between nature and culture, and human and environment; the sonic demonstration of an inclusive ecological worldview which acknowledges the interactions between things as part of an interconnected mesh, whose operation makes no distinction between organic and mechanical, living and nonliving, natural and human-created; the ability of sound to highlight the agency of objects, and the ways in which those objects interact with other presences, events and forces in assemblages of actants; the forging of an enhanced ecological sensibility, and perhaps feelings of ecophilia, through the direct sensorial connection with environmental materials, presences and processes achieved by listening; and the creation of artistic metaphors which provide new ways of thinking about today's urgent ecological issues in the age of the Anthropocene. This list does not by any means represent an exhaustive account of all of the ecological themes which may be found within works of sound art, however; and it is hoped that the case studies provided in this chapter might provide a blueprint for future ecocritical listenings, in order that the conclusions presented here might be further explored, challenged and expanded upon, and the

potential for sound art to speak to the urgent ecological issues facing humankind in the twenty-first century might continue to be investigated.

Chapter 4
Ecological Sound Art

Introduction

At the outset of this thesis, it was established that the purpose of this research is to address two significant gaps in sound art scholarship regarding its relationship with contemporary ecological issues. The first of these was critical, regarding the absence of any ecocritical engagement with the art form – and the last two chapters have taken steps towards addressing this gap, through the development of a new ecocritical framework specifically designed for sound art in Chapter Two, and its application to a selection of classic and contemporary sound works in Chapter Three, which have demonstrated how an ecocritical listening can unlock new facets of such works which enable them to speak to contemporary ecological issues.

Having done this, the present chapter will now turn to addressing the second of the two gaps, which has been identified as curatorial in nature, regarding the failure to group together and recognise the growing number of ecologically-engaged sound works as a distinct and coherent genre in their own right. As determined in Chapter One, curation is here understood as the practice of selecting and grouping together works of art based upon a given set of shared characteristics, thus contextualising them as part of a wider movement or trend – an act which can have considerable influence upon the ways in which they are promoted, received and understood. It was also observed that if a given curatorial strategy is replicated by others, it can lead to the recognition of a distinct new artistic genre, which can in turn lead to more widespread awareness of the works within it – something which has, as demonstrated in Chapter Two, happened on a significant scale with eco-art over the twenty-five years since it was first 'curated into existence' by Barbara C. Matilsky in 1992's *Fragile Ecologies* exhibition and accompanying book. It was also explored how, in more recent years, other art forms have begun to adopt this curatorial strategy of grouping together and defining distinct ecological or 'eco-' genres, such as 'ecofiction' (Dwyer, 2010), 'ecocinema' (Willoquet-Maricondi, 2010) and 'ecotheatre' (Schafer, James and Standing, 2014), enabling the consolidation and promotion of common bodies of ecologically-engaged practice in these art forms. When it comes to sound art, however, it was identified that, despite the significant and ever-increasing number of ecologically-engaged works, such a curatorial strategy has not yet been adopted, with no exhibitions, books, papers or even websites having collected them together in order to identify, analyse and promote them according to their common ecological themes, meanings and messages.

The first steps in addressing this curatorial gap in sound art scholarship have already been taken in the final sections of Chapter One: first, by establishing the most suitable terminology

for the proposed new genre as being 'ecological sound art', following the precedent set in other art forms; second, by formulating a basic definition of it as 'sound art whose content or subject matter displays an engagement with ecological issues'; and third, by using this definition as the guiding principle to compile a selection of works of sound art which suggest such an engagement. The present chapter will now move to build upon these initial steps by combining the critical with the curatorial, employing the framework developed in Chapter Two to carry out ecocritical listenings to a selection of these potential works of ecological sound art.

In compiling the list at the end of Chapter One, it was decided that, rather than attempt to exhaustively cover every facet of the vast and complex network of contemporary ecological issues, the curatorial process would be limited to sound works which suggested an engagement with one of five key ecological areas or tropes: the polar regions; trees and forests; rivers and seas; atmosphere and climate; and extinct and endangered species. Even with these limitations imposed upon its scope, this yielded a selection of over fifty works by more than thirty artists or groups of artists, amply demonstrating the validity of this endeavour. However, this represents too great a number to allow in-depth examinations of all of these works to be contained within the limits of this thesis; thus, the ecocritical listenings in the present chapter will focus upon the works within the two tropes which emerged as the most dominant: the polar regions, and trees and forests. These ecocritical listenings should therefore be considered merely as a first step, providing a template for further research into the identification and analysis of this important and timely new genre. At the conclusion of the chapter, the results of these listenings will be collated to develop a more detailed definition-in-progress of ecological sound art, including a list of some of its common characteristics.

4.1 A spectrum of ecological sound art

As detailed in Chapter One, each of the potential works of ecological sound art listed at the conclusion of that chapter was selected on the basis that its content or subject matter suggested an engagement with contemporary ecological issues. Part of the purpose of the ecocritical listenings in the present chapter will therefore be to determine the precise nature of this engagement, as well as its strength and significance, in each sound work – something which may ultimately result in some of them being judged not to be works of ecological sound art after all. However, this is something which, it is expected, will vary greatly from work to work, making it not just difficult, but undesirable, to attempt to categorise them according to a simple binary 'in or out' judgement. As a solution to this problem, four categories have been developed to enable the positioning of each work on a spectrum of ecological sound art, determined by its level of engagement with contemporary ecological issues.

1. **Explicit ecological sound art** – in which an engagement with ecological issues is explicitly declared within the work itself.

2. **Implicit ecological sound art** – in which an engagement with ecological issues is not specifically declared, but still forms a clear part of the work's implicit meaning.

3. **Marginal ecological sound art** – in which individual listeners may or may not interpret a connection with ecological issues, depending upon whether they bring this concern to the work.

4. **Non-ecological sound art** – in which the work does not engage with ecological issues in any meaningful sense.

These four categories should not be confused with an assessment of a given work's quality, artistic merit, or degree of success, whether from an ecocritical or any other perspective. Rather, the function of the categories is as a working framework which will help to determine the degree to which individual works may be considered as ecological sound art; and it will ultimately be used as the final part of the curatorial strategy employed in compiling the catalogue of ecological sound art provided in the Appendix, which will also incorporate all of the other potential examples listed in Chapter One.

4.2 Ecocritical analyses I: The polar regions

One of the major concerns relating to the global warming caused by climate change is the melting of the ice at the Arctic and the Antarctic, and the consequent rise in sea levels around the world – an issue which has made the polar regions, and particularly their majestic glaciers, the most common and enduring image symbolising climate change. A number of sound artists have undertaken expeditions to the poles and have produced a wide variety of sound works: some which have focused upon recordings of the sounds made by the melting polar ice; others which allow audiences to experience the ice melting live and in person; and still others which explore the human relationship with the polar regions. But are all sound works about the North and South Poles works of ecological sound art?

4.2.1 The sound of melting ice

A number of sound artists have turned their microphones towards the polar ice itself, recording the sounds made by melting glaciers. Some present their recordings as edited 'highlights': Chris Watson's *Vatnajökull* (2003) uses field recordings to follow the journey of 10,000-year-old glacial ice as it melts and flows into the Norwegian sea, while Douglas Quin's vinyl-only release *FATHOM* (2010) features four underwater recordings of glacial ice at the Arctic and the Antarctic, with the clicks and pops that are a natural by-product of the vinyl format becoming mixed with the sounds made by the glacial ice as it cracks and frozen bubbles pop. Others work with the sounds more compositionally: a number of Jana Winderen's works, including *+4°C* (2007), *Evaporation* (2009) and *Energy Field* (2010), feature recordings of Arctic glaciers in Greenland and Norway combined with drones which give the feeling of being submerged in the icy waters; while Daniel Blinkhorn's *frostbYte* cycle of compositions (2012-15) treat the Arctic glacial sounds acousmatically, employing a microsound aesthetic which invites comparisons between the cracking and popping of the polar ice and the sonic palette of glitch music.

One of the key aspects of all of these works is the way in which sound captures the dynamics of the glacial melting process. Approached from a purely visual perspective, a glacier appears to be literally 'frozen', in the sense of being still, unmoving and unchanging; unless one manages to witness a dramatic calving event, its melting is generally too gradual to be perceived in real time. In contrast, the sonic dimension of glacial melting gives voice to this key example of one of the "gradual and less visible processes" (Kanngieser, 2015, p. 3) of ecological change, facilitating an "[o]pening up and listening very carefully to the imperceptible, to the prospect of things beyond human cognitive and sensorial reach, and accepting their value and validity" (ibid., p. 3). This opening up, which serves to reveal the animate nature and vitality of the glaciers, thus acts as a concrete example of Jane Bennett's vibrant materialism, in which non-human, non-living things are revealed to "act as quasi agents or forces with trajectories, propensities, or tendencies of their own" (Bennett, 2010, p. viii). In her next sentence, Bennett goes on to wonder "how analyses of political events might change if we gave the force of things more due" (ibid., p. viii); in this case, it might be proposed that our understanding of glacial melting as a dynamic, ongoing process, happening ceaselessly and progressively in real time, second by second, might encourage the sense of urgency with which it is so vital that we learn to regard and respond to climate change.

In *The Spell of the Sensuous*, David Abram observes that while our visual sense tells us about their outer surfaces, listening tells us about "the interior substance of things. For the audible resonance of beings varies with their material makeup" (Abram, 1996, p. 128). Listening to the startling range of sounds made by the polar ice, from deep, rumbling creaks and groans to high squeaks, fizzing and dripping, punctuated by sudden cracks, pops, bangs and the occasional dramatic, echoing crash, provides a strong sense of the material characteristics of the

glacier – its voluminosity and density, its immense weight and power – serving as an example of precisely the sort of ecologically-attuned phenomenology which Abram regards as so vital to the rediscovery and restoration of our deep ecological understanding of, and relationship with, the nonhuman world.

The more straightforward field recordings of Quin, Watson and Winderen also possess an investigative aspect, suggesting that we are listening in to the artist's own sonic explorations of the polar glaciers – that we are listening to their listening. This positions the artist as a student of the environment, listening to it in order to learn from it, modelling a "pushing away from a sense of oneself … [in which] it might be possible to become sensitive to that which humans have no claim to, or over, and to which humanity is of no concern" (Kanngieser, 2015, p. 3). Their recordings thus become a channel through which to share this learning with other listeners, demonstrating an ecocentric approach in which their environmental subject matter is placed at the heart of a work which is not about the artist, but about the ice.

The much more heavily composed approach taken by Daniel Blinkhorn in his *frostbYte* cycle is more problematic in this respect, demonstrating a more anthropocentric attitude towards his subject matter. While his works are also undoubtedly the product of close listening to the sounds of the glacial ice, and also demonstrate a thorough exploration of its sound world, his extensive electroacoustic manipulations transform the sounds into something which arguably functions more as an expression of the composer's own technical abilities and musical sensibilities. This raises the further question of whether his compositional approach itself constitutes a form of environmental exploitation; for while the act of composing with the sounds of an Arctic glacier does not in itself do it any direct harm, Blinkhorn's sonic transformations are perhaps in danger of carrying overtones of the "transformations of capitalism, which are connected to the transfiguration of so-called nature, and ongoing forms of colonial violence" (Kanngieser, 2017, p. 376) which Anja Kanngieser argues lie at the heart of the Anthropocene. As listeners, we must ask ourselves whether Blinkhorn's use of the glacial sounds as compositional material might thus be perceived as a 'conquering' of this inhospitable environment by human will and technology, and of regarding the glacier itself as nothing more than a resource whose only value lies in its sounds being captured and manipulated – something which is dangerously resonant of the central problem in the attitude of human beings towards the natural world in general.

This said, however, while the principle of letting sounds 'be themselves' is often equated with a sort of 'purity', both from an aesthetic and a moral point of view, especially amongst the field recording community, we should beware of the temptation to conclude that the ecological worth of sound works involving recordings of natural sound is simply inversely proportionate to the amount of manipulation that the sounds are subjected to; while such a conclusion is nice and neat, it is perhaps overly simplistic. Blinkhorn's works are impressionistic compositions, and as such achieve things that the other, more 'natural' recordings of glacial ice do not. For example,

the skittish way in which the icy sounds dance around the speakers in the first section of *frostbYte: red sound* conjures up feelings of shivering and teeth chattering, creating a tangible sense of the cold; while the stretched-out and shimmering granular tones of the final section of the work evoke wide open spaces with the sunlight shimmering off the ice, suggesting feelings of awe at the beautiful yet forbidding frozen landscape. Such aspects may facilitate a more personal response to the polar ice than the more straightforward, less manipulated field recordings; and while the resulting works may end up being more about the artist than the environment, they also possess an emotional dimension that is perhaps lacking in the other works, and which may promote ecological concern in the listener for different reasons.

For those listeners who approach them with an awareness of the issue of climate change, all of these works which portray the sounds of melting glaciers may carry strong resonances of the global warming which is the cause of this melting, and which will eventually result in the disappearance of glaciers altogether, as well as catastrophic sea level rise around the world. That said, however, it must be noted that none of them actually makes any direct comment upon the issue of climate change: they merely portray a phenomenon strongly associated with it, which is a different thing. While Quin, Winderen and Blinkhorn have all expressed their own personal concerns about climate change in interviews or on their websites, their sound works themselves do not convey any explicit ecological meaning or message, meaning that any resonances to do with climate change are wholly dependent upon the listener bringing their own concerns about the issue to the works. If they do not, it would be perfectly possible to listen to them merely as documents of interesting sonic phenomena, or to focus solely upon the rich variety of timbres and textures; and for this reason, all of these works must be considered examples of *marginal* ecological sound art.

4.2.2 Glacial installations

All of the artists discussed so far have used the medium of field recording to investigate the sounds of melting polar ice; however, others have used the ice to create installations which provide audiences with a more direct and personal connection to the melting glaciers. Katie Paterson's *Vatnajökull (the sound of)* (2007) provides audiences with a telephone number which connects them to a hydrophone submerged in the Jökulsárlón lagoon underneath the glacier of the title, enabling them to listen to it melting in real time; while her related work *Langjökull, Snæfellsjökull, Solheimajökull* (2007) involves recordings of three melting glaciers being pressed onto records made from their own refrozen meltwater, which were played on turntables until they completely melted. Max Eastley's *Glacial Soundscape* (2005) consists of two large blocks of ice with stones embedded in them suspended over an amplified aluminium sheet, creating a constant dripping sound as the ice melted, punctuated by sporadic loud bangs

whenever a stone falls. Finally, Cheryl E. Leonard's composition *Meltwater* (2013) from her suite *Antarctica: Music from the Ice* (2009-14) combines field recordings of the Marr Ice Piedmont glacier with performers playing instruments made from Adélie penguin bones, feather quills, scientific glassware and stone slabs; and with a number of icicles, representative of those she encountered within the crevasse of the glacier, suspended over amplified Pyrex beakers and Petri dishes, creating steadily increasing patterns of rhythmic dripping as they melt.

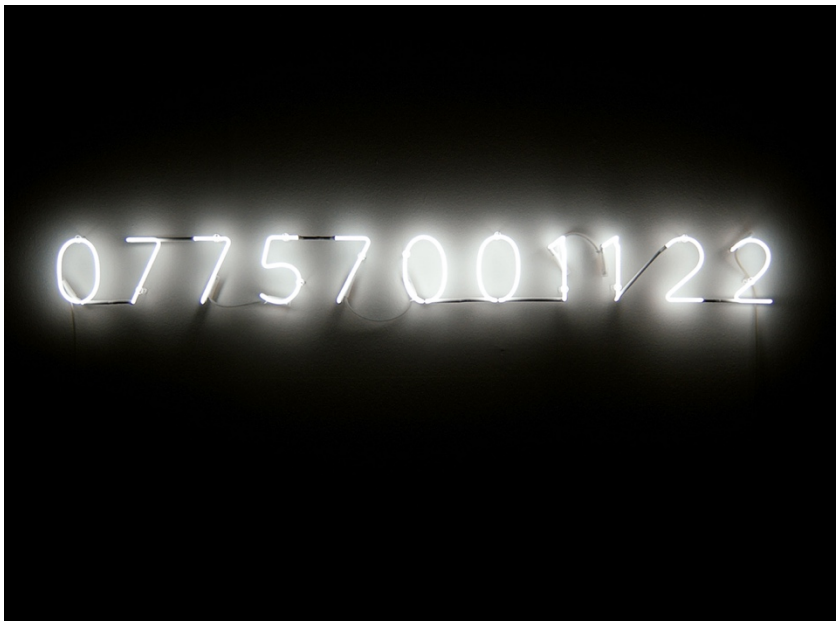

Fig. 7 Katie Paterson – *Vatnajökull (the sound of)*

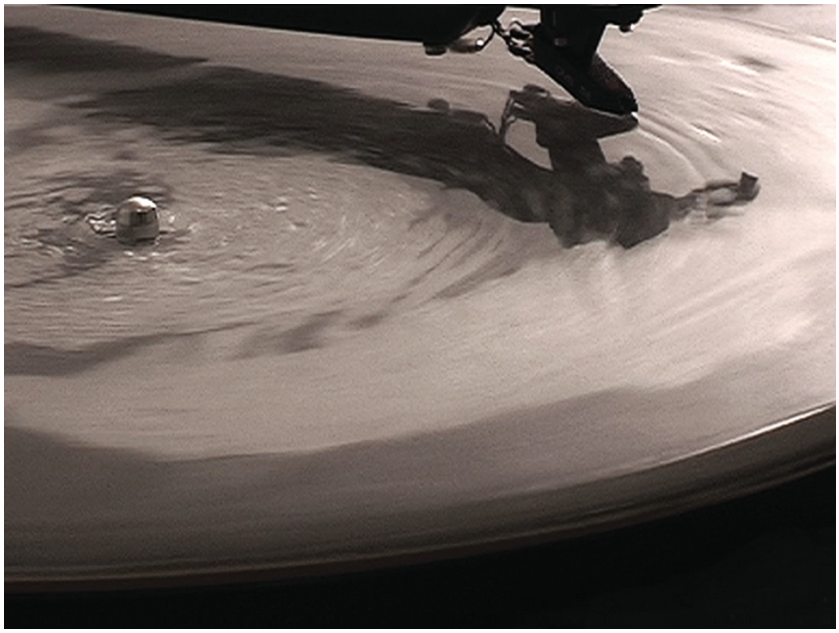

Fig. 8 Katie Paterson – *Langjökull, Snæfellsjökull, Solheimajökull*

As portrayals of the sounds of melting glacial ice, these works perhaps lack the sonic depth and richness of the field recording-based works discussed in the last section: in Paterson's

works the sounds of the glaciers are distorted by being heard through a mobile phone, or pressed onto records made of melting ice; while Eastley's and Leonard's works reduce the complex soundworld of a melting glacier to simple drips and bangs. However, the power of these installations lies in the real time and personal nature of the listening experience they create – something which field recordings cannot hope to reproduce. To listen to the recordings of Watson, Quin, Winderen or Blinkhorn is to listen to a playback of something that happened in the past, somewhere else, and to someone else: we are not listening to the glacier, we are listening to what the artist heard and recorded in another place and time, and are thus always one step removed from the reality of the event.

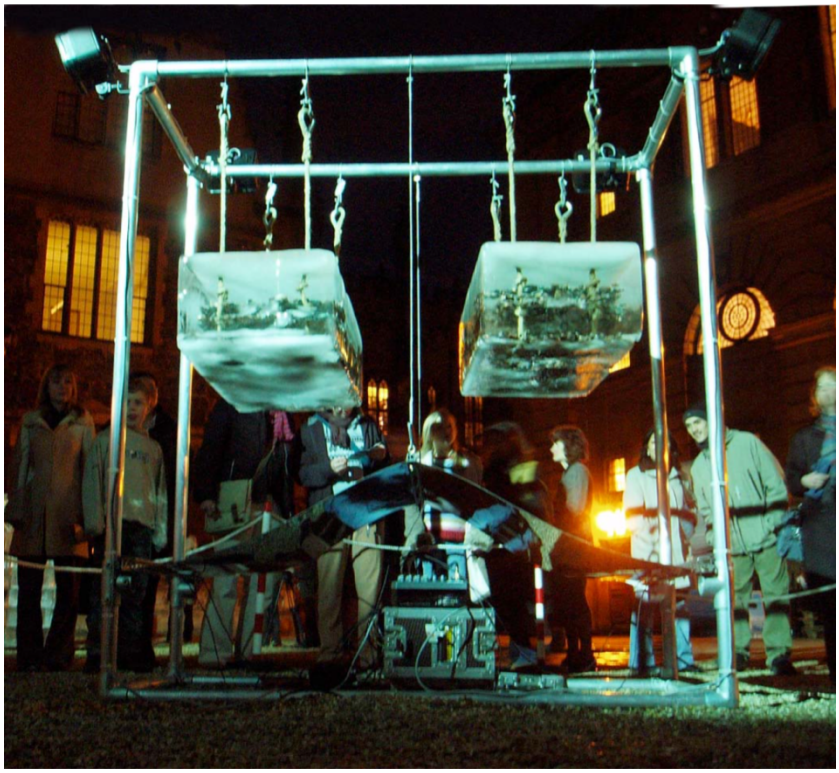

Fig. 9 Max Eastley – *Glacial Soundscape*

In the works by Paterson, Eastley and Leonard, in contrast, the audience are direct witnesses to an event that is happening in the present moment. In *Vatnajökull (the sound of)*, Paterson's use of the medium of a telephone call connects the listener to the glacier on an intimate, 'one-to-one' basis (only one caller could get through at a time); in Eastley's *Glacial Soundscape*, the audience is physically in the immediate vicinity of two large blocks of melting ice, hearing them steadily dripping as they melt, in constant anticipation of when a stone will fall with a sudden loud and violent crack, whose sound reproduces that heard by Eastley when up close to an actual melting glacier in the Arctic; while in Leonard's *Meltwater*, the audience witness the gradual melting of the icicles strung up at the front of the stage. These intimate, first-person sonic encounters with the melting polar ice facilitate a sense of personal connection with the glaciers, providing an embodied, sensorial route towards the thinking of Timothy Morton's

'ecological thought', in which "[t]he ecological view to come … is a vast, sprawling mesh of interconnection without a definite center or edge. It is radical intimacy, coexistence with other beings, sentient and otherwise – and how can we so clearly tell the difference?" (Morton, 2010, p. 8). In addition, the fact that listeners experience the melting not as the playback of a past event, but as something that is happening right before their ears in the present moment, prompts a sense of urgency born of the awareness that the melting of the polar ice is happening right now – an awareness that asks us to take concrete action before there really is nothing left to hear.

Fig. 10 Cheryl E. Leonard – *Meltwater*

In addition to this spatial intimacy and temporal immediacy, each of the works also functions on a conceptual level to address different aspects of the issue of the melting polar ice. In Paterson's *Vatnajökull (the sound of)*, the reduction of the normally two-way dynamic of a telephone call to a one-sided conversation puts us in a situation of silent attentiveness which, as Anja Kanngieser argues, "challenges human exceptionalism and holds space for the more-than-human … creat[ing] the grounds for *particular* expanded notions of community or alliance, bound to specific ecological processes and more-than-human agents" (Kanngieser, 2017, p. 377) – in other words, facilitating a *commoning* between the listener and the melting glaciers of the Arctic, which is further strengthened by the ability of the telephone to collapse geographical distance. It also creates a feeling of powerlessness: we can hear the glacier melting, but nothing we can do or say from our end can halt its melting, rendering us impotent earwitnesses to the ongoing consequences of anthropogenic climate change. Such a feeling can, of course, cause us to give up entirely if we let it; but it may also spur on some listeners to try to do something about the issue in the world outside the work, where they do have a voice and can act upon what they have heard, once they have hung up the phone. The ice records in *Langjökull, Snæfellsjökull, Solheimajökull*, meanwhile, poetically enact the glacial melting and take it to its

logical conclusion, reminding us that if we do not act to prevent it, there will come a time when the glaciers disappear altogether; and while field recordings can be played back to give the illusion that they still exist, the melting records remind us that when the glaciers themselves are gone, we will be unable to bring them back simply by returning the needle to the start. In Eastley's *Glacial Soundscape*, the sporadic and unpredictable loud bangs in the midst of the constant, gentle dripping sounds made by the suspended blocks of ice facilitate an understanding that the melting of a glacier is not just a gradual, steady process, but can also be sudden and violent in nature; while the constant feeling of nervous anticipation it creates prevents audiences from being able switch off and ignore it or relax into a state of complacency, encouraging instead the sort of anxiety we should be feeling when we contemplate the melting of the Arctic ice, and reminding us that there is no place to hide from the catastrophic consequences of our actions in the age of the Anthropocene. Leonard's *Meltwater*, meanwhile, stages a musical re-enactment of the progressive disappearance of the Marr Ice Piedmont glacier by combining field recordings of the melting glacier itself with the sound of dripping from icicles like those which are formed within its crevasses as a direct consequence of its melting. The fact that these icicles melt because of being hung in the warm, man-made climate of the concert hall represents the fact of the real glacier melting as a consequence of atmospheric warming due to anthropogenic climate change; while the Pyrex beakers and Petri dishes used to resonate and amplify the dripping creates a conceptual link with the scientific research being done into the rates at which the polar ice is disappearing: at the end of the work, the amount that the icicles have melted can, in fact, be measured by the amount of water in the beakers. Finally, the additional sonic element of the performance on instruments made from penguin bones which Leonard collected while at the Antarctic references the decline in penguin colonies being caused by the changing climatic conditions and the progressive disappearance of the ice.

In the previous section, the works made from field recordings of melting glaciers were deemed to be examples of marginal ecological sound art, since a connection with the ecological issue of climate change would only be made if listeners brought this concern to their listening; but do the glacial installations by Paterson, Eastley and Leonard forge a stronger connection to contemporary ecological concerns? As with the field recording-based works, none of them directly states that they are about climate change, and so they cannot be considered examples of explicit ecological sound art; however, unlike the previous set of works, each of the glacial installations makes a clear symbolic connection to the issue. Katie Paterson's works display an evident attitude of concern for the melting of the Arctic ice – an attitude which is also encouraged in the listener through the forging of a personal connection with a glacier by way of a phone call, and the ice records' poetic reflection upon their eventual fate. Eastley's *Glacial Soundscape*, meanwhile, is more directly connected to the issue of climate change through its creation and exhibition as part of the Cape Farewell project, whose stated goal is the use of the arts to publicise the effects of global warming on the Arctic; and his amplified blocks of ice

support this mission by bringing audiences closer to the phenomenon of the melting Arctic glaciers, and encouraging feelings of concern, and even anxiety, around it. Finally, Leonard's *Meltwater* makes connections with the melting of an Antarctic glacier on several levels, including the scientific research into global warming, and the progressive decline in penguin colonies which is just one of its tragic consequences. In each case, therefore, while they do not make any explicit ecological declaration, these glacial installations nevertheless make reasonably unambiguous conceptual comments upon the issue of climate change, making them all strong examples of *implicit* ecological sound art.

4.2.3 People and the poles

A number of other sound artists have expanded their focus beyond the polar ice itself to explore the human relationship with the Arctic and the Antarctic. Max Eastley's *ARCTIC* (2007), produced following his participation in the *Cape Farewell* project, comprises twelve soundscape compositions featuring both natural and human-made industrial sound, conveying the artist's own subjective impressions of the place. Philip Samartzis's *Antarctica: An Absent Presence* (2014) was originally produced as a fifty-six-minute radio work, featuring field recordings of both the natural elements and the buildings and machinery in and around the Davis Research Station combined with narrated excerpts from his expedition diary, which Samartzis has subsequently expanded upon and published as a double CD of field recordings and soundscape compositions, with the diary excerpts transferred to an accompanying book; while Craig Vear's soundscape composition *Antarctica: Musical Images from the Frozen Continent* (2005) also features a mix of natural and industrial sounds, along with personal accounts from people talking about their experiences of living and working at the Antarctic, and is also accompanied by a book including his expedition diary. Andrea Polli's *Sonic Antarctica* (2009) also mixes field recordings and interviews with scientists, along with sonifications of the climate data they are studying; while Holly Owen and Kristina Pulejkova's *Switching Heads: Sound Mapping the Arctic* (2015) is an audio-visual work in which an ice sculpture of a human head with binaural microphones planted in its ears explores the Norwegian city of Tromsø, listening to its sounds, and hearing local people talk about the impact of climate change upon the place. Finally, Matthew Burtner and Scott Deal's multimedia opera *Auksalaq* (2012) takes a multifaceted approach to portraying the human relationship with the Arctic, combining Burtner's sonification-based 'ecoacoustic' compositions with field recordings, interviews, and a narrative addressing the ways in which the Arctic is being affected by climate change, with specially-designed software enabling networked audience participation.

One common strategy amongst several of these works is the inclusion of interviews which give voice to the perspectives, opinions and experiences of the people who live and work in the

polar regions. Craig Vear's *Antarctica: Musical Images from the Frozen Continent* features interviews with four people relating their personal experiences of working at the Antarctic, which are layered to create 'vocal quartets', borrowing the 'contrapuntal radio' technique developed by Glenn Gould in his *Solitude Trilogy* (1967-77). The conversations listened to by the frozen head in Holly Owen and Kristina Pulejkova's *Switching Heads: Sound Mapping the Arctic*, meanwhile, mostly revolve around the effects of climate change on the area, including observations about spring coming earlier each year, the threat to polar bear populations, and the long-term implications of increasing temperatures and rising sea levels on the town.

Both Andrea Polli's *Sonic Antarctica* and Matthew Burtner and Scott Deal's *Auksalaq* feature interviews with scientists who are studying the effects of climate change upon the polar regions. This strategy lends an air of authority to the works' statements about climate change: since the message is not coming simply from the artist themselves, but from the mouths of the scientists who are doing research in the field, we are perhaps more inclined to trust what is being said as the ecological reality of the Anthropocene, and it is perhaps less easy – for those who might be inclined to do so – to dismiss the work as environmentalist 'propaganda'. In Polli's work, this is further reinforced by the air of honesty and authenticity the scientists project about a topic which is otherwise often articulated through emotive and one-sided rhetoric. They discuss both the strengths and weaknesses of their models in making future projections, admit to the limitations of their own knowledge, and describe the struggles of the scientific profession to engage with the world beyond their data, all of which makes us feel able to trust that what we are being told is the unbiased facts – something which also makes the scientists' articulations of their own fears for the future all the more affecting. Moreover, Polli's interviews also reveal the people behind the science, their personalities and the passions that drive their research. The empathy that this enables us to feel with them makes it all the more likely that we will also pay attention to the valuable information they have to relate about our changing climate.

Burtner and Deal's work also includes a brief contribution from a native Inupiat academic, who notes the impact that decreasing levels of snow has had upon his people's fishing. Given the general disregard of the perspectives of the indigenous people of the Arctic circle in debates surrounding climate change, the creators must be commended for its inclusion; and this brings Burtner and Deal's work a step closer to the multi-ethnic perspectives and explorations of ecological justice issues expressed in third wave ecocriticism, as well as indicating some of the inequalities that, as Kanngieser (2015) points out, characterise the ecological realities of the Anthropocene. However, having made use of an Inupiat word for its title, *Auksalaq* would perhaps have benefited from more Inupiat contributions such as this, and it is to be hoped that future works see more of a voice given to the indigenous peoples of the Arctic circle.

As well as featuring the perspectives of others, many of these works also bring the artist's own perspective to the fore, resulting in works which are much more openly subjective than

those discussed previously. The radio version of Philip Samartzis's *Antarctica: An Absent Presence* places his personal reflections about life at an Antarctic research station at the centre of the work through its inclusion of narrated excerpts from his expedition diary, with the subsequent published version featuring these diary excerpts in an accompanying book, an approach also adopted by Craig Vear in the book accompanying *Antarctica: Musical Images from the Frozen Continent*; while Andrea Polli's field recordings on *Sonic Antarctica* present a very personal document of her own first-hand experiences of the Antarctic, including her arrival in a helicopter, her exploration of a glacier, coming across a rookery of penguins, observing the scientists at work, and being caught in a strong, icy wind. In all of these recordings Polli's presence is clearly heard in the sounds of her footsteps, her voice, and even her laughter; however, her position within the work is still very much that of a listener, with the album a platform to enable us to listen in to what she is hearing: her ears become our ears, and we share her experiences.

Fig. 11 Holly Owen and Kristina Pulejkova – *Switching Heads: Sound Mapping the Arctic*

In Holly Owen and Kristina Pulejkova's *Switching Heads: Sound Mapping the Arctic*, meanwhile, it is the experiences of the ice head which we share, as its ears become our ears through its implanted binaural microphones. This creates an embodied connection and personal identification with the head, investing the listener in its wellbeing; and as it appears in various states of melting throughout the film, from its fully frozen and perfectly rendered form to an unrecognisable block of slush, we find ourselves willing it not to melt, creating a powerful conceptual resonance with the fact that the wellbeing of humankind – most immediately in places such as Tromsø – is reliant upon the Arctic ice remaining frozen.

While the sound works discussed in previous sections have focused mainly upon on the sounds made by the polar ice, those featured here also turn their microphones to the human and industrial sounds which form part of the polar soundscapes, and which are thereby revealed to be part of the ecosystems of the Arctic and Antarctic alike, challenging notions of the empty

wilderness suggested by images of glaciers and endless ice sheets (and, to an extent, by the aforementioned field recordings by Quin, Watson and Winderen). Philip Samartzis, Craig Vear and Andrea Polli all employ field recordings of various sounds from the Antarctic research stations where the artists were based, emphasising the presence of the humans that live and work there; while Holly Owen and Kristina Pulejkova's frozen head listens to the human sounds of Tromsø, including traditional Sami percussion instruments being played on a beach, and boats unloading in the harbour. Max Eastley's *ARCTIC* album, meanwhile, juxtaposes his recordings of the natural Arctic soundscape with compositions which focus upon the mechanical sounds of the ship which transported him to the island of Spitzbergen, and the industrial noise of the Barentsberg coal mine extracting the fossil fuels which are, ironically, one of the primary causes of the climate change which is melting the Arctic ice, making it an example of a sound work which fulfils Anja Kanngieser's directive that "[i]n positing the effects of 'humankind' on geophysical life, it is imperative not to gloss over the very asymmetrical possession of economic-technological means for resource extraction and accumulation" (Kanngieser, 2015, p. 2), as well as gesturing towards a place where listening becomes a means "for unsettling the ongoing colonization and exploitation of resources and body for capital" (ibid., p. 5) which she identifies as one of the central issues of the Anthropocene.

While both Andrea Polli and Owen and Pulejkova all present the various sounds they have captured as relatively straight field recordings, Philip Samartzis, Craig Vear and Max Eastley all treat their recordings in a more overtly compositional manner, conveying their personal impressions of the polar soundscapes as heard through a musical ear. Both Samartzis and Vear employ a relatively subtle compositional approach, editing and arranging their field recordings to create compositions whose pacing and structure reflect the trajectory of their personal experiences of the Antarctic; while Eastley treats the industrial sounds of the ship and the coal mine on *ARCTIC* to more extensive manipulations, editing, layering and looping them to create rhythmic patterns which emphasise their mechanical nature. However, he refrains from manipulating the sounds of the natural environment in the same way, letting these sounds be themselves and instead adding his own musical contributions in the form of his Aeolian instruments being played by the Arctic wind, and his improvisations on the Arc, his homemade electroacoustic monochord, in an approach more akin to duetting with them. The problematic overtones of anthropocentrism and environmental exploitation that accompany Daniel Blinkhorn's electroacoustic manipulations of the natural sounds of the Antarctic are thus avoided by Eastley, whose compositions suggest instead a more ecocentric attitude driven by an appreciation of the beauty of the sounds in their original form, but also by a desire to highlight their natural musicality by augmenting them using a sensitive and complementary sonic palette, highlighting the way in which, by "cutting across matter and beings, sound renders apparent that the world is not *for* humans. The world is rather *with* humans" (ibid., p. 4). Eastley's Arctic

'duets' can thus perhaps be heard as a reaching towards a commoning with the more-than-human environment, something which "requires responsiveness, a turning toward one another, at the same time leaving space for adversity and silence" (ibid., p. 4), and which ultimately results in the attainment of "a shared sensibility, a 'communism of the senses' that builds sense, the common, and common sense simultaneously" (Dyson, 2014, p. 149).

The music of Matthew Burtner and Scott Deal's *Auksalaq* and Andrea Polli's *Sonic Antarctica*, meanwhile, is the product of two very different approaches to the sonification of the dynamics of the Arctic and Antarctic ecosystems. In *Sonic Antarctica*, the climate data being studied by the scientists interviewed in the work is translated into a simple palette of electronic bleeps and tones reminiscent of minimal techno. *Auksalaq*, meanwhile, features a number of Matthew Burtner's 'ecoacoustic' works, composed according to a methodology which Burtner describes as "a type of environmentalism in sound … tak[ing] the form of musical procedures and materials that either directly or indirectly draw on environmental systems to structure music" (Burtner, 2005, p. 10). These compositions include *Windprints* (2005/10), which uses a spectrographic analysis of wind blowing across the Arctic tundra to determine the harmony, meter and dynamics of the music; *Cloudprints* (2008/12), in which notes are mapped onto images of cloud formations, resulting in sustained chords whose gradually shifting forms reflect the drifting of the clouds; and *Iceprints* (2009), which combines a hydrophone recording made beneath the Arctic ice with a piano part based on a transcription of the recording, and whose pitch is determined by mapping the progressive decline in Arctic ice over the forty years between 1970-2010 onto the first six octaves of the keyboard, with each page of the score covering one year.

These different methods of translating the dynamics of the Arctic and Antarctic ecosystems into music immediately bring us back to John Cage's oft-repeated statement that "the function of Art is to imitate Nature in her manner of operation" (Cage, 1967, p. 31); while in terms of contemporary ecological concerns, they serve as perfect examples of the sort of art which Timothy Morton argues can help us to open ourselves up to the vast and complex implications of ecological interconnectedness, through "hardwir[ing] the environment into its *form*" (Morton, 2010, p. 11).

However, just because Polli's electronic tones and Burtner's instrumental compositions are sonifications of climate data and other ecological information, this does not mean they are necessarily experienced as something ecological or environmentalist by the listener. In the case of Polli's work, we can perhaps be reasonably confident that if her album were listened to without any contextual information to explain their significance, very few listeners would glean any ecological significance at all from the various patterns of electronic tones. However, to do this would be to approach the work in the wrong way, for the fact is that the album's liner notes *do* provide the contextual information required so that we understand that the sounds are sonifications of the very climatological data that the scientists are talking about, including

"weather balloon sounding data" on 'No Boundaries', a "tropospheric ozone balloon data stream" on 'Countdown', and "Antarctic ice acceleration data" on 'A Model is a Cartoon'. This information is intended to inform the listener's understanding and appreciation of what they are hearing; and it must therefore be considered a vital and integral part of Polli's work.

While these brief descriptions inform the listener what the sonified data is measuring, however, they do not provide enough information for us to be able to discern exactly what the behaviour of the sounds signifies – a fact which may leave some listeners frustrated. While this renders its usefulness moot from a purely scientific perspective, however, Polli's is not a purely scientific work, but an art-science work, in which the sonifications function on a more conceptual level, enabling a sensorial encounter with the data – something which, to quote one of the scientists, "feeds into our understanding in a non-quantitative way". The listener is led to reflect upon the fact that the data determining the sounds we are hearing is the same data which, as the scientists explain, has dire implications for the human race in the age of the Anthropocene – a fact which gives a significant conceptual weight to what would otherwise be innocuous patterns of electronic bleeps and tones.

Auksalaq, meanwhile, operates on a number of different levels to support the message of Burtner's sonification-based ecoacoustic compositions. Its overt subject matter, communicated via the words of the libretto and on the video screens, centres upon the effects of climate change upon Alaska and the Arctic; however, another key component is the wider philosophical theme of ecological interconnectedness, which manifests in several aspects of the work. Different parts are performed simultaneously in several different locations and brought together over high-speed internet networks, resulting in each audience experiencing a different combination of 'in-person' live performances and those transmitted from other locations, functioning as a metaphor both for being impacted by geographically distant events, and for the cooperation between people in different places working together to achieve a common goal – in other words, forming a commons, of the kind that both Frances Dyson and Anja Kanngieser argue is so vital as a response to the social, political and moral conditions of the Anthropocene.

The audience is also invited to actively participate in this cooperative staging, as a specially-designed app called NOMADS (Network-Operational Mobile Applied Digital System), enables them to contribute to aspects of the performance via their own laptops and mobile devices. This proves most effective at the beginning of the work, when each audience member is given control of the speed and pitch of the sound of a single droplet of glacial meltwater; thus together, the whole audience forms a melting glacier. As well as making the performance an interactive experience, this forms a powerful metaphor for the way in which we are all responsible, in a small way, for a tiny element of our changing climate; and how, when all of our seemingly insignificant individual actions are combined, it can result in the melting of an entire glacier – or even, eventually, the entirety of the Arctic sea ice. A similar principle is at work later on, when the audience is able to control a noise generator through which they

collectively create and control the sound of the Arctic wind; however, this does not possess the same metaphorical power of the earlier performance of the melting glacier.

Fig. 12 Matthew Burtner and Scott Deal – *Auksalaq*

As the audience members make their contributions to the work, they also appear on another screen as a node which is connected to other nodes nearby, emphasising the interconnected network of participants created within the space of the work. The spoken narrative also emphasises the human interconnectedness with the Arctic itself, through our imaginations, actions, and the air that we breathe, the narrator stating that "we are interconnected through the aerial ocean that surrounds us. The same air we breathe also rushes across the Arctic". This image of being immersed in an 'aerial ocean' through which we are all interconnected resonates with David Abram's statement that "[o]nly as we begin to notice and to experience, once again, our immersion in the invisible air do we start to recall what it is to be fully a part of this world … we feel ourselves enveloped, immersed, caught up within this sensuous world" (Abram, 1996, p. 260). Abram's notion of the air as "a zone of subtle influences crossing, mingling, and metamorphosing" (ibid., pp. 254) finds expression in Burtner's narrative, as it proceeds to explore how sound as a medium reveals our interconnectedness through the air:

> The same atmosphere allows me to talk to you now. The sound propagates waveforms across those molecules of air. The sound is invisible, but it brings attention to the profound and unseen connective and life-sustaining vapour between us. My voice is a noise, activating the silence. The noise reveals our interconnectivity. Breathe in the noise; exhale the silence. As you take in the noise of the world, you also take in the air to live. As the wind pushes and pulls air across the Arctic landscape, imagine your breath, and the breath of all the others in our Auksalaq community, a part of that wind. We are not far from

> home; we are closer than we think. We are all part of a web, a layer of human imagination and air pressures and sounds changing each second, remade each moment. We are not far from our home; we are almost there.

The symbolic associations created between sound, air, breath and the Arctic wind, and their portrayal as interconnected and life-giving elements, serve to conceptually tie the various aspects of Burtner's work together, as well as to engender feelings of physical connection between the audience members, and between the human body and the Arctic. All of these elements of Burtner and Deal's work combine to form a powerful demonstration of the way in which, as Frances Dyson states, "[t]he aural opens avenues toward an understanding that is arational, that evokes a grain (or rather tone) of thought and an aesthetics of listening that, I would argue, offers some entry into the dilemma of how to hear the world and in hearing, also be able to act, with the aim and existential condition of the 'in-common'" (Dyson, 2014, p. 149).

The theme of interconnectedness is also present in some of the scientists' statements, such as when a climate oceanographer states that we should recognise all the oceans of the world as forming one large body of water, a single connected system in which whatever happens in one part affects the ecosystem of the others. This observation is picked up in the narrator's final statement and used as the basis for a message of hope and empowerment to effect change through collaboration, stating that "[w]e humans are also a substantial body of water, part of that network. Our tide of billions pulls one way – and the earth shifts". This final sentence is repeated, summarising the core message that Burtner and Deal intend the audience to take from the work.

Uniquely, we are able to get some idea as to whether this has been achieved, as the libretto for the final part of the work, the *Auksalaq* aria, is composed of the audience's own thoughts, feelings and reflections upon the work, which appear on screen in real time. Inviting this kind of instant, unfiltered feedback and incorporating it into the work is a bold move, and also revealing: some audience members contribute the sorts of positive feelings, such as 'connected' and 'hope is alive', that the work is clearly aiming to engender; while others are less positive, sharing feelings such as 'helpless', 'hopeless' and 'defeated'. This serves to demonstrate that, as a work of art, the ecological message of *Auksalaq* is ultimately subject to the individual interpretations of each audience member.

The various sound works portraying the human relationship with the poles carry a number of implications when considered ecocritically. One thing which all of them do is to challenge the romantic notion of the polar regions as desolate, pristine wildernesses of snow and ice, using sound to reveal the wide variety of human activity at the Arctic and Antarctic, including mining, fishing and scientific research, as well as the impressions, opinions and stories of the people themselves.

However, the engagement of the works investigated in this section with the ecological issues associated with the polar regions varies widely. Some works make no reference to ecological issues at all: neither Philip Samartzis's *Antarctica: An Absent Presence* nor Craig Vear's *Antarctica: Musical Images from the Frozen Continent* make any reference to the receding of the polar ice or to the issue of climate change. This should not be regarded as a failing; indeed, it could be argued that such works serve a valuable purpose in demonstrating that there is much more to the human relationship with the Antarctic than concerns over the fact of its melting, ensuring that it is not wholly defined by the issue of climate change. However, their lack of engagement with this key ecological issue means that they cannot be considered works of ecological sound art as it is defined here; and they therefore fall into the category of *non-ecological* sound art.

Max Eastley's *ARCTIC*, as with his *Glacial Soundscapes*, is inherently connected to the issue of climate change through being a product of the Cape Farewell project; and in the album's liner notes, Eastley describes the work as "a summation of my experience of the sublime: exhilaration, fear, and an overwhelming sense of tragedy unfolding before me. I hope that the music communicates my emotion, passion and concern for this fragile natural world" (Eastley, 2007). Eastley's musical duetting with the natural sounds of the ice, seals and wind certainly conveys an emotional connection to the Arctic environment and could perhaps cause an ecologically conscious listener to reflect upon the natural wonders we stand to lose if climate change continues unchecked. However, nothing within the compositions themselves directly references the issue of climate change, and such reflections are thus wholly dependent upon the listener bringing either their own concern about the issue, or a prior knowledge about the work's connection with Cape Farewell, to their listening. For this reason, it ultimately represents an example of *marginal* ecological sound art.

The other three works are all explicit about their connection with the ecological issue of climate change. In both Holly Owen and Kristina Pulejkova's *Switching Heads: Sound Mapping the Arctic* and Andrea Polli's *Sonic Antarctica*, frank discussions of the issue – amongst the local residents of the Arctic city of Tromsø in the former, and climate scientists working at the Antarctic in the latter – place climate change firmly and explicitly at the centre of the works, with the powerful metaphorical devices of a human head made of ice that melts as it listens, and music that sounds out the data which is measuring the ice's decline, supplementing the spoken words with strong conceptual statements that invite deeper reflection. In December 2015, Owen and Pulejkova also took their work to the COP21 climate conference in Paris, where they walked the streets dressed as polar explorers, wearing 'backpack cinemas' equipped with a screen and headphones on which audiences could experience the work, bringing a vitally direct and experiential dimension to the issues being discussed in theoretical terms at the summit. Matthew Burtner and Scott Deal's *Auksalaq*, meanwhile, combines many of the elements and techniques discussed in this section, including field recordings, the sounds of live melting ice,

musical sonifications of the Arctic ecosystem, and interviews with climate scientists, to create a multifaceted artistic exploration of the issue of climate change; while the multi-venue staging of the work and its elements of audience participation act as a powerful metaphor for our interconnectedness with the Arctic ecosystem, our collective responsibility for climate change, and the collective action that needs to be taken in order to address it, creating the powerful sense of commoning, both with other humans and with the more-than-human elements of the earth's ecosystems, which is needed to prompt humanity to take such action. All three of these works thus stand as powerful and effective examples of *explicit* ecological sound art.

4.3 Ecocritical analyses II: Trees and forests

The melting of the polar ice caps may be one of the most immediately obvious and dramatic results of climate change; however, perhaps an even more crucially important player in the management of the global climate are the world's forests. Trees play a direct role in the regulation of the earth's climate in their absorption of carbon dioxide and production of oxygen; simply put, the less trees there are, the more carbon – and the less oxygen – there will be in the atmosphere. The earth's forests, and particularly its tropical rainforests, are also a habitat, home to over fifty per cent of the earth's plant and animal species. Many sound artists have created works about forests, some of which focus upon what we can learn from listening to the soundworlds of forests and the creatures that live in them, while others explore the interactions and relationships between forests, humans and our technologies.

4.3.1 Listening to the forest

Francesco López's *La Selva* (1998) comprises a number of unprocessed field recordings made in the Costa Rican rainforest, edited down to represent a compression of a complete circadian cycle during the rainy season; while Hildegard Westerkamp's *Beneath the Forest Floor* (1992) is a soundscape composition using field recordings of old-growth forests on the west coast of British Columbia. *Dark Sound* (2016) by Mikel R. Nieto is a CD of field recordings and accompanying book which documents the sounds of the Amazon rainforest in Ecuador, and the impact of the oil industry upon it; and in *Rainforest Listening* (2015), Leah Barclay uses her recordings of the Amazon rainforest in a site-specific work accessed via a mobile app in which the listener hears different sounds as they move around given locations, such as Times Square and the Eiffel Tower.

In all of these works, field recordings are used to reveal both the beauty and diversity of forest ecosystems. The sound material in Francisco López's *La Selva*, Mikel R. Nieto's *Dark*

Sound and Leah Barclay's *Rainforest Listening* constitutes a selection of edited 'highlights' from many hours of field recording, which are otherwise left largely unprocessed. A wide variety of sounds are heard, including animals, birds, insects, trees, rivers, rain and thunder; however, the sonic environment portrayed in these works is experienced not as a succession of individual elements or phenomena, but as the totality of an interconnected ecosystem which shifts and evolves as the listener journeys through the world of the work, facilitating an ecological listening in which we behold the rainforest ecosystem as a rich and shifting tapestry composed of a bewildering variety of interacting parts. The works of López, Nieto and Barclay thus exhibit the central principle in Morton's approach to ecological aesthetics, demonstrating the power of sound to facilitate the 'thinking of the ecological thought' through an experiential understanding of the rainforest environment as a complex mesh of interconnected elements.

In *Beneath the Forest Floor*, meanwhile, Hildegard Westerkamp takes a more overtly compositional approach, editing, processing and arranging her recordings of old-growth forest in Vancouver Island's Carmanah Valley into a highly stylised soundscape composition. In doing this, Westerkamp focuses more upon individual sounds rather than the soundscape as a whole, meaning that, while sounds such as birds, the wind in the trees and the flowing of a river do sometimes sound simultaneously, the work as a whole does not provide the same sense of an interconnected ecosystem as the relatively unprocessed recordings in the other three works. In addition, as with Daniel Blinkhorn's *frostbYte* compositions, the process of subjecting the sounds of the natural world to electronic manipulations comes with its own inherent problems when considered from an ecocritical perspective, since it can feel like another form of ecological exploitation visited upon an already abused and endangered environment. The issue is arguably even more problematic when it involves the manipulation of the sounds of living creatures rather than those made by a nonliving material such as Blinkhorn's glacial ice, since it could be perceived as demonstrating a fundamental lack of respect for the creatures whose voices are captured and distorted: David Dunn, for one, has expressed the importance of recognising that "[t]he sounds of living things are not just a resource for manipulation" (Dunn, 2009, p. 98). However, the purpose of Westerkamp's sonic manipulations is not to turn the sounds into something they are not, but rather to highlight and accentuate their natural musicality: bird calls are slowed down and drenched in reverb to create a harmonic wash of tones, and short snatches of the sound of running water are looped, opening our ears to the internal rhythms contained within the sound. Hearing the sounds reframed in this way facilitates a reduced or musical listening to the forest soundscape, encouraging the listener to appreciate the sounds for their own inherent sonic qualities. For many listeners, this may open up a new dimension to the way in which they experience the natural world, encouraging an enhanced aesthetic appreciation which can perhaps be carried into subsequent experiences of natural sound in the real world, and which also, perhaps most crucially, constitutes an additional reason to desire the preservation of forests such as those in the Carmanah Valley.

The necessity of taking action to ensure this preservation is made evident in both Westerkamp's and Barclay's works through their inclusion of the sounds of chainsaws which violently cut through the forest soundscape, raising the spectre of the clear-cut logging which has decimated the forests in both the Amazon and the Carmanah Valley. In Westerkamp's work, the chainsaw's buzz is manipulated to increase its air of menace and threat, beginning as a distant sound and gradually drawing nearer, its pitch manipulated as it approaches to make it sound like the calling of a huge, hungry beast – an element which ensures that listeners leave the work not only with an impression of the forest's beauty, but with an awareness of how it is being threatened.

It is in Nieto's *Dark Sound*, however, that this element of human threat to the rainforest ecosystem is brought to the fore. Roughly the first third of the sixty-four-minute work is composed almost entirely of the sounds of insects, frogs, birds, wind, rain and thunder – long enough for the listener to become familiarised with the natural soundscape of the Amazon rainforest. However, at around nineteen minutes a motorboat engine rudely intrudes; and from this point, the work becomes increasingly dominated by the sounds of engines, generators, pumps, drills and vehicles – the sonic evidence of the incursion of the oil industry into the rainforest. The nature of the sounds themselves serves to call into question aesthetic judgements, such as those which underpin much of R. Murray Schafer's principles of acoustic ecology, of natural sound as pleasing, pretty and desirable, and of industrial sound as noisy, ugly and undesirable, since on several occasions the juxtaposition of these two sound families highlights the striking similarity between the buzzing of insects and frogs and that of the generators and engines. The overall trajectory of the work, however, leaves its overall message in no doubt, as the human-made industrial sounds progressively obliterate the sounds of the natural ecosystem, mirroring the way in which the oil industry is progressively obliterating the rainforest, raising the spectre of the future days of the Anthropocene, in which the natural soundscape – as well as, perhaps, the rainforest itself, along with the animals and people that live there – will be no more.

The work's title, *Dark Sound*, borrows from Timothy Morton's concept of 'dark ecology', his "*noir* form" (Morton, 2007, p. 187) of ecological politics and aesthetics which "undermines the naturalness of the stories we tell about how we are involved in nature. It preserves the dark, depressive quality of life in the shadow of ecological catastrophe" (ibid., p. 187). As opposed to the many rainforest field recordings and soundscape compositions which deliberately eliminate anthropogenic sounds of any kind in order to stay in the realm of the so-called 'natural' environmental sound, Nieto's work uses field recording for precisely the opposite purpose through its increasing focus upon the industrial noise which serves as the sonic dimension of, and evidence for, the human destruction of the forest. In this respect, it stands as an example of precisely the sort of approach suggested in David Michael's 2011 paper, 'Towards a Dark Nature Recording', in which he argues that the practice of using edited field recordings to

present an illusion of pristine, untouched ecosystems might actually be dangerous, allowing us to carry on believing that our ecologically destructive actions have no real consequences. In its place, Michael proposes a 'dark nature recording' which focuses upon the sounds of the damage being done to the earth's ecosystems and its living creatures, and suggests that "[i]f fantasy creates inappropriate distances between environment and us, perhaps a practice of dark nature recording could actually begin to reflect the totality of an ecology from which we are inseparable" (Michael, 2011, p. 210).

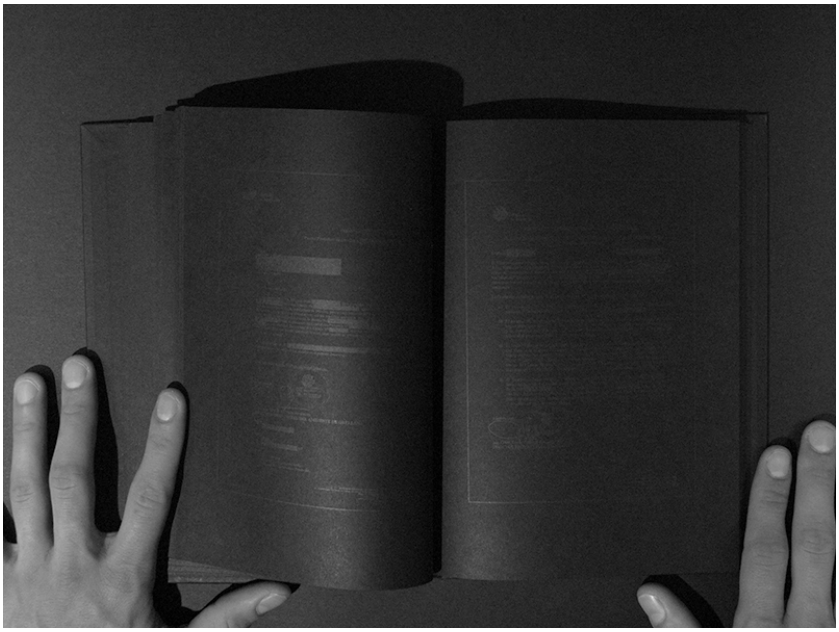

Fig. 13 Mikel R. Nieto – *Dark Sound*

The CD on which *Dark Sound* is made available is presented in a 176-page black hardcover book, containing a series of texts in English, Spanish, Basque and Huao which further explore the issue of the oil industry's encroachment upon the rainforest from a variety of perspectives. These include an introduction / epilogue by Spanish author José Luis Espejo, an open letter to the native Huaorani people who live in the rainforest, two research texts, a bertso (a form of improvised Baque poetry), descriptive explanations of the field recordings, a possible chronology, a glossary, and a variety of reports and testimonies concerning the impact of the oil industry, and particularly of the noise it creates, upon the Ecuadorian rainforest and the people and animals that live there. The book thus provides important contextual and technical information which aid the listener in their awareness of the wider issues which surround the work; and it must therefore be considered an inherent part of the work, rather than extraneous programme notes of the sort that, as discussed in Chapter Three, have generally been disregarded for the purposes of these ecocritical listenings. The text itself, meanwhile, is printed in black ink on black paper, reinforcing both the colour of oil and the dark nature of the subject matter; while the effort the reader must go to in order to read the texts mirrors the challenging nature of properly understanding and addressing ecological issues such as this, which are

inseparable from the complex backdrop of social, political and economic issues within which they occur.

On both the back cover and in the front of the book, as well as on the project's website and on the Gruenrekorder page it can be ordered from, is the bold statement: "By buying this book you are contributing to the destruction of the planet" (Nieto, 2016, p. 3). Such a declaration brings to the fore one of the central problematics that dwells as a vaguely uncomfortable undertone within all works of ecological art: that of the ecological footprint generated by the work. *Dark Sound*, whose subject is the destructive effects of the oil industry upon the Amazon rainforest, is made available on a CD manufactured from polycarbonate, housed in a book whose paper has necessitated the cutting down of trees; and whose ecological footprint can be further extended to include the travel involved, fuel burned, waste generated and power consumed over the course of the work's creation. In making explicit what the ecologically-conscious listener might perhaps be thinking – that there is a degree of conflict involved in creating a work with an ecological message which itself has an ecological footprint – Nieto voluntarily brings this issue to the attention of the audience, his forthright honesty anticipating, and to some extent ameliorating, potential accusations of hypocrisy.

However, it cannot solve the issue: the carbon footprint involved in the production and consumption of the work is still the same, whether it is declared or not; and it might be questioned whether it makes it better or worse that the artist is fully aware of the ecological impact of producing and selling his work but has gone ahead and done it anyway. The opportunity to make a clever, rather nihilistic point about his work's ecological footprint could be regarded as having trumped the opportunity to minimise its ecological impact – otherwise, why not make the work available as a digital download and online text, rather than producing five-hundred hard copies of a CD in a hardback book? It must also be noted that, in his statement, Nieto shifts all of the responsibility for the work's ecological footprint onto the audience, which might seem more than a little unfair, given that the work has already been created and produced, with the only part of its footprint which can reasonably be attributed to the individual audience member or consumer being its transportation to wherever they live, and the electricity used in playing back the CD. Whatever opinions the individual may hold upon these matters, however, the implications of this statement certainly serve to highlight the complex moral conundrums which are caused by our heightened awareness of the ecological footprint of almost everything we do – a state of affairs in which, ultimately, perhaps the only course open to us is to follow Timothy Morton's suggestion to embrace the irony and complexity of a dark ecology, in which "[w]e start by thinking that we can 'save' something called 'the world' 'over there,' but end up realizing that we ourselves are implicated … reframing our field of activity as one for which we ourselves are formally responsible, even guilty" (Morton, 2007, p. 187).

In contrast to the CD-based presentation of the works by Nieto, López and Westerkamp, Leah Barclay's *Rainforest Listening* is made up from over one hundred individual recordings of the Amazon rainforest which are geotagged to specific locations and made available to listeners via the free Recho app, which plays the recording when the listener moves through that location; thus, as the listener physically explores their environment, they aurally experience different areas of the rainforest soundscape. The work was launched in Times Square during Climate Week NYC in September 2015 and is now permanently installed in Times Square and Central Park, where it can be explored 24 hours a day. Two months later, it was installed over a wide area in the centre of Paris during the COP21 climate change summit. At the Eiffel Tower, Barclay added the dimension of height to the work, assigning recordings to each level's viewing platform which corresponded to the four distinct layers of rainforest vegetation, thereby enabling listeners to experience soundscapes from the forest floor up through the understory and the canopy, finally bursting out into the emergent layer as they reached the top level of the tower.

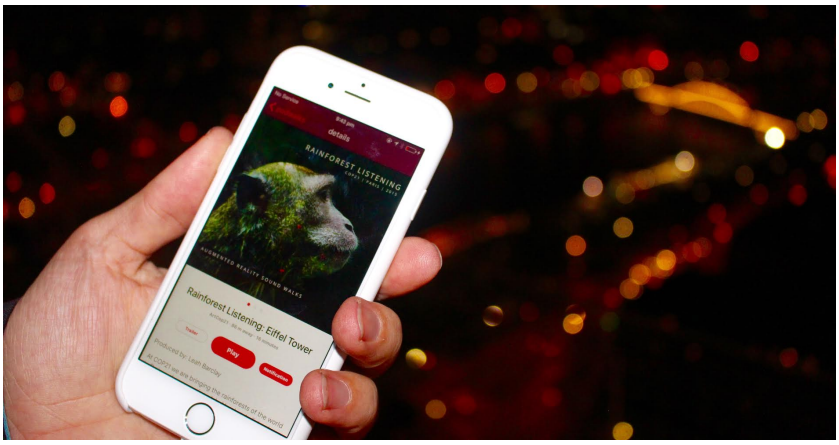

Fig. 14 Leah Barclay – *Rainforest Listening* (Paris)

This method of delivery adds a spatial dimension to the listening experience, giving listeners the sense of physically moving through a sonic environment rather than just listening to a static recording. It also gives listeners the freedom to explore the work at their own pace, and to choose their own path through the rainforest soundscapes, resulting in an experience which is much closer to the reality of exploring an environment than that given by listening to a single recording of a set length on CD. In addition, the specific content of the work is set to change on a daily basis, meaning that listeners can revisit the work multiple times, and each walk will be a different experience, evolving and changing over time, providing the feeling of experiencing something unique and individual, and encouraging feelings of personal connection to the rainforest in the here-and-now. The work thus has its own ecology: rather than being a fixed and unchanging entity, it operates like a living, breathing ecosystem, flowing with the

movements of the listener, its form determined by the path they choose, and its content different every time.

Although it might achieve a deeper level of personal engagement than the works by López, Westerkamp and Nieto, the fact that it only engages one sense – that of hearing – means that *Rainforest Listening* is a work of augmented, rather than virtual, reality: even if the listener's ears are in the rainforest, their eyes and feet are still planted firmly in the concrete jungle. While the resulting cognitive dissonance – or, to use R. Murray Schafer's term, schizophonia (Schafer, 1977, p. 273) – prevents the work from being a fully immersive experience, however, it also has its advantages: rather than attempting to take the listener away from the city and into the rainforest, it results in a sense of inhabiting a commons which includes both city and rainforest, providing an example of how "[s]ound envelops affectively, thoroughly, but also singularly; sound has general affordances, but these are contingent and always nonidentical. This is how commons must be approached, with a keen sensitivity to polyphony" (Kanngieser, 2015, p. 4). This aspect of Barclay's installation thus works to expand the listener's thinking from the local to the global, encouraging us to consider the ways in which our actions in the city might impact the rainforest in another part of the world, in a place other than 'here', and in a time other than 'now'.

This principle naturally applies to the ecologically irresponsible or destructive actions which contribute to phenomena such as climate change, biodiversity loss, and global ecological injustices; however, it also applies just as much to the positive action we choose to take. This is something which Barclay's work crucially encourages by enabling listeners to make a donation to the Rainforest Partnership – an NGO which works with rainforest communities to help conserve the forest – with their mobile device while they are still in the moment of engagement with the work. In this way, Barclay's work provides people with the ability to quickly and easily make a positive contribution to rainforest conservation exactly at the point when they are most likely to feel the desire to take such action.

These four works, each taking a different approach to listening to forest soundscapes, each carry different implications in terms of their status ecological sound art. López's *La Selva* stands as a perfect example of the difference between the two camps of 'ecological' art. In the wider sense promoted by Timothy Morton, it is strongly 'ecological', illustrating the dynamics of an interconnected ecosystem, encouraging an appreciation for its complexity, diversity and beauty, and facilitating our understanding of its ecological operation; however, it contains nothing which pertains to the ecological issues facing the rainforests, such as deforestation, biodiversity loss or climate change, and López himself is very clear that he wishes it to simply be appreciated as pure sound matter, abstracted from any other concern. Thus, while it strongly exhibits the ecological characteristics that Morton looks for his approach to ecocriticism, in terms of the generic category established in the present study it must be considered *non*-ecological sound art.

While Hildegard Westerkamp's *Beneath the Forest Floor* does not explicitly state an ecological message within the work itself, meanwhile, the key inclusion of the sound of a chainsaw, and its manipulation to make it sound like a threatening beast, means that an intention to raise listener's awareness of the problem of clear-cut logging is reasonably clear; and this, coupled with the musical appreciation of the forest soundscape opened up by Westerkamp's compositional techniques, makes this work an example of *implicit* ecological sound art.

Finally, Mikel R. Nieto's *Dark Sound* directly addresses the destruction of the Ecuadorian rainforest by the oil industry, with its sonic component supported by the book which informs the listener of its wider context and implications. The augmented reality experience of Leah Barclay's *Rainforest Listening*, meanwhile, immersing listeners in a spatially rendered sonic rainforest superimposed upon the city, encourages feelings of personal connection with the forest; while giving listeners the ability to donate to the work being done by the Rainforest Partnership to combat deforestation and help conserve the forest both informs listeners about the issue, and enables them to take direct positive action as they experience the work. These factors thus make each of these works clear examples of *explicit* ecological sound art.

4.3.2 Interacting with the forest

The four sound works discussed in the previous section all provide a platform for listeners to experience the sounds of the forest; however, other works explore different methods for humans and our technologies to interact with forest ecosystems, with a variety of ecological implications. In *Viva la Selva!* (1999), Natasha Barrett subjects her rainforest recordings to a variety of manipulations, also mapping both electronic sounds and human voices onto the sounds of the rainforest; while Douglas Quin's *Forests: A Book of Hours* (1999) combines field recordings with a wide sonic palette of acoustic instruments, electronic sounds, and the human voice in song and spoken word. In the performative works composed for his *Fragments of Extinction* project (2002–present), David Monacchi uses spectrograms to demonstrate the principles of Bernie Krause's Acoustic Niche Hypothesis within rainforest soundscapes, adding his own electronic improvisations as a metaphor for humanity finding a way to sensitively and respectfully reintegrate into natural ecosystems; while *Heartwood* (2014) by Adrian Newton (a.k.a. Nemeton) uses contact microphones and ultrasound detectors to audify the internal sounds made by an ash tree in the South Dorset Ridgeway, one of many threatened by ash dieback disease, with individual parameters of the sound controlled by sensors channelling various aspects of the tree's immediate environment, enabling the audience to interact with the tree. Finally, David Dunn's *The Sound of Light in Trees* (2006) also allows us to hear the internal soundscape of trees, this time focused upon the sounds made by the pine bark beetle as they eat piñon pines from the inside; while for his *Autonomous Systems: Red Rocks* (2003), a

sonic feedback loop is established in which, Dunn claims, the forest ecosystem begins to dynamically interact with the technological system, exposing the fabric of mind in nature, and achieving an integration of the technological with the biological.

Like Hildegard Westerkamp's *Beneath the Forest Floor*, Douglas Quin's *Forests: A Book of Hours* is based around the concept of highlighting the musicality of the forest soundscape; however, he does this not by manipulating the natural sounds themselves, but by augmenting them with a variety of human, instrumental and electronic sounds which complement, imitate and harmonise with them, leading us to hear the tones and rhythms in the sounds of insects and frogs, and musical phrases in the calls of birds and monkeys. Over the course of the work, arranged into three movements – 'Dawn', 'Day', and 'Dusk' – which together condense the evolving forest soundscape over the course of the day into a single hour, Quin alternates passages of musically augmented soundscape with passages of 'pure' field recording, which give the listener time to absorb and reflect upon what they have heard, and perhaps to hear the natural rainforest soundscape in a new way, as we continue to perceive the musicality of the natural sounds even when the other, more obviously musical sounds have disappeared.

Natasha Barrett's *Viva la Selva!* also incorporates a variety of electronic, acoustic and human sounds into the forest soundscape; however, rather than using them to musically harmonise with the forest sounds, Barrett utilises the common electroacoustic compositional technique which Simon Emmerson terms "aural and mimetic interpenetration" (Emmerson, 2007, p. 14) to map various sonic and behavioural characteristics of the rainforest sounds onto these other sound sources – a technique which, as with the sonifications of Polli and Burtner, also equates to imitating nature in her manner of operation. It also thoroughly blurs the boundaries between the 'natural' and 'synthetic', creating a sonic ecosystem which exhibits the characteristics of Morton's 'mesh', the vast network of interconnections between everything that exists, whether natural or artificial, living or nonliving, organic or technological, and in which "[n]othing exists all by itself, and so nothing is fully 'itself'" (Morton, 2010, p. 15).

The introduction of human and technological sounds into the forest soundscape in the works by Quin and Barrett might also be regarded as problematic from an ecocritical perspective, however, with the works' multi-faceted soundscapes also resonant of the Anthropocene, as if the human has colonised the forest, despoiling the wilderness with our own voice and our artificial technologies when we should perhaps rather learn to shut up and simply listen. Around two-thirds of the way through Barrett's work, human voices join the forest soundscape, calling to one another in short, sharp yells; however, rather than merely being added to the soundscape as in Quin's work, here the human voice actually takes the place of one element of it, as Barrett maps human vocal sounds onto the spatial and temporal parameters of the calls of three howler monkeys. This element in particular can be interpreted as carrying strong colonial overtones as it literally silences the creature, obliterating it from the forest soundscape altogether in order for our own species to take its place, in a way which also perhaps exemplifies "the violence and

limitations at the heart of translation" (Kanngieser, 2015, p. 4). Barrett's electroacoustic manipulation of the rainforest sounds, meanwhile, also inevitably carry the same problematics as in Blinkhorn's and Westerkamp's works, suggesting the exploitation of natural environmental resources. Barrett's work is perhaps even more problematic in this regard, for while the other works tend to follow the cardinal rule of soundscape composition that "the original sounds must stay recognisable and the listener's contextual and symbolic associations should be invoked" (Truax, 2008, p. 105), in Barrett's composition the rainforest and its inhabitants are constantly in danger of being obscured by her electroacoustic acrobatics – something which can make *Viva la Selva!* feel decidedly anthropocentric in nature, with the rainforest simply serving as raw material for her work.

The works can also be regarded in a more positive light, however. The harmonious blending of acoustic instruments, electronic sounds and the human voice with the forest soundscape in Quin's work can be interpreted as a sonic metaphor which suggests that the most helpful response to living in the Anthropocene is to find ways in which humankind, our culture and our technology might learn to integrate into the earth's natural ecosystems in a positive and harmonious way. Recognised as an impressionistic composition, meanwhile, Barrett's *Viva la Selva!* can be understood as a portrayal of the subjective emotional and psychological experience of being a human in the middle of the rainforest, a simultaneously beautiful and dangerous environment in which we are the outsiders who must treat it with respect; while the mapping of the human voice onto the calls of the howler monkeys can also be heard as a rejection of the romantic image of the rainforest as wilderness, absent of humans (both Barrett and Quin, after all, were based at human research stations during the time they made their recordings). In his introductory chapter to *The Book of Music and Nature*, David Rothenberg states that "while we are created from nature, we are somehow cast out by our wily, civilised ways" (Rothenberg, 2009, p. 5); however, a possible ecocritical reading of Barrett's human / monkey cries could also suggest the human eschewing the sophisticated language which casts us as the evolutionarily superior master – and despoiler – of nature, in favour of imitating our primate cousins, in the hope that we may learn something from them about how to exist in a harmonious relationship with this wild ecosystem.

Fragments of Extinction, the most recent of David Monacchi's 'eco-acoustic' sound works in his ongoing project of the same name, involves a similar investigation of how humankind and our technologies might learn to exist harmoniously with the ecosystems of the earth's rainforests; however, it does so in a way which avoids problematic anthropocentric connotations of environmental exploitation. Presented within Monacchi's own patented 'eco-acoustic theatre', in which the audience are surrounded by 360° sound alongside a scrolling spectrogram analysis of what they are hearing, listeners are first immersed in a twenty-minute time-lapsed rainforest soundscape. Monacchi then introduces the scrolling spectrogram, coupled with selective filtering and pitch-shifting of the sound, using it as an educational tool to demonstrate

the principle of Bernie Krause's 'Acoustic Niche Hypothesis', which states that in a healthy ecosystem "each creature … [has] its own sonic niche … [which is] occupied by no other at that particular moment" (Krause, 1987, p. 3). Once this principle has been established, Monacchi then begins to make his own human / technological contribution to the soundscape, performing an electronic improvisation by way of infrared sensors reading the movements of his fingers; however, crucially, he carefully confines his contributions to the available acoustic and temporal niches in the frequency spectrum.

Fig. 15 David Monacchi – *Fragments of Extinction*

Perhaps more than any other discussed in this chapter, therefore, Monacchi's work serves as a powerful metaphor for how humans might learn to approach the earth's natural ecosystems guided by the principles of listening, of understanding, and of learning how to humbly and harmoniously integrate into an environment by respecting the places and roles of others, being guided by the healthy operation of the ecosystem as a whole. In this way, Monacchi's work also exhibits a core ecocentrism, epitomised by its fundamental prioritisation of listening over sounding – a strategy which, as Anja Kanngieser explains, can help us to regard an ecosystem as a space of commons through understanding the principles whereby "individual interests constellate into collective interests without demanding equivalence" (Kanngieser, 2015, p. 4). It also demonstrates an affinity with many of the principles of deep ecology in its recognition of the intrinsic value and wisdom of the nonhuman life forms and ecosystems of the earth's rainforests; however, rather than following the arguments of some deep ecologists that the natural world would be better off without humans and our technologies, Monacchi instead employs technology as a tool to explore how we can learn to harmoniously integrate into the earth's ecosystems, and to try to provide some of the knowledge, understanding and ways of thinking we need in order to begin to move in this direction.

The focus in all of the works discussed so far has been the soundscapes of forest ecosystems; however, both Adrian Newton's *Heartwood* and David Dunn's *The Sound of Light in Trees* delve beneath the bark to explore the internal soundworld of trees. Newton's real time audification of the sounds made by an ash tree in the South Dorset Ridgeway aims to highlight the issue of dieback disease currently threatening the trees by encouraging a heightened awareness of it as a living, breathing organism rather than a static object, and as something which actively responds to – and is therefore vulnerable to – changes in its environment. The incorporation of sensors measuring temperature, light, pressure, moisture, and movement, meanwhile, cause the sound to be directly affected by listeners' physical interactions with the tree, facilitating not only feelings of personal connection with it, but also an awareness of how humans constitute one of the environmental factors which the tree is vulnerable to, and thus encourages an acceptance of human responsibility for their continued wellbeing.

Fig. 16 Adrian Newton – *Heartwood*

The net result of Newton's exploration of the internal soundworld of a threatened ash tree is comparable, in some respects, to the sound works discussed earlier which explored the internal soundworlds of melting glaciers: aside from being sonically similar, each uses sound to evidence ecological processes which are largely invisible to the naked eye, challenging our visual perception of both glaciers and trees as static, unchanging objects by revealing the changes they are undergoing, second by second, as a direct result of changes in their environment; each gives voice to the dynamic agency of their subject in a way which acts as a sonic demonstration of Jane Bennett's ecological theory of vibrant materialism; and each uses listening as a means to grasp and connect with its materiality in a way which supports the kind of ecologically-attuned phenomenology promoted by David Abram.

The sounds heard on David Dunn's album *The Sound of Light in Trees*, meanwhile, are not those being made by the tree itself, but by the pine bark beetle, whose rapidly increasing

numbers due to climate change are causing the decimation of the population of piñon pines in New Mexico. Dunn's recordings of the beetles' clicking, squeaking stridulatory noises simultaneously invite us to feel both wonder at the complex soundworld involved in the communication and behaviour of the tiny beetles, and horror at the sound of the destruction going on inside the trees. However, Dunn's work goes beyond the release of his recordings on CD: he discovered that playing these recordings back to the beetles and combining them with nonrepeating synthetic sounds so that they could not get used to them had a profound effect on their neural system, causing them to cease their tunnelling and feeding behaviours, and even shutting down their reproductive cycle. This has enabled Dunn to use his work as an effective, and environmentally-friendly, form of pest control to help actively combat the bark beetle infestation, making it a rare example of a work of sound art which also constitutes a remedy for the ecological problem it highlights.

Fig. 17 David Dunn – *The Sound of Light in Trees* (bark beetle pest control device)

Another strain in Dunn's sound-based art-science work, exemplified by his *Autonomous Systems* project, represents a quite different form of interaction between sound technology and the forest ecosystem. *Autonomous Systems: Red Rocks* constitutes audio documentation of one manifestation of this project, in which we hear a juxtaposition of the natural environmental sounds of a forest, such as birds and insects, with distorted, filtered and pitch-shifted versions of them, as well as more heavily processed bursts of clicks, beeps, sustained tones and noise. The sum of this combination of natural and electronic sounds serves to close the aesthetic gap between the organic and mechanic, resulting in a soundworld in which the line between the 'natural' and the 'unnatural' is constantly in flux, and in which we begin to wonder what the difference is anyway. Listening alone can only take us so far with Dunn's work, however, and a deeper understanding of what we are actually listening to requires reading the explanatory liner notes, in which we discover that we are listening to the output of an autonomous computer

system recording the soundscape of a northern arboreal forest and using a non-linear (chaos) information generator to select short sections to play back into the environment, sometimes electronically processed, sometimes unprocessed. These sounds are then also recorded as part of the overall soundscape, creating feedback loops in which both the predominant sonic characteristics and the natural resonant frequencies of the environment are reinforced and amplified, creating a work which, on one level, is something of a collaboration between the ecosystem and the computer system.

However, here we find a similar problem to that in Andrea Polli's *Sonic Antarctica*: for while the liner notes provide a brief explanation of the work's premise and operation, they do not provide enough information for the listener to be able to decipher the precise dynamics of the engagement between nature and machine, leaving us unable to hear evidence of the emergent ecological intelligence that the work is attempting to demonstrate. For instance, some of the sounds we hear are identifiable as processed samples of the forest soundscape; others, however, particularly the high-frequency tone which sounds on and off for the majority of the work and which will perhaps constitute its most aurally challenging component for many listeners, is left unexplained, leaving us unclear as to its significance. It is also impossible to tell whether any given 'natural' sound we hear is a 'live' part of the forest soundscape happening at that moment, or whether it is the playback of an unprocessed sample by the computer; and we therefore cannot know whether it constitutes a response to the sound made by the computer or not. The upshot is that the listener is required to listen very carefully to try to make connections between what we hear and what came immediately before, and which might act as evidence of interaction between the computer and the natural forest ecosystem; and when we do, we have no way of knowing whether it really was an interaction or not.

But these problems, while valid, are also perhaps a little pedantic, and miss the point that, while it might have the form of an experiment, Dunn's work is first and foremost a work of art whose philosophical connotations are ultimately of greater importance than its scientific rigour. It might also be argued that scepticism towards the emergent intelligence of the forest ecosystem in *Autonomous Systems: Red Rocks* demonstrates precisely the sort of anthropocentric hubris – the assumption that nonhuman equates to nonthinking – that Dunn is challenging with his work. Perhaps the recognition of a nonhuman intelligence in natural ecosystems depends upon a crucial combination of intelligence and humility – the same combination that is necessary for us to realise the truth of our own fragility and dependence upon the healthy functioning of the earth's ecosystems in the age of the Anthropocene. In placing his autonomous computer system within the forest ecosystem and then retreating to let the situation naturally unfold, Dunn removes himself from the work, eschewing the anthropocentric role of creator in favour of the ecocentric role of listener, humbly seeking to learn about the operation of that ecosystem not only from listening to its sounds, but also from listening to the ways in which it reacts to, and interacts with, the sonic reflections and

distortions generated by the computer. Moreover, Dunn carries out his sonic experiments not as a demonstration of his own intelligence, but in order to activate an ecological listening which facilitates our recognition and understanding of the intelligence of the earth's natural ecosystems, so that we might better understand the nature of our interactions with them:

> My belief is that there is an important role for the evolution of an art form that can address the phenomenon of sound as a prime integrating factor in the understanding of our place within the biosphere's fabric of mind. As the ecology movement has repeatedly articulated, the traditional epistemological dichotomies between humans and nature are no longer tenable. We must instead develop a participatory relationship between humanity and the greater environmental complexity of the biosphere that is mutually life-enhancing. The political implications are that issues of freedom and dignity must now include the *total fabric of life* within which we reside, and new modes of experience that can help recover those aspects of human integrity rooted in a sense of connectedness with the nonhuman world must be explored … Music as a language is one of our best means for thinking about the fabric of mind that resides everywhere. Sound as a vibrant plenum reminds us of the profound physical interconnectedness that is our true environment. (Dunn, 2009, p. 99)

Dunn's work may present something of a challenge to listen to and to understand; however, it is a challenge that is worth taking on and fully engaging with. If we can learn to accept the principle explored by Dunn's sonic experimentation – that the earth's natural ecosystems represent autonomously and intelligently operating systems with which we are interconnected – we open ourselves to exploring the myriad implications this holds for how we regard the relationship between 'nature', humans, and our technology, and to think about how we might begin to approach the intelligent ecosystems we exist within, and depend upon, with a greater degree of understanding, humility and, crucially, respect.

The various works which explore interactions with the forest carry a variety of implications when considered in terms of ecological sound art. While Natasha Barrett's *Viva la Selva!* provides an engaging electroacoustic portrayal of the subjective experience of being a human in the middle of the rainforest, and the human / monkey cries can be interpreted as a portrayal of the human learning to fit into the rainforest ecosystem, the work as a whole cannot be considered to engage with the ecological issues relating to rainforest conservation in any meaningful sense, and must therefore be considered *non*-ecological sound art.

The personal ecological concerns behind Douglas Quin's *Forests: A Book of Hours* are made clear in the album's liner notes, in which he highlights humanity's destruction of the rainforests, and his hope that music and listening might help to engender an attitude of

ecological mindfulness. His work's musical blend of the rainforest soundscape with instruments, electronic sounds and the human voice, meanwhile, can certainly be interpreted as a metaphor for the harmonious integration of humankind and our technology into the earth's natural ecosystems. However, as with Max Eastley's *ARCTIC* album, the profession of ecological concern in the liner notes does not necessarily translate into an explicit statement within the work itself; and to interpret the work in this way requires that the listener bring these concerns to their listening, a fact which makes Quin's work, like Eastley's, an example of *marginal* ecological sound art.

David Monacchi's *Fragments of Extinction* operates on multiple levels: as a presentation of the complex and multifaceted soundscape of the rainforest ecosystem, an educational demonstration of Krause's Acoustic Niche Hypothesis, and a philosophical metaphor for humankind respectfully finding a way to coexist with the rainforest ecosystem guided by ecocentric principles. The title of Monacchi's project, meanwhile, makes explicit the fact that these ecosystems are endangered, and provides a clear reason for why it is so important that we learn to act in an ecologically responsible way towards them before they disappear altogether – a combination of factors which makes Monacchi's work an example of *explicit* ecological sound art.

Adrian Newton's *Heartwood* aims to highlight the ecological issue of ash dieback disease; and during the three days of its installation, this ecological message was reinforced by regular performances of a choral work by Karen Wimhurst whose lyrics explored what the loss of the trees would mean for people, and which incorporated ritualistic elements celebrating the ash tree as a sacred element in prehistoric ceremonial life and folklore. As with many of the works discussed, if the recordings of Newton's installation are listened to shorn of these other contextualising elements and without reading its programme notes, its ecological meaning is not readily apparent from the sound alone; however, if listened to, as originally intended, in conjunction with these other elements (documentation of which are available on Newton's website), its message become clear, making it an example of *implicit* ecological sound art.

David Dunn's *The Sound of Light in Trees* is a difficult work to categorise, since it is not just an artwork, but an art-science project comprising two elements: the CD of recordings released to the general public; and Dunn's use of those recordings to help combat the problem of bark beetle infestation. If assessing the CD in isolation, while the beetles' destruction of piñon pine forests is clearly the driving preoccupation behind the work, and is explained in depth in the extensive liner notes, this issue is not inherently proclaimed by the sound alone, making it an example of *implicit* ecological sound art; however, with Dunn's use of the recordings as a form of pest control, the use of sound to remedy the very ecological problem it evidences turns the project as a whole into a work of *explicit* ecological sound art.

The categorisation of Dunn's *Autonomous Systems: Red Rocks*, meanwhile, is even less straightforward: to an even greater extent than Francisco López's *La Selva*, it stands as a work

which perfectly exemplifies the demonstration of ecological principles promoted by Timothy Morton. Dunn's use of sound to achieve the integration of a technological system with the natural ecosystem of the forest, and his exploration of the dynamics of its operation, make his work more ecologically-focused than López's purely sound-focused recordings; however, to understand the deeper ecological implications of his work requires a committed engagement both with the sound work and with the explanatory notes which accompany it, and that the listener brings to their listening an attitude of ecological concern which will lead them to make these connections, making it an example of *marginal* ecological sound art.

4.4 Ecological sound art: a definition-in-progress

In Chapter One, the proposed new genre of ecological sound art was given an initial basic definition of works of sound art which demonstrate an engagement with ecological issues, which was used as the basis for compiling a list of works whose content or subject matter suggested such an engagement, and which were therefore considered as potential examples of this new field. Over the course of the ecocritical analyses in this chapter a number of points of confluence have emerged, enabling the collation of a list of common characteristics to be incorporated into the following expanded 'definition-in-progress' of this proposed new genre:

Ecological sound art is a modern, ecologically-concerned movement within sound art, comprising works whose form, content or subject matter demonstrate an active engagement with contemporary ecological issues. Works of ecological sound art tend to reflect the artist's own ecological concerns, and exhibit an inherent ecocentrism in conception and realisation, evidenced through the following common characteristics:

1. **The use of listening as pathway towards greater ecological understanding.**
   Listening to the sounds of an environment or ecological phenomenon is frequently used within works of ecological sound art as an intuitive, experiential means of learning more about the functioning of the earth's natural ecosystems, and about the problems they are facing.

2. **The promotion of an ecological mode of listening.**
   The soundworld found in works of ecological sound art frequently directs us towards an ecological mode of listening, in which our focus is moved away from isolated objects or things in favour of the dynamics of ecological processes, interactions and interrelationships, and which thus facilitates a deeper, experiential awareness of the principles of the interconnected ecosystem.

3. **A prioritisation of listening over sounding.**

   As opposed to being about the sounding of the artist or something they are causing to sound, ecological sound art commonly demonstrates the prioritisation of listening over sounding, centred upon the artist's own open and investigative listening to an environment, ecosystem or ecological phenomenon, with the work functioning as a channel through which to share their listening and learning with others. This principle also involves a type of humility on the part of the artist which equates to a tangible ecocentrism, in which the focus of the work is shifted away from the artist, and onto the environment or ecosystem being explored.

4. **The use of sounding as a metaphor for ecological coexistence.**

   When ecological sounds art does incorporate the sounding of humans, and human instruments and technologies, it is frequently used as a metaphor for learning how to positively coexist with the other elements within a space of commons, guided by the principle of the healthy and harmonious operation of the ecosystem as a whole.

5. **A form that functions as an ecosystem.**

   The ecological principles explored in works of ecological sound art are often exemplified by a work which itself functions as an ecosystem, comprising a number of interconnected parts whose interaction determines the final form of the overall work. This principle also involves a kind of ecocentric humility on the part of the artist, as it necessitates the relinquishing of a certain degree of control over the precise form and content of the work.

6. **A blend of art with science, and of ecology with environmentalism.**

   Works of ecological sound art tend to be inherently interdisciplinary in nature, blending the investigation and experimentation of science with the creativity and expression of art, and combining the principles and dynamics of ecology with the causes and concerns of environmentalism.

7. **A combination of the educational with the philosophical.**

   In their engagement with contemporary ecological issues, works of ecological sound art frequently combine the investigative, informative or educational with the emotive or philosophical, thus leaving audiences with both an enhanced understanding of contemporary ecological issues, and the emotional urge to do something about them.

Conclusion

The original motivating force behind the research detailed within this thesis was a personal desire to explore how an interest in sound art might be combined with a concern for ecological issues, coupled with a growing awareness that a significant number of artists were doing exactly that, but that their work was not being promoted, written about or critically engaged with in the same way that equivalent ecologically-concerned works in other art forms had been for years. As detailed in Chapter One, this can be attributed to a large degree to a gap in sound art scholarship which is curatorial in nature, regarding the failure to collect together and recognise the growing number of ecologically-concerned works of sound art as forming a distinct genre in their own right. The conclusion to that first chapter took the first steps towards addressing this gap by proposing the new terminology of ecological sound art and formulating a basic definition, which was then used to perform the initial curatorial act of compiling a list of proposed ecological sound works relating to five key ecological tropes.

The present chapter has built upon these initial steps by combining the critical and the curatorial aspects of this research, taking a selection of the potential works of ecological sound art identified in the first chapter, and employing the ecocritical framework for sound art developed in Chapter Two to conduct ecocritical listenings which have sought to determine the precise nature and extent of their engagement with contemporary ecological issues. These listenings have revealed that different sound works demonstrate varying degrees of ecological engagement, making it both difficult and inappropriate to subject them to a binary 'in or out' judgement; thus, each work has been placed in one of four categories – explicit, implicit, marginal and non-ecological sound art – which represents its position on a spectrum of ecological sound art. Finally, the overall outcomes of the ecocritical listenings in this chapter have been collated and summarised to build upon the basic definition of ecological sound art provided in Chapter One, formulating a more comprehensive definition of this proposed new genre, including a list of seven common characteristics: the use of listening as a pathway towards greater ecological understanding; the promotion of an ecological mode of listening; a prioritisation of listening over sounding; the use of sounding as a metaphor for ecological coexistence; a form that functions as an ecosystem; a blend of art with science, and of ecology with environmentalism; and a combination of the educational with the philosophical. However, since ecological sound art is being defined and delineated for the first time in this thesis and represents an area which is still growing and evolving, this is offered merely as a definition-in-progress, with the hope that it may subsequently be revised and expanded upon by others in future critical and curatorial engagements with the field.

Chapter 5
Findings, Problematics and Future Directions

Introduction

Over the course of the preceding four chapters, this thesis has undertaken a thorough investigation into the ways in which ecology and environmentalism is made manifest within contemporary sound art, and how this might be properly acknowledged and engaged with. In Chapter One, the cultural response to contemporary ecological issues was examined, and two significant gaps in current scholarship were identified relating to the relationship between sound art and ecological issues: one critical, concerning the lack of a theoretical ecocritical engagement with sound art in general; and the other curatorial, regarding the failure to collect together the growing number of sound works which are directly engaging with contemporary ecological issues and recognise them as a distinct genre in their own right, in the same manner as that done with ecologically-engaged works in other art forms. With regard to the latter, the new generic terminology of ecological sound art was proposed, a basic definition formulated, and an initial list of works compiled and sorted into common tropes. In Chapter Two, the core principles and approaches of ecocriticism were identified, and ecocritical readings in other art forms were explored in order to determine key areas of ecological subject matter, while the commonalities between contemporary ecological theory and sound studies were used to pinpoint ways in which sound art might display ecological principles in its form and operation; all of which was then employed in the development of a new ecocritical framework designed specifically for sound art. This framework was then employed in Chapters Three and Four to carry out a series of ecocritical listenings to works of sound art: in the former, eight sound works – six canonical, and two contemporary – were analysed in order to explore how an ecocritical listening strategy might unlock new facets which allow them to speak to contemporary ecological concerns. In Chapter Four, meanwhile, the ecocritical framework was applied to the works of ecological sound art in the two most common of the identified tropes – the polar regions, and trees and forests – in order to determine the exact nature of their engagement with ecological issues. Following this, each work was placed in one of four categories, representative of a spectrum of ecological sound art; and a more comprehensive definition-in-progress of this proposed new genre was formulated, including a list of seven key characteristics.

In this final chapter, the key findings from the previous four chapters will be identified, providing a summary of the major aspects of new knowledge contributed by this research. The problematics encountered during the process of conducting the research will also be discussed; and directions will be proposed both for further ecocritical sound art research, and for future

ecological sound art, in the hope that this thesis may represent the first step in the wider recognition of an important new field in contemporary sound art and sound art scholarship.

5.1 Findings

Finding #1: The potential of a work of sound art to speak to contemporary ecological issues does not necessitate an overt engagement with such issues, but is revealed and activated through the act of listening with an ecocritical ear.

In order to explore the question of what might be gained from an ecocritical listening to sound art, eight works were selected for ecocritical analysis in Chapter Three: six classic or canonical examples, each of which exemplified a particular approach to the medium (an electronic composition, a sound sculpture, a performative work, an installation, a field recording-based work and a soundscape composition), and two contemporary works. While some of these works involved environmental sound in one form or another, none of them displayed any overt engagement with any particular ecological issue. However, in each case, a number of ecologically resonant aspects were revealed, demonstrating that no matter what the overt content or subject matter of the work – or, indeed, the original intention of the artist – it is the act of listening with an ecocritical ear which uncovers and activates a work's potential to speak to the ways in which we understand and relate to contemporary ecological issues.

The six canonical case studies span a period of over thirty years, from Edgard Varèse's *Poème Électronique* (1957-8) to Hildegard Westerkamp's *Kits Beach Soundwalk* (1989), a period during which, as explored in Chapter One, the modern environmentalist movement was founded and developed. At the time of writing, meanwhile, almost three more decades have passed since Westerkamp's work, during which there has been an exponential increase in global awareness and concern around a diversity of ecological issues, with climate change in particular having necessitated a shift in thinking from a local to a global scale, and from short-term to long-term periods of time. These significant shifts in ecological issues, attitudes and modes of thought mean that the ecological resonances revealed by a contemporary ecocritical listening may not have been part of the artist's intention or audience's experience of the work at the time of its original creation and exhibition. This is particularly true if such a listening is conducted with an openness to the wide-ranging concerns of the second and third waves of ecocriticism, enabling the identification of the implications of a given work regarding more inclusive, politically-aware and enlightened modes of modern ecological thought, such as the ecological implications of natural vs technological sound in the works by Varèse, Tudor and Ganchrow; of non-human agencies and subjectivities in those by Morris, Woolf and Lockwood; of the urban

in those by Westerkamp and Phillipsz; and of ecofeminism, queer ecology and dark ecology in those by Lockwood and Westerkamp.

Finding #2: All works of sound art carry an implicit set of ecological values which they transmit to listeners; an ecocritical listening can help to make us aware of these values, and to decide whether they are helpful or unhelpful in the context of contemporary ecological issues.

The ecocritical listenings conducted in Chapter Three reveal that no work of sound art can be deemed completely ecologically neutral: in each case, listening with an ecocritical ear reveals an implicit set of ecological values, which will be transmitted to the listener, whether consciously or unconsciously, along with all other aspects of the work. Part of the value of an ecocritical listening lies in its ability to make us aware of these implicit ecological values, and to decide whether they are helpful or unhelpful with regard to contemporary ecological issues. These values may be identified as being broadly anthropocentric – such as Morris's *Box with the Sound of its Own Making* in its foregrounding of the actions of the human artist forcefully shaping the wood to his will, and negating the growth of the tree which may be considered an equally vital part of the box's 'making'; or ecocentric, such as Lockwood's *A Sound Map of the Hudson River* in its focus upon the river rather than upon the artist, and its allowing the river to 'speak' for itself. This is not to say that works of sound art can ever be reduced to a simple binary judgement of either anthropocentric or ecocentric: it is likely that any given work will demonstrate a matrix of ecological values which lie within the many shades of grey (or green) between these two positions, such as Wolff's *Stones* and *Sticks*, which may be considered anthropocentric in its reliance upon human manipulations of natural materials, but ecocentric in its emphasis upon a close listening to their resonant qualities, and its encouragement of respectful treatment of them; while Ganchrow's *Long Wave Synthesis* might be regarded as anthropocentric in its use of human-made technology to generate loud infrasonic waves and pump them out into the surrounding environment, but ecocentric in its sonification of the physical and climatic environment, and its revealing of the materiality of the air. Moreover, once the ecological values of a given work are revealed, an ecocritical listening also enables us to question them, and thereby to transform our experience of the work from what might have acted as an unconscious reinforcement of unhelpful ecological values into an active and conscious challenging of them.

Finding #3: Certain key ecological principles are inherently embodied by sound as a medium, and by listening as a means of engagement, and can thus be found exhibited within the form and operation of all works of sound art, positioning it as an inherently 'ecological' art form.

As part of the development of the ecocritical framework for sound art in Chapter Two, a number of points of confluence were identified between some of the principles of contemporary ecological theory and of sound studies, revealing some of the ways in which ecological principles are exhibited by sound as a medium, and listening as a means of engagement. This was then evidenced by the ecocritical listenings in Chapter Three, which found these principles displayed by each of the works analysed. The following can therefore now be proposed as representing some of the ecological principles embodied by sound art:

1. **Sound art reveals an ecosystem of interactions and interconnections between things.**
   Sound is the result of movement, of interactions, of the transfer of energy between things, evidencing not merely what *is*, but what is *happening*, in our environment. The ways in which sounds occur, behave, interact and are received are experienced as the dynamics of an ecosystem in operation, revealing the mesh of interactions and interconnections between everything in our environment, as well as the specific characteristics of that environment. In their sounding, and in our listening, works of sound art thus inherently make us aware of a surrounding environment of interacting forces, activating a sense of the ecological.

2. **Sound art creates an embodied experience of our own ecological interconnectedness with the other things in our environment.**
   Sound bridges the gap between us and the other things in our environment, as the sound waves resulting from their movement literally penetrate our body, so that their agency becomes a physical part of us, giving the listener a sense of being embedded within an ecosystemic mesh of interpenetrating forces. This can forge an enhanced ecological sensibility through the direct sensorial connection with environmental materials, presences and processes. Though this will be true for all works of sound art, it is likely to be experienced particularly strongly in those installation or performative works which involve sounds being experienced by listeners in 'real time' as they happen.

3. **Sound art reveals the materiality of the atmosphere and our bodily immersion in it.**

   The sound generated by an event reaches the ear and body of the listener by travelling in pressure waves through the air. In the process, it reveals the materiality of the atmosphere and our bodily immersion in it, making it tangible, and encouraging an awareness of our dependence upon its condition being suitable for our physical survival.

4. **Sound art highlights the vibrant agency of nonhuman matter.**

   There is perhaps no more direct or straightforward way of demonstrating Jane Bennett's ecologically-charged notion of 'vibrant matter' – of the agency of things, and of the operation of those things in assemblages of actants – than through sound. Sound is, simply put, the result of matter vibrating, and is thus our most immediate and direct sensorial evidence of the principle of vibrant matter; while a work of sound art can be understood as an assemblage of actants, of an interconnected web of things in motion interacting with each other – and with us.

5. **Sound art creates a space of ecological commons.**

   In experiencing our embodied interconnectedness with the nonhuman within an ecosystemic assemblage of actants, we find ourselves within a shared space of interdependent coexistence – a *commons*. The space in which the listener encounters a work of sound art thus becomes a space of ecological commons, in which sensing the work, and the environment within which the work exists and with which it interacts, becomes a path towards sensing the commons, and thereby, in the words of Frances Dyson, forging a true 'common sense'.

Since these ecological principles have been found to represent inherent elements within the form and operation of all works of sound art, they can thus be proposed as representative of the ways in which sound art can be considered an inherently 'ecological' art form. In the context of an ecocritical listening, meanwhile, they can be considered a baseline: the very least we might expect to find in the analysis of any given work of sound art, and to which any other ecologically resonant elements in form, operation or subject matter are additions.

Finding #4: There exists an abundant and growing number of works of sound art which actively engage with contemporary ecological issues, making apparent the need for the curatorial establishment of a distinct new genre of ecological sound art.

While it has been demonstrated that certain key ecological principles are found in the form and operation of all works of sound art, one of the fundamental arguments of this thesis has been that there also exists a significant and growing number of works of sound art which build upon these strong ecological foundations to actively engage with contemporary ecological issues. It has further been proposed that such ecologically-engaged works of sound art deserved to be recognised as forming a distinct new genre in their own right, in order to afford them the same recognition as equivalent ecological works within other art forms – most significantly that of eco-art, from whose curated exhibitions and texts sound art has been excluded – and to ensure that their specific philosophies, meanings and methodologies are not lost, ignored or misunderstood through continuing to be conflated with the many other forms of environmental sound art. Following the precedent set within the visual arts, 'ecological sound art' has been proposed as the most suitable terminology with which to identify this new genre; and a basic initial definition formulated as 'sound art whose content or subject matter displays an engagement with ecological issues'. Based upon this definition, an initial list of ecological sound works was compiled, comprising works or bodies of work whose content or subject matter suggested a relationship with contemporary ecological issues. In Chapter Four, the twenty-seven works which fell into the two most significant of these tropes were subjected to ecocritical listenings, following which twenty-two of these were confirmed as fulfilling the necessary criteria to be regarded as falling on a spectrum of ecological sound art.

The subsequent application of the same criteria to the other works listed in Chapter One demonstrated that all of these also fell on the spectrum of ecological sound art, resulting in a curated collection of over forty works or bodies of work by twenty-five artists or groups of artists. This list is by no means intended to be definitive, but merely a representative sample of the many ecologically-engaged sound works being realised by artists all over the world; and it is to be expected that their number will only continue to grow as the global ecological issues they address grow ever-more urgent. The sheer volume of contemporary works of sound art which are engaging with ecological issues, and the set of common characteristics which unite them as a coherent movement, thus makes apparent the need for such works to be recognised as forming the distinct new genre of ecological sound art proposed by this thesis.

Finding #5: There are certain subjects or tropes which currently dominate ecological sound art; and so, conversely, others which are under-represented.

In compiling the initial selection of ecological sound works in Chapter One, the subject matter of the vast majority of works discovered was found to relate to five key tropes: the polar regions; trees and forests; rivers and seas; atmosphere and climate; and extinct and endangered species. These tropes are, of course, incredibly broad, and represent five areas of the earth's ecosystem which are generally perceived to be suffering a high degree of ecological damage; and it is thus perhaps to be expected that they would represent common subjects for works of ecological sound art. However, it should also be noted that the vast majority of the ecological sound works in the selection in Chapter One also focus upon what might be imperfectly labelled 'natural environmental sound' – that is, to use the terminology coined by Bernie Krause (2015), the sounds of the biophony (living creatures) and geophony (the earth, weather and 'natural' environment) – with comparatively few which incorporate the sounds of the anthropophony (humans, human-made technologies and urban environments). Ideas of wilderness might thus be identified as a dominant theme within ecological sound art; and its problematics must therefore also be taken into consideration. Just as Greg Garrard notes the use of a high degree of artifice in many depictions of wilderness, and Barbara C. Matilsky points out the problem of nineteenth century industrialists collecting landscape paintings since the belief that there was still plenty of wilderness out there allowed them to continue their ecologically destructive actions, so David Dunn cautions against sound works which artificially construct idealised versions of wilderness soundscapes:

> The premise appears to be that these recordings will somehow sensitize the listener to a greater appreciation of the natural world, when in fact they are more often perpetuating a nineteenth-century vision of nature and, at best, merely documenting a state of affairs that will soon disappear … phony mixes to construct convincing audio portraits of places that do not actually exist … [are] even more reprehensible because it lures people into the belief that these places still fulfil their romantic expectations, and it gives the illusion that all is well when it is not. (Dunn, 2001, pp. 103-4)

Dunn's contention might certainly be conceived as a problem for many field recording-based works of sound art; however, the majority of the examples of ecological sound art identified in this thesis can perhaps be seen to have avoided this trap, due to their explicit emphasis upon the issues that are threatening the wildernesses they portray. Those works which deal with the polar regions focus upon the sounds of melting glaciers, or contain explicit references to the issue of climate change which is causing them to disappear; those which explore trees and forests

reference the ways in which they are under threat, or else explore ways in which we might learn to live in harmony with their natural ecosystems; those which focus upon rivers and seas address issues of pollution, damming and habitat destruction; those which deal with the atmosphere and climate focus upon issues of pollution and climate change; and the trope of extinct and endangered species requires no further explanation.

It might therefore be proposed that an overarching dominant theme within ecological sound art is not just wilderness, but 'wilderness under threat'. The precise reasons for this focus can only be speculated upon; however, one possible explanation might be found by tracing its origins in the practice of field recording, and the discipline of acoustic ecology. There is a strong tradition within field recording, particularly that relating to acoustic ecology, of capturing the sounds and soundscapes of the natural world in locations devoid of the sounds of humans, both in order to preserve and catalogue them, and to make them available for urban listeners to enjoy at home. In an age in which many natural habitats and species are being damaged or destroyed by human actions, it is a small step to channel this motivation to capture the soundscapes of the natural world which are 'unspoiled' by anthropogenic sound into an ecologically-motivated call to value the earth's natural environments, and to increase awareness of what we stand to lose if we continue on our unthinkingly destructive path. Acoustic ecology, meanwhile, from its beginnings in the writings of R. Murray Schafer and the activities of the World Soundscape Project, has had a strong historical bias towards natural soundscapes, and against the spread of urban and technological sound, which it has traditionally regarded primarily as noise pollution. This implicit value judgement has been challenged by more recent moves within acoustic ecology which take a more open-minded and balanced view of anthropogenic, technological and urban sounds and soundscapes; however, in their focus upon the sounds of natural environments, ecosystems or creatures, the majority of works of ecological sound art can be seen to be taking their cues from the more traditional philosophies of acoustic ecology. When anthropogenic sound does feature, it is often chiefly as the force responsible for ecological destruction, as in Max Eastley's *ARCTIC* with its industrial rhythms of the Barentsberg Coal Mine; Hildegard Westerkamp's *Beneath the Forest Floor* and Leah Barclay's *Rainforest Listening*, with their violent sounds of chainsaws; and Mikel R. Nieto's *Dark Sound*, with its sounds of the oil industry invading the soundscape of the Ecuadorian rainforest. There are also exceptions to this rule, however: Douglas Quin's *Forests: A Book of Hours*, David Monacchi's *Fragments of Extinction* and David Dunn's *Autonomous Systems* all use electronically synthesised sound as a means to portray ways in which humankind and our technologies might learn to sensitively coexist within the earth's natural ecosystems.

The other side of there being certain dominant tropes within ecological sound art is, of course, that there are other subjects which are currently under-represented. The dominance of the theme of 'wilderness under threat', along with its adoption of acoustic ecology's traditional prejudice against urban soundscapes, means that artistic investigations of urban ecology are

currently largely lacking from ecological sound art. Even when urban environments do feature, it is almost invariably from the perspective of revealing the decline in ecological health within them and because of them, such as in Softday's *Nobody Leaves till the Daphnia Sing* (2009) and *Marbh Chrios (Dead Zone)* (2010), Andrea Polli's *Heat and the Heartbeat of the City* (2004) and *Airlight* (2006-7), and Wesley Goatley's *Breathing Mephitic Air* (2017). This may be considered a problem in light of the fact that, according to the UN, over half of the earth's population dwell in urban areas, a figure predicted to rise to 60 per cent by the year 2030 (United Nations, 2016, p. ii); and while it is certainly important to draw attention to the ecological damage being done within cities, it is also vital that the city is not simplistically regarded as nothing but an ecologically damaged and damaging phenomenon – the negative flip-side of 'nature'. In this respect, ecological sound art might perhaps do well to heed the points raised by certain second wave ecocritical studies, such as those in Michael Bennett and David Teague's collection *The Nature of Cities: Ecocriticism and Urban Environments* (1999), in their explorations of ways in which those who dwell in cities might cultivate an ecologically conscientious sensibility through the forging of a positive connection to the environment they live in.

Another area which is underrepresented within ecological sound art is that of political ecology and ecological justice issues, with most works portraying ecosystems to be preserved, and damage being done, without engaging with deeper issues such as ecologically negligent and destructive corporate behaviour, the developing world suffering the consequences of the ecologically irresponsible lifestyles of First World countries, and the structures of patriarchy, colonialism and capitalism which perpetuate these issues. Once again, therefore, it is perhaps desirable that ecological sound art draws inspiration from the exploration of these issues in third wave ecocritical studies, such as Gustafsson and Kääpä's collection *Transnational Ecocinema: Film Culture in an Age of Ecological Transformation* (2013), *Ecocriticism and Indigenous Studies: Conversations from Earth to Cosmos* (2016) edited by Salma Monani and Joni Adamson, and T.J. Demos's *Decolonizing Nature: Contemporary Art and the Politics of Ecology* (2016), as well as from the works of eco-art which engage with them, such as many of those featured in the 2015 exhibition staged at the Nottingham Contemporary and curated by T.J. Demos and Alex Farquharson, *Rights of Nature: Art and Ecology in the Americas*.

While ecological sound works can be an effective way of highlighting ecological problems, meanwhile, another area which has yet to be properly engaged with is the investigation of possible solutions to these problems, or ways to get involved in making a positive difference – a fact which means that many works are perhaps in danger of leaving listeners with feelings of helplessness, or even hopelessness, regarding the issues they highlight. In this regard, ecological sound art might take a cue from the works of eco-art which propose or demonstrate practical strategies for positive ecological change, something which constitutes the key feature of the 'restorationist' school of eco-art, exemplified by works such as Hans Haacke's *Rhinewater*

Purification Plant (1972), Joseph Beuys's *7000 Oaks* (1982) and Mel Chin's *Revival Field* (1990), and collected together in exhibitions such as *Fragile Ecologies: Contemporary Artists' Interpretations and Solutions* (1992) curated by Barbara C. Matilsky, *Ecovention: Current Art to Transform Ecologies* (2002) curated by Sue Spaid and Amy Lipton, and *Groundworks: Environmental Collaboration in Contemporary Art* (2005), curated by Grant Kester. While it is difficult to see how sound art could replicate many of the practical ecologically transformative strategies exemplified by these largely sculptural and installation-based works, however, this should perhaps not be its main objective. It is a different medium; and as such, it falls to the artists themselves to explore how sound art might offer new strategies and approaches to address contemporary ecological issues in ways which other art forms do not. It is to be hoped that the future may see the production of works of sound art which begin to address all of these currently under-represented areas; and, indeed, this constitutes one of the most significant of the directions for future ecological sound art proposed in section 5.3.

Finding #6: The ecological impact of the creation and exhibition of a work of sound art can affect its wider ecological meaning and significance; and works of ecological sound art tend to be held to account in a way that non-ecological works do not.

The ecocritical listenings to works of sound art reveal that it is not just the form and content of the work which determine its ecological significance, but also the wider context of the ecological impact of the circumstances and processes surrounding its creation and exhibition. Within this thesis, this principle first became clear in the ecocritical listening to Robert Morris's *Box with the Sound of its Own Making* – a work whose main focus is precisely upon the process of the work's creation (or, at least, one aspect of the work, which is the wooden box). The presentation of the sound, as if the box itself were relating the process of its own construction in the first person, leads the ecocritical ear to hear the violence in the acts done to the wood in the process of turning it into a cultural object; and this, coupled with the awareness of the wood's previous state as a walnut tree, gives rise to the question of which object – the walnut tree, or Morris's artwork – has the greatest value from an ecological perspective. As discussed, to condemn the act of cutting down a tree to create an artwork as inherently immoral would perhaps be a pantheistic step too far; however, the question does lead us to reflect upon the wider implications of the act of taking and destroying the earth's natural resources in order to create objects to which we assign aesthetic, cultural, practical or financial value.

In contemporary society, meanwhile, the issue of ecological impact – the carbon emitted, the waste created, the pollution caused, the natural resources used, the habitats destroyed – has increasingly become a factor in how we think about all of our actions and endeavours, including the food we buy, the energy we consume, the transportation we use, and the things we throw

away, all of which adds up to our ecological footprint. Such considerations must therefore also play a part in contemporary ecocritical listenings to works of sound art, leading us to question the ecological footprints generated in the course of their creation and exhibition, and whether this can ultimately be justified by their cultural value. This question is especially pertinent for works of ecological sound art, which are generally the product of an artist's desire to make work which might have a positive, not negative, ecological impact. Ironically, however, one thing which became clear over the course of the ecocritical listenings in Chapters Three and Four is that sound works which demonstrate overtly ecological subject matter are much more likely to lead the listener to hold them to account in this regard, and to a much higher standard, than works which do not, due to the issue of perceived hypocrisy. These issues generate complex and difficult questions, and will be discussed further in section 5.2 as one of the most significant problematics encountered in the course of this research.

Finding #7: The wider context of a work's creation may reveal the influence of external motivations and agendas upon its subject, meaning and message.

While they may not be a direct factor within the listening experience, the wider context of the circumstances surrounding the creation of a work of sound art can also be an informative aspect in the process of analysing and evaluating its ecological significance, since it can reveal the influence of external motivations and agendas upon its subject, meaning and message. This becomes particularly evident if we compare the circumstances surrounding the creation of the various sound works which engage with the polar regions. For the purposes of the ecocritical listenings in Chapter Four, no distinction was made between works which focused upon the Arctic and those which focused upon the Antarctic, since the issue of the ice melting due to climate change is the same at both polar regions; however, they are of course very different places, a fact which has led to significant differences in the specific circumstances of artists' engagements with them.

The Antarctic is a frozen continent with no native population, inhabited only by a transient community of scientists and researchers. Its relative inaccessibility means that all of the sound artists whose work has engaged with the Antarctic – Douglas Quin, Philip Samartzis, Craig Vear, Andrea Polli and Cheryl E. Leonard – have done so via official artistic residencies, funded by various national Antarctic research programmes, which enabled them to spend a fixed period of time based at scientific research stations. Quin, Polli and Leonard's expeditions were each funded by the US National Science Foundation Antarctic Artists and Writers Program, whose application criteria state that it gives priority to "projects that focus on interpreting and representing the scientific activities being conducted in and/or about the unique Antarctic region" (National Science Foundation, 2017); Vear's expedition was funded by a joint

fellowship from the British Antarctic Survey's Artists and Writers Programme and Arts Council England's International Artists Fellowships Programme, which is described as "part of a continuing programme by BAS to raise awareness and understanding of the extensive science it undertakes in Antarctica" (British Antarctic Survey, 2003); and Samartzis was funded by the Australian Antarctic Arts Fellowship, which supports artists to create work "with a focus on communicating within Australia and internationally the activities of the Australian Antarctic Program" (Australian Antarctic Division, 2017). Each of these artists thus travelled to the Antarctic with an imperative to create work which raises awareness of the scientific research being done by a particular country, a fact which is particularly evident in the works by Samartzis, Vear and Polli, which all place a strong focus upon the research stations and the people who live and work there. Indeed, it was their focus upon this subject rather than upon any particular ecological issue which meant that the works by Samartzis and Vear were ultimately deemed not to constitute examples of ecological sound art, with Polli the only artist who deals explicitly with the scientists' research into the issue of climate change.

The Arctic, in contrast, encompasses not just the sea ice surrounding the North Pole, but parts of Alaska, Canada, Finland, Greenland, Iceland, Norway, Russia and Sweden. This makes it generally much more accessible than the Antarctic; and the sound artists who have produced work dealing with the region have therefore not been obliged to do so under the remit of a scientific programme, but have done so from a variety of locations and perspectives. Max Eastley and Daniel Blinkhorn, the two artists who travelled the furthest north, to the Arctic island of Spitzbergen, did so on expeditions with two different arts organisations. Cape Farewell, with whom Eastley went on three separate Arctic expeditions in 2003, 2004 and 2005, is a UK-based project founded by photographer David Buckland, who has characterised its primary objective as being "to invest in artists who produce personal and emotively charged responses to climate change" (Buckland and Wainwright, 2010, p. 11). The sound works created by Eastley over the course of his involvement with Cape Farewell are thus already strongly connected with the issue of climate change as a result of having been conceived, realised and presented within this context of this project. Blinkhorn, meanwhile, went to the Arctic in 2011 with US-based organisation The Arctic Circle, whose mission statement is much more open, describing it simply as "a nexus where art intersects science, architecture, education and activism – an incubator for thought and experimentation for artists and innovators who seek out and foster areas of collaboration to engage in the central issues of our time" (The Arctic Circle, 2009). Naturally, one of these issues will be that of climate change; however, it does not explicitly engage with it in the way that Cape Farewell does, with the only real condition for participating artists being that they produce work that engages with the Arctic in some way. It is therefore perhaps unsurprising that the works realised by Blinkhorn as a result of his participation do not engage with the issue of climate change in the way that Eastley's do, focusing instead upon primarily acousmatic explorations of the Arctic soundscape.

Those artists who explored the Arctic Circle from the standpoint of some of the countries within it, meanwhile, were able to do so largely independently, and were thus less obviously influenced by any outside organisation's agenda. Holly Owen and Kristina Pulejkova crowdfunded their trip to Norway to realise their project; while for others, the Arctic circle simply is, or has been, home: Jana Winderen is Norwegian, Matthew Burtner and Scott Deal are both Alaskan, and Katie Paterson created her works while living in Iceland. It is interesting to note, therefore, that the works of Owen and Pulejkova, Burtner and Deal, and Paterson all place a strong focus upon the human connection to the Arctic as a means of encouraging concern about the effects of climate change on the region.

These observations lead to the conclusion that the content, focus and overall purpose of works of ecological sound art may often be strongly influenced by outside factors, which may include requirements by projects and organisations that artists produce works which tie in with their own agendas, and which may or may not incorporate a focus upon ecological issues; and while this does not affect the core assessment of a given work's ecological significance in an ecocritical listening, it can prove very revealing regarding the question of how and why it came to be the work that it is.

Finding #8: Not all works of sound art which focus upon ecologically resonant subjects automatically constitute examples of ecological sound art.

The initial list of potential ecological sound works in the final section of Chapter One was compiled by identifying works of sound art whose content or subject matter suggested a relationship with contemporary ecological issues, as represented by the five key tropes of the polar regions, trees and forests, rivers and seas, atmosphere and climate, and extinct and endangered species. The ecological engagement of the twenty-six works which fell into the first two of these tropes was then critically analysed and evaluated in the ecocritical listenings in Chapter Four, following which five of them were judged not to engage with ecological issues in any meaningful sense, and therefore could not be regarded as works of ecological sound art. Three of these works – Philips Samartzis's *Crush Grind* (2011) and *Antarctica: An Absent Presence* (2014), and Craig Vear's *Antarctica: Musical Images from The Frozen Continent* (2005) – were sound works composed from field recordings made at the Antarctic, while the other two - Francisco López's *La Selva* (1998) and Natasha Barrett's *Viva la Selva!* (1999) – featured recordings of the Costa Rican rainforest. The portrayal of both of these environments in contemporary culture commonly carries strong associations with ecological issues such as climate change, biodiversity loss and deforestation, to the extent that, for many people, it is now impossible to think of the Antarctic without thinking of it melting, or to think of the rainforest without thinking of it being cut down. The hypothesis was thus that any sound work which took

these environments as its subject might also, to some extent, speak to the ecological issues which have become so strongly associated with them; however, as a result of the process of listening with an ecocritical ear, this was found not to invariably be the case. The fact that a work is about the Antarctic does not necessarily mean it is also about the ecological issue of climate change: the works by Samartzis and Vear focus upon the human relationship with place, investigating the experience of living and working at the Antarctic, and do not engage with the issue of its progressive melting. Similarly, just because a work is about the rainforest, it does not mean that it is also about the ecological issue of its conservation, as demonstrated by the ecocritical listenings to the works by López and Barrett which reveal them to be fascinating and engaging works about the richness of its ecosystem, and the human experience of being within it, but which make no reference to the issues of deforestation and biodiversity loss. These examples serve to clarify what ecological sound art is, and what it is not: it is not simply works which are about 'nature' or the 'natural world', nor is it works which are about particular environments or ecosystems which many of us might perceive as under threat; rather, it constitutes works of sound art which, in one way or another, demonstrate a tangible engagement with the myriad ecological issues which threaten the earth's ecosystems.

Finding #9: Individual works of sound art may demonstrate different degrees of engagement with contemporary ecological issues, and can be recognised as existing on a spectrum of ecological sound art.

In addition to discovering that not all works which focus upon ecologically resonant subjects necessarily constitute example of ecological sound art, it also became apparent through the ecocritical listenings that different works exhibited varying degrees of ecological engagement, and that it was therefore neither possible nor desirable to subject works to an overly simplistic 'in or out' judgement. In order to solve this problem, therefore, it was decided that one of the outcomes from these ecocritical listenings would be the placement of each work into one of four categories, reflecting its position on a spectrum of ecological sound art. Following the ecocritical analyses of the twenty-six works in the two tropes of 'the polar regions' and 'trees and forests', they were distributed as six works of explicit ecological sound art, in which an engagement with ecological issues is explicitly declared within the work itself; six works of implicit ecological sound art, in which an engagement with ecological issues is not specifically declared, but still clearly part of the work's implicit or conceptual meaning; nine works of marginal ecological sound art, in which individual listeners may or may not interpret a connection with ecological issues, depending upon whether they bring this concern to the work; and five works of non-ecological sound art, in which the work does not engage with ecological issues in any meaningful sense. It is important to emphasise, however, that this categorisation

simply reflects the degree to which an ecologically-concerned meaning, message or purpose is evident, and does not constitute an overall value judgement upon the artistic quality or success of any given work.

Finding #10: A number of common characteristics can be identified which unite works of ecological sound art as a distinct and coherent genre.

The final outcome of the ecocritical listenings carried out in Chapter Four was the formulation of a more comprehensive definition of ecological sound art, including a list of seven common characteristics: the use of listening as a pathway towards greater ecological understanding; the promotion of an ecological mode of listening; a prioritisation of listening over sounding; the use of sounding as a metaphor for ecological coexistence; a form that functions as an ecosystem; a blend of art with science, and of ecology with environmentalism; and a combination of the educational with the philosophical. These seven characteristics embody the ecologically-attuned philosophies, methods and approaches which unite works of ecological sound art, and which validate its consideration as a distinct and coherent genre within sound art. They are not, however, intended as a closed or definitive list: since it is an emerging field, it is to be hoped that the definition and characteristics formulated by this thesis will be developed and refined by subsequent research, and it is for this reason that it is offered here as a 'definition-in-progress'.

5.2 Problematics

5.2.1 Limitations of an ecocritical listening strategy

One problematic encountered with regards to this research is the inherent limitations of conducting an ecocritical listening to works of sound art. As with any school of critical theory, ecocriticism operates by applying a specific lens or filter to the analysis and evaluation of works in order to assess their significance in relation to a specific topic or area of interest; in this case, contemporary ecological issues. It must therefore be recognised and acknowledged that, as the ecocritical ear tunes into the ecological frequencies of a given work, it simultaneously filters out a host of other frequencies which do not have an ecological resonance; and that an ecocritical listening, while opening up the potential of a work to speak to contemporary ecological issues, can thus only ever be a partial appreciation of that work.

It might also be questioned whether subjecting a work to an ecocritical listening is valid or fair if the artist did not intend their work to be received in this way. Is it fair, for example, to interrogate the ecological credentials of Robert Morris's *Box with the Sound of its Own Making*

when Morris – as far as we can tell – never intended his work to convey any kind of ecological message? In this, it is important to emphasise that an ecocritical listening cannot declare that a work has failed as an ecological statement if it was never intended as such. The object of an ecocritical listening is the identification and analysis of those aspects of a work which speak to the ways in which we perceive, understand and respond to contemporary ecological issues, and to judge whether it might prove helpful or unhelpful in this regard; and this is an exercise which can ultimately be applied to any work, regardless of artist intention. In the present age of ever-deepening ecological crises, it has become increasingly important, if not imperative, to learn to approach all aspects of life, including arts and culture, with an ecologically-attuned mindset. Indeed, this is something which is not just desirable, but also increasingly inevitable: as Timothy Morton points out, even trivial conversations about the weather are losing their triviality, becoming weighed down by the uncomfortable implications of its significance regarding our changing climate (Morton, 2010, p. 28). An ecocritical understanding of arts and culture has thus become essential to the development of a properly holistic critical understanding of how contemporary audiences may engage with and interpret works of any kind: as Morton again points out, "[w]e will soon be accustomed to wondering what any text says about the environment even if no animals or trees or mountains appear in it" (ibid., p. 11).

5.2.2 Subjectivity of both the critical and the curatorial exercise

Another fundamental problematic of this kind of research is the fact that it relies upon a number of subjective decisions and judgements with regard to both the critical and curatorial elements. To begin with, both the scope of the research project as a whole and the detail of the ecocritical listenings has been determined both by my own personal understanding of the fields of ecology and environmentalism, and of what is encompassed by the general category of 'contemporary ecological issues', as well as by my own assessment of which sorts of works do and do not fall under the fluid and contested category of 'sound art'. My formulation of a definition of ecological sound art also determined the range of works which were selected as representative of this new genre, while the organisation of these works into five sets of common tropes is also a highly subjective exercise: as the ecocritical listenings in Chapter Four demonstrate, there are a number of different things going on in each of the works, meaning that they could potentially have been grouped in a number of different ways. All of these subjective judgements will have been shaped by my own personal understanding and beliefs, and may have been made differently by others, which would have altered the nature of the research, as well as its findings.

Another aspect of this problematic is the fact that I happen to be a white British man, and so am unable to further third wave ecocriticism's core objective of promoting ecocritical

perspectives from writers other than white western males. However, over the course of my research, I have been making my ideas and arguments available to peer review and scrutiny through presenting them at conferences and symposia, and to the editors and committees of academic journals and books[12]. Furthermore, it is important to reiterate that my research is not intended to represent the final word on ecocritical approaches to sound art, or on the new genre of ecological sound art, but rather the first; and the incorporation of perspectives from other genders, races, nationalities and socio-economic backgrounds constitutes a key area for further research in this field.

5.2.3 The question of programme note dependence

A key problematic encountered in the process of conducting ecocritical listenings to works of ecological sound art was the question of the role of programme notes in explaining the ecological meaning or message of the works. Of the works discussed in Chapter Four, some were accompanied by comprehensive notes detailing every aspect of their conception and realisation, as well as the meaning the artist intended the work to have, while others were presented with no notes or explanations at all. For the ecocritical listenings in Chapter Four, the initial intention was to disregard programme notes altogether, in order that each work might be critically assessed and evaluated on an equal footing, based purely upon what is received and understood from listening to the work itself rather than any additional explanation from the artist. This was based on the principle that any work of art which is intended to communicate a specific meaning or message – such as a work of ecological sound art – but which requires external explanation in order for audiences to detect or understand it has ultimately failed in its central purpose. However, this quickly proved to be unrealistic as an ecocritical listening strategy, since these works are generally not intended to be listened to on an acousmatic basis, and require at least a basic knowledge of the sources of the sounds being listened to. In many cases, this may not be immediately obvious: unless listeners are already acquainted with the sounds made by melting glaciers, or – even more unlikely – pine bark beetles, some basic contextual information provided via programme notes is essential. This is perhaps especially crucial in the case of those works which incorporate sonification, such as Andrea Polli's *Sonic Antarctica* and Matthew Burtner and Scott Deal's *Auksalaq*: as discussed in Chapter Four, while their overall focus upon the issue of climate change is made clear from their inclusion of interviews with climate scientists, the significance of their sonifications of climate data would be utterly lost upon the vast majority of listeners unless accompanied by the explanatory programme notes which detail what is represented by the sounds. Other works also require

[12] Listed in the 'Research Outputs' section of this thesis.

explanation of the technical process involved in their realisation: without programme notes, listeners could never know that the records featured in Katie Paterson's *Langjökull, Snæfellsjökull, Solheimajökull* were pressed from the frozen meltwater of the same glaciers whose melting sounds they play back, or that David Dunn's *Autonomous Systems: Red Rocks* involves leaving a home-made computer system in a forest to record its soundscape, process it according to chaos theory and play it back in to the environment in order to provoke an autonomous interaction between the computer system and the natural ecosystem; and without this essential information, the meaning of these works would be lost.

It therefore became necessary to make a distinction between those programme notes which identify the sound sources and explain what is happening in the work on a technical level, and those which detail the artist's intended meaning or message. The former were regarded as an integral part of the work, essential for accessing its meaning, and were therefore incorporated into the ecocritical listenings; while the latter were considered to constitute an attempt to dictate how listeners should interpret and respond to the work, and were thus disregarded in order that the assessment of a given work's ecological significance might be based purely upon the content of the work itself, rather than because the artist declares that it is. However, since the research conducted prior to the ecocritical listenings had involved reading programme notes in full, the possibility of completely disregarding them when it came to the listenings was precluded. This necessitated being very conscious of which meanings were being received from the work itself, and which were being influenced by prior knowledge of the artist's intention; and it is hoped that the resulting evaluations and comparisons of works have been made as fair and objective as possible considering this problematic.

5.2.4 Assessing and passing judgement upon a work's ecological footprint

As outlined in Chapter Two, it was decided that the ecocritical framework for sound art should adopt the concerns of eco-media studies and incorporate a consideration of the practical ecological impact of works – their ecological footprint. The first problem with this, of course, is that unless this is something which the artist themselves has deliberately and conscientiously measured, there is no way of accurately assessing the ecological footprint of a given work; all we can do is to make a very rough guess, based upon what we can infer about the carbon emitted, pollution caused, natural resources used, waste generated, or other harmful ecological effects arising during the process of its realisation and exhibition.

For the purposes of an ecocritical listening, however, the issue is not so much about the precise size of a work's ecological footprint, but about how it affects the assessment of its overall ecological significance. This question was incorporated into the ecocritical framework for sound art developed in Chapter Two with the intention of asking it of all works, regardless

of whether or not they had overtly ecological subject matter. However, it felt unreasonable, perhaps even actively wrong, to hold a work such as Edgard Varèse's *Poème Électronique* to account for the carbon emitted in the course of powering the tape recorders used in its creation, or the hundreds of speakers involved in its performance, since it was realised in 1957-8, prior to the development of the modern environmental movement and scientific understanding about the causes of climate change. Moreover, the particular ecological resonances discovered within this work are centred upon the ways in which it provides a collective sonic experience of ecological interconnectedness, rather than upon the issue of climate change; therefore, its potential carbon footprint was not considered relevant to this particular ecocritical listening, and did not end up forming part of the analysis. The analysis of Ravi Ganchrow's *Long Wave Synthesis*, however, was very different in these respects: first of all, it was realised in 2015, with the globally catastrophic nature of climate change having become common knowledge; and secondly, whilst the work itself does not address any particular ecological issue, and cannot therefore be judged to be a work of ecological sound art, it was created in response to a commission by Sonic Acts as part of their three-year *Dark Ecology* project, which was centred upon the concept of the Anthropocene and the impacts that humans are having upon the earth and its climate. This means that Ganchrow must be held to account for choosing to create a work which must, compared to many, have had a significant ecological footprint. Of course, as discussed in the analysis of this issue in Chapter Three, a further problematic with this issue is that our measurement of this significance is relative. However, perhaps the real issue in terms of an ecocritical listening is the fact that the work's ecological footprint directly relates to the key ecological resonances of the work, namely its sonification of the climate, and the resulting metaphorical image of anthropogenic climate change as a detuning of the earth's own low frequency oscillator, resulting in a philosophical tension which causes us to consider whether the footprint of the work is justified. The comparison of these two examples thus highlights how our awareness, consideration and judgement of the ecological footprint of works of sound art is contingent upon both the time and circumstances of its creation, and the nature of the ecological resonances revealed through an ecocritical listening; and that it is therefore very difficult, perhaps impossible, to consider this issue in a completely fair and balanced manner amongst different works.

When it came to the ecocritical listenings to works of ecological sound art, meanwhile, it was found that the issue of their ecological footprint appeared even more problematic than for non-ecological sound works. It became clear that this was because there were, in fact, two separate issues involved: the first being the basic awareness of a work's ecological footprint; and the second being the issue of the perceived hypocrisy that arises in the case of works with ecologically-engaged subject matter. In the selection of ecological sound works analysed in Chapter Four, this is perhaps most clearly a problem for those works whose subject is the melting of the ice at the polar regions as a result of climate change, but whose creation has

involved the artists taking long-haul flights to travel there – as well as consuming an unknown amount of power in the realisation and exhibition or performance of the final work – and which might thus be perceived to be contributing to the very problem they are highlighting. This problem is inferred by Malcolm Miles with regard to Cape Farewell, the major eco-art project which gave rise to Max Eastley's *Glacial Soundscape* and *ARCTIC*. Miles observes that "[e]xpeditions take place on the sailing vessel *Noorderlicht*, which would be a low-carbon mode of travel except that it is necessary to fly to Spitsbergen to join the ship" (Miles, 2012, p. 128), following this with a critique of one of founder David Buckland's works in which he states that while he was captivated by its imagery, it did not make him think of the causes of global warming, which, he pointedly notes, "include aviation" (ibid., p. 129). While he stops short of explicitly condemning the project, therefore, Miles implies an inherent hypocrisy resulting from the ecological footprint of Cape Farewell's mission to address climate change through the arts.

In the context of the ecocritical listenings detailed in Chapter Four, it was found that this issue of perceived hypocrisy led to an inclination to hold works of ecological sound art to account for their ecological footprint much more, and to a much higher standard, than non-ecological sound works. That this was the case was demonstrated not only by my own ecocritical listenings, but also by the responses of others: by far the most common question to arise when I presented my research at academic conferences or talked about it to other people was that of its ecological footprint, and whether this could reasonably be justified. (It almost goes without saying, however, that this is not a question I have ever heard asked of any work of non-ecological sound art, no matter how significant its footprint must be.) While this is, of course, a completely reasonable question to ask, it might perhaps also lead us to wonder whether there is not something rather perverse about questioning the moral validity of those works of sound art which are attempting to take positive action regarding ecological issues on the basis of their ecological footprint, if we do not also hold works which have no ecologically beneficial aspect to account on the same grounds. This perhaps becomes more apparent if we generalise this principle for a moment, and consider how perverse it might seem to use the ecological footprints of environmental activists, climate scientists and conservation organisations to level accusations of hypocrisy and call into question the validity of their activities, while ignoring those of ecologically disastrous corporations and industrialists simply because they never claimed to be trying to make a positive ecological impact in the first place. This is therefore a complex issue which requires careful handing; most of all, we must beware of creating a situation in which artists shy away from creating ecologically-engaged works due to laying themselves open to accusations of hypocrisy which they would not have to deal with if they did not bother to attempt to make a positive difference.

5.2.5 Impossibility of measuring positive ecological impact

Exacerbating the problem of the disproportionate emphasis that can be placed upon the negative ecological impact of ecological sound works is the immense difficulty of ascertaining the positive ecological impact of such works. While we can discuss the intended or potential positive effects, such as raising awareness, aiding understanding or facilitating feelings of personal connection to ecological issues, and while such effects may be further supported by testimony of listeners, it is generally impossible to demonstrate any measurable impact that such works ultimately have regarding the issues they address. The upshot of this, when regarded in conjunction with the previous problematic, is that the negative ecological impact of works can be regarded as something definite and concrete, since this is readily identifiable in terms of air miles, materials used, electricity consumed, etc., while their positive impact can be easily dismissed as wishful thinking since it cannot be proven or measured – something which poses a considerable obstacle to ecological sound art being taken seriously as a means of addressing contemporary ecological issues, and which must therefore be openly and thoroughly tackled by artists and ecocritics alike.

5.3 Future directions

5.3.1 Directions for future ecocritical sound art research

This research has been conducted with the objective of providing the initial foundations for the ecocritical analysis and appreciation of sound art. An ecocritical framework specifically designed for sound art has been developed, and it has been applied in conducting ecocritical listenings to eight works of sound art – six canonical, and two contemporary. However, these are only the first steps in what it is hoped might be more widely adopted as an ecologically-aware approach to this art form; thus, one clear direction for future ecocritical sound art research is, quite simply, for there to be more of it, applied to as wide a range of sound works as possible. Indeed, it is to be hoped that an ecocritical perspective will eventually form a fundamental part of listening to any work of sound art in an era when ecological issues represent such a significant and increasing global concern. Another clear direction is to fulfil that objective of third wave ecocriticism which I cannot: namely, the incorporation of perspectives other than from white western males. It is my sincere hope that future research might see this field become as inclusive as possible through the incorporation of alternative perspectives from a diversity of genders, races, nationalities and socio-economic backgrounds.

There is also a need for further ecocritical research into the ecological footprint of works of sound art, both in terms of providing educated estimations of the impact of individual works,

and of openly discussing the tricky question of the extent to which such negative ecological impact can be justified by the cultural value of the work – an extremely uncomfortable question, and one which will no doubt prove immensely controversial, but one which must be asked nonetheless, as it must be asked of any human activity in an age of ecological crisis. However, in addressing this issue it will also be important to make the distinction between awareness and judgement: it is possible to be aware of the potential ecological footprint of a work without necessitating that we condemn it as a result, and this is what an ecocritical listening can do in the case of non-ecological sound works.

Regarding ecological sound art, meanwhile, there is also a need for further research into the problematic issue of the perceived hypocrisy which is a somewhat inevitable consequence of producing work with a positive ecological goal but which itself generates its own ecological footprint. While this issue is one which must be engaged with and discussed openly and honestly, however, this still presents a tricky problem for ecocriticism, since it will inevitably lead to discussing the ecological footprints of ecological sound works to a greater extent, and in greater depth, than those of non-ecological works, thereby perhaps giving the impression that their ecological impact is both more significant, and less justifiable. Perhaps the best that can be done is to accompany such ecocritical investigations with a warning against falling into the trap of inferring that the ecologically-concerned purpose of a work of ecological sound art somehow makes its ecological footprint less justifiable than that created by a non-ecological work. Indeed, we might equally propose the opposite argument: that it is the moral responsibility of all artists, as it is of all humans, to minimise the negative ecological impact of their work, and that the potentially positive ecological impact of a work of ecological sound art goes at least some way towards counterbalancing the negative impact of its ecological footprint, making it more justifiable than for works which have no ecologically beneficial aspect. In addition, it might be suggested that the enlightened contemporary ecocritic, rather than simply exposing and critiquing the ecological impact of works, might also take some responsibility for proposing potential solutions to the problems they uncover, suggesting alternative ways in which sound works might work to minimise their ecological footprint.

Following on from this, another aspect which requires substantial further research is that of the potential positive ecological impact made by ecological sound art. As noted above, this is something which is extremely difficult to measure. Strategies such as audience surveys and investigations into the reach of works might go some way towards providing evidence of impact in this regard, and assist in tackling the cynicism that such endeavours are almost inevitably met with. Ultimately, however, it must perhaps be accepted that, as with any artistic response to any socio-political issue, it is almost impossible to provide hard evidence of its impact; but that we should not confuse this with thinking that its contribution is not one worth making. On the contrary, while it is true that it is only concrete action such as cutting carbon emissions, ending deforestation and conserving natural resources that is going to mitigate the ecological

catastrophe which is already occurring, it is also crucial to understand that the only way that the human race is likely to take such action on the scale required is through a significant shift in attitude; and this is where the arts, including sound art, might just be one of the most powerful tools we possess – whether we can make accurate measurements of that power or not. It is therefore up to ecocritics to make the case, not only for the potential positive impact of ecological sound art, but also for the importance of letting go of the need to require concrete evidence of something before declaring it to be a worthwhile endeavour, and instead learning to be wise and brave enough to engage the qualities of hope and faith, which are too often dismissed as signs of weakness or stupidity in a society obsessed with information, evidence and intellect. The global crisis humanity is currently facing requires that ecological issues are addressed in every facet of our lives; however, if we wait until we have scientifically measurable evidence of the effectiveness of a particular course of action before we do it – or before we are prepared to advocate its being done – we will end up doing nothing, perhaps ultimately becoming victims of our own cynicism as much as of our carbon emissions.

Finally, while the curatorial act of collecting together, defining and describing ecological sound art as a distinct and coherent genre has been done here for the first time, this is not intended as the last word on the subject, but the first; and it is my sincere hope that further research will be forthcoming which will challenge and build upon my own initial research into this significant new genre. It is for this reason that the definition of ecological sound art formulated within this thesis is offered as an open-ended 'definition-in-progress', in the hope that further research may lead to its being revised, refined and redefined as appropriate. The list of ecological sound works compiled here is also not intended to be taken as definitive or exhaustive, but as an initial catalogue to which future works, as well as past works which my research may have missed, may be added; while the findings and conclusions of the thesis as a whole are offered as the foundations for both myself and, hopefully, others to build upon.

5.3.2 Directions for future ecological sound art

The research presented here has been predicated upon filling two major gaps identified in current sound art scholarship: one critical, in the lack of any ecocritical engagement with sound art; and the other curatorial, in the lack of recognition of the many works of ecologically-engaged sound art as a distinct genre in their own right. Over the course of this thesis, ecological sound art has been defined, and an initial catalogue of works compiled, of which a selection have then been subjected to ecocritical analysis, from which findings have been made regarding this new genre. It therefore seems appropriate, in addition to the directions for further ecocritical sound art research detailed above, to suggest some directions for future ecological

sound art, with the object of broadening and strengthening the work being done within this important new genre.

Perhaps the most essential element which is to be desired in future ecological sound art is the production of more works in which the engagement with contemporary ecological issues is made more explicit, or placed more centrally within the work. Over the course of this research, a number of artists were encountered who professed, in interviews or articles, to be motivated by a concern for ecological issues, but in whose works no reference to such issues could be detected, which meant that it did not meet the basic criterion for consideration as ecological sound art. There may, of course, be very good reasons for this: artists may feel that producing works which engage too explicitly with a particular issue would be to push a particular meaning or message upon the listener, and that they would rather their works retain a certain ambiguity and openness to interpretation; and this is, of course, perfectly reasonable. However, it could also be suggested that if your motivation to create a work of sound art stems from a concern with a particular issue, there is also merit in having the courage of your convictions and making it clear to listeners that this is what the work is about, and that this does not necessarily have to detract from either the artistic integrity of the work, or the listener's freedom to receive and interpret it in their own way; and it is hoped that some of the works of ecological sound art examined within this thesis have provided examples of this. As David Rothenberg argues, "[a]s the environmental crisis perpetuated by humanity intensifies, all artists, including musicians and composers, ought to take some responsibility for finding ways of linking excellence in their work with making constructive contributions to the solutions of the world's problems" (Rothenberg, 2009, pp. 7-8).

The aforementioned issue of the ecological footprint of works is also something which needs to be engaged with by ecological sound artists, just as much as, if not more so than, ecocritics. While, as has been argued, it is the responsibility of all artists in an age of ecological crisis to minimise the ecological impact of their work, the issue of perceived hypocrisy means that – rightly or wrongly – artists producing works of ecological sound art must be more conscientious than others both in minimising their ecological footprint, and in being open and honest about the problematics of the issue. In his critique of the ecological footprint of eco-art exhibitions, T.J. Demos concludes that the benefits of such exhibitions make it important that they continue, but that they must also strive to "somehow meet the requirements of a just sustainability" (Demos, 2009, p. 28); a similar objective may also be wished for future works of ecological sound art.

In terms of the specific focus of works of ecological sound art, meanwhile, one of the key findings discussed earlier in this chapter is that there are certain subjects, issues or tropes which dominate ecological sound art, such as climate change at the polar regions, threats to the earth's forests (particularly rainforests), pollution in rivers and seas, and extinct and endangered species, with the first two of these being particularly well-represented. However, as also noted,

the flip-side of this is that there are certain other subjects which are currently under-represented, such as ecological investigations of urban environments, political ecological issues, and creative proposals for possible solutions or ways to get involved in positive action. It is thus desirable that future works of ecological sound art begin to address some of these areas.

This said, while the above suggestions for future directions have been highlighted because they are not currently common features of ecological sound art, there are nevertheless a handful of works which do exhibit some of these features, and which might thus be proposed as models for future works to follow. With regard to the issue of ecological footprint, there exist a few works which, while not necessarily examples of ecological sound art in terms of subject matter, provide more ecologically sustainable models which may be adopted. There are a number of examples of solar powered works of sound art, such as Alvin Lucier's *Solar Sounder I* (1979), Joe Jones's *Solar Orchestra* (1982) and *Solar Music Hot House* (1988), Harold Kubiczak's *Singing in the Sun* (1991), Felix Hess's *How Light is Changed into Sound* (1995), Christina Kubisch's *Clocktower Project* (1996), Nigel Helyer's *Padme* (2010), Craig Colorusso's *Sun Boxes* (2010), Mike Blow's *Solar Work #2* (2012), and Chris Meigh Andrews's *Aeolian Processes* (2013). Solar powered sound art is also a key research interest of Scott Smallwood, who has created many solar powered sound sculptures such as *Arcade Bells* (2012), *The Engine Room* (2015) and *Aalborg* (2017), and installations such as *Rainforest Arcade* (2010), *Hideout* (2013) and *Coronium 3500 (Lucie's Halo)* (2012-15). Also significant in this regard is a paper by Smallwood with Perry Cook, 'SOLA: Sustainable Orchestras of Laptop and Analog', which explores the use of solar panels to power devices such as laptops and amplifiers, demonstrating the possibility of the wider application of solar power in sound art. Of course, sound art does not necessarily require any electrical power at all, such as the Aeolian sculptures by artists such as Leif Brush, Harry Bertoia, Alan Lamb and Max Eastley, or works which harness other environmental and meteorological forces to make sound, such as the wave organs by Peter Richards and George Gonzales (1986), Liam Curtin and John Gooding (2002) and Nikola Bašić (2005), or Jim Finer's *Score for a Hole in the Ground* (2008), inspired by the traditional Japanese *suikinkutsu*, which amplifies the sound of rainwater dripping into its central chamber. While it must be acknowledged that the use of renewable energy sources – or no electrical energy at all – places limitations upon what can be done, and so will not be suitable for adoption by all ecological sound art projects, such works provide examples of what is currently possible in terms of reducing the ecological footprints of sound works; and in an age of global ecological crisis, it is desirable for every ecological sound artist – just as it is for every artist in any medium – to move towards this objective in every way possible.

There are also a handful of works which point the way towards how ecological sound art might address some of the areas currently under-represented by the field. One work which stands alone in proposing a potential solution to the problem it highlights is David Dunn's *The Sound of Light in Trees* (2006): as discussed in Chapter Four, Dunn discovered that when he

played the sounds of the bark beetles he had recorded back to them, it caused them to cease their tunnelling and feeding behaviours, and even shut down their reproductive cycle, thus acting as a form of ecologically sound pest control to address the problem of their widespread destruction of the piñon pines in New Mexico. In terms of political ecology, meanwhile, there are several works which might act as models for future ecological sound artists. Peter Cusack's 'sonic journalism' projects *Sounds from Dangerous Places* (2006-12) and *Sounds of Water Use and Abuse* (2012-present) use sound as a medium to document and report upon ecological issues which are also highly politically-charged: the former project investigates places which have been subjected to major ecological damage due to industrial, political and military action, including the Chernobyl exclusion zone, the Caspian oil fields, and sites in the UK affected by nuclear power stations, military actions, and greenhouse and landfill waste gases; while the latter focuses upon issues around our use of water, including how the dredging of the Thames at Southend-on-Sea is damaging both the underwater ecosystem and the local fishing industry, and how the large-scale damming of the Tigris and Euphrates river system in Turkey has significantly reduced water flowing into the neighbouring countries of Iraq and Syria, threatening to displace large numbers of people and causing international unrest between the countries. Graciela Muñoz's *El Sonido Recobrado* (2014) deals with a similar issue facing communities in Chile: her work features recordings of the Baker, Chile's largest and most powerful river which is threatened with being dammed by a hydroelectric company, played back over twenty-eight speakers set in the bed of the Petorca, a river which has been completely dry since the 1990s due to being illegally dammed by mining and agricultural companies, causing the displacement of the community in which Muñoz herself grew up. Addressing a different politically-charged ecological issue, meanwhile, Mikel R. Nieto's *Dark Sound* (2016) constitutes an album of field recordings accompanied by a series of texts, investigating the oil industry's incursions into the Ecuadorean rainforest and the ecologically damaging effects suffered, not only by the rainforest ecosystem, but also by the indigenous Huaorani people.

Of all the sound artists discussed in the course of this research, however, it is perhaps Leah Barclay whose work provides the most comprehensive and forward-thinking model for future ecological sound art. *Rainforest Listening* has already been analysed in Chapter Four; however, this represents just one of Barclay's many works of ecological sound art, a number of which are, in fact, not merely stand-alone works but multifaceted interdisciplinary projects. Barclay's work is guided by her 'Sonic Ecologies Framework', a methodology first developed as the foundation for her practice-led doctoral research (Barclay, 2014), and which comprises five essential components: site-specific subject matter which is "pertinent to the community and grounded within a comprehensive understanding of the proposed thematic content" (Barclay, 2013, p. 30); multi-platform dissemination "in a range of environments for maximum exposure; this includes harnessing the power of virtual platforms to facilitate global accessibility" (ibid., p. 30); community engagement and education tools which help people to "gain a deeper understanding

of their sonic environment and play a role in the process … [and which] identifie[s] the necessity of engaging the younger generation in participatory soundscape experiences" (ibid., p. 30); interdisciplinary partnerships and collaborations which ensure that sound works are "augmented from [their] traditionally isolated academic circles and expand into regional communities collaborating with environmentalists, conservationists, scientists and policy makers to expand awareness" (ibid., p. 31); and a long-term strategic vision which focuses upon the work as a "process that will continue to resonate and evolve over time … [making it] essential that the artist invests critical thought into the methods in which the community will continue to engage as well as the appropriate technology for the project to remain accessible and functional" (ibid., p. 32). This methodology, which underpins all of Barclay's ecological sound art projects, means that the resulting works model many of the proposed directions for future ecological sound art outlined in this thesis.

The Dam(n) Project (2011-present), for example, is a collaborative, multi-disciplinary project about the damming of the Narmada river in North India by hydroelectric companies, and its impact upon the many communities – comprising over thirty million people – who have been displaced, as well as the Narmada Bachao Andolan activist movement. Barclay's sound works, composed from recordings of the river combined with testimonies and songs from people in local communities and gathered in non-violent protest, have been presented both as a site-specific sound installation, and as the soundtrack to *Zameen*, a touring contemporary dance work produced in conjunction with Attakkalari Centre for Movement Arts, as well as an accompanying short film which has toured international film festivals and is available to watch online. The project thus not only addresses a significant political ecological justice issue, it also becomes a part of the activism it documents by publicising the issue through a number of different art forms and contexts, giving a global platform to the voices of the affected communities.

Sonic Explorers (2012-present) is a project which engages young people in ecological sound art through workshops which enable them to go out and do their own environmental field recordings; the creation of collaborative soundscape compositions which allow them to work creatively with their sounds; live performances and installations which provide them with a platform to present their work to the public; and sound mapping which enables them to locate their recordings and compositions on a globally accessible online map. Originally commissioned for the Queensland eco-art event *Treeline* in June 2012, the most recent workshops at the time of writing occurred on 9th January 2018, when a group of young people between the ages of eight and seventeen explored the Mary Cairncross Scenic Reserve at the Rainforest Discovery Centre on Queensland's Sunshine Coast, doing sound walks, practicing deep listening, building recording kits, making field recordings, setting up live streams, creating graphic scores, and learning how to monitor environmental changes through sound.

River Listening (2014-present), meanwhile, is an interdisciplinary art-science project which combines the scientific research of soundscape ecology or bioacoustics, studying the soundscapes of rivers as a means to learn about their ecosystems and measure their health and biodiversity, with sound art which aims to engage audiences and communities in learning about, and connecting with, the rivers where they live. Launched in London in July 2014 with the audio-visual installation *Listening to the Thames*, the project subsequently developed to incorporate interactive soundwalks delivered via listeners' mobile devies using the free Recho app, with sound clips geotagged to specific locations along the length of the river. This iteration of the project premiered on the Noosa River at the 2015 Floating Land festival in Queensland, and has subsequently been staged at many different urban rivers around the world, including the Seine during the COP21 summit in Paris in December 2015, and the Humber during the Sound + Environment conference in Hull in July 2017 (which is where I was able to experience the installation for myself). The sound clips featured in the installation combine recordings of the specific river the installation is based at with the sounds of some of the many other rivers Barclay has recorded, as well as recordings of people talking about the various rivers and their environments, encouraging the listener not to think of the river whose banks they are walking as an isolated entity, but to consider its connections with other rivers around the world. These clips are also sometimes combined with a live hydrophone feed, giving listeners real time access to the complex ecosystems teeming with life beneath the surface, as well as any noise pollution there may be from boats or other machinery, expanding their understanding of what the river is, what it represents, and how it must be cared for. Furthermore, this central installation is supplemented by a programme of presentations which enable Barclay and her collaborators to communicate more detailed information about the river and its ecosystem, as well as the importance of protecting it; guided soundwalks which help to teach audiences how to listen to the river; and hydrophone workshops which allow participants to explore the soundscape beneath the surface of the river for themselves, as well as make their own recordings of the river, which may then be added to the collection of sounds in the installation. Prior to the installation in Hull which I experienced, Barclay had conducted workshops with local schoolchildren, whose recordings of the Humber were then added to the installation. This aspect also makes *River Listening* a democratic work, one which breaks down the barriers between artist and audience, and one which itself begins to operate like an ecosystem, creating an ever-expanding network of participants and collaborators who are able to actively contribute to it as well as experiencing and learning from it. In its active celebration of the ecology to be found in urban areas through its exploration of the soundscapes of rivers and waterways in cities across the world, and its encouragement to local residents to explore, value and take care of them, *River Listening* thus represents a model for the exploration of urban environments through ecological sound art.

On an even larger scale is *Biosphere Soundscapes* (2012-present), a multifaceted project exploring the soundscapes, ecology and environmental health of UNESCO Biosphere Reserves. The project pivots on three core systems: BioScapes Residencies, which bring together selected artists, researchers and scientists to explore and map the soundscape of a biosphere reserve, make field recordings, share knowledge through workshops and discussions, work on creative outputs, and engage with local communities; BioScapes Labs, a series of stand-alone workshops exploring specific research questions around the soundscape ecology of biosphere reserves; and the BioScapes Community, an online resource which acts as a platform for the dissemination of the project's outputs, including an interactive sound map and educational resources, and to which anyone is able to contribute content and participate in discussion as the project continues to evolve and expand. Since 2014, *Biosphere Soundscapes* has also run an internship programme whereby two interns each year are provided with mentorship, support and advice in developing their work, and given opportunities to attend conferences, workshops and residencies. From 7th – 9th December 2017, Perspectives on Listening, the first Biosphere Soundscapes International Workshop and Symposium, was held at Griffith University in Brisbane, featuring keynote presentations from ethnomusicologist and sonic anthropologist Steven Feld, and expert in plant bioacoustics Monica Gagliano, as well as numerous other panels, presentations, installations, performances, sound walks and field trips.

Biosphere Soundscapes is also a project of which I have first-hand experience, having been selected as a participant in the 2015 Biosphere Soundscapes Residency in the Sian Ka'an Biosphere Reserve in the Mexican state of Quintana Roo. Along with a handful of other artists, researchers and scientists, I spent ten days at a research station in the heart of the reserve, during which time I participated in numerous field recording expeditions exploring the soundscapes of different aspects of its ecosystem, including its thick rainforest, swampy wetlands, and rivers teeming with mangroves; presented and discussed my research, and learned about the artistic projects and scientific research of others; participated in workshops covering subjects such as the ecology and biodiversity of the reserve, species identification, approaches to acoustic and soundscape ecology and sound art, and ambisonic recording techniques; spent a full day engaging with representatives of the local indigenous Mayan community, who taught us about aspects of their history, culture, and their relationship with the natural environment which the Biosphere Reserve helps to protect, including their reliance upon it for food and traditional medicines; and worked on my own creative sound works, presenting some of my work-in-progress during the symposium held on the final day. I personally learned a great deal from the residency; and as a result of my participation, I am now able to put back into the project by contributing the field recordings I made to its archive, as well as to that of Fonoteca Nacional de México, the project's partner in Mexico, who will also be able to make use of them as part of their own ongoing research into the soundscape ecology of Sian Ka'an; and I will also be contributing my own creative sound works to the project's expanding collection of artistic

outputs. In sum, therefore, Barclay's *Biosphere Soundscapes* brings together art, science, ecology, conservation, education and community engagement in a forward-thinking, large-scale ecological sound art project which works in a variety of ways and across multiple platforms to increase both scientific understanding of the ecology of biosphere reserves and public awareness and appreciation of their existence and importance.

The limitations of this thesis preclude a more comprehensive exploration of Barclay's significant portfolio of work; however, in their scope and ambition, their multifaceted, interdisciplinary and collaborative nature, their combination of a local and global focus, their holistic ecological outlook combining artistic, scientific and political concerns, their community engagement, their educational benefit, their multi-platform delivery, their global reach, and their overall artistic and ecological integrity, the ecological sound art projects of Leah Barclay represent perhaps the most powerful and effective model for future ecologically-concerned sound artists to aspire to.

Conclusion

The ten key findings detailed in this chapter serve both to validate the core objectives of this research, and to demonstrate the important new ways in which we might experience and understand works of sound art in the immensely significant contemporary context of global ecological issues. It has been found that the act of listening with an ecocritical ear constitutes a listening strategy which can be usefully applied to any work of sound art to uncover its potential to speak to contemporary ecological issues, regardless of whether it has directly ecologically-engaged subject matter, demonstrating the importance of the critical dimension of this research. The process of conducting such ecocritical listenings, meanwhile, has uncovered the fact that all works of sound art carry an implicit set of ecological values, whether anthropocentric or ecocentric, enabling us to identify and to question them; while certain key ecological principles have been found to be inherently embodied by sound as a medium, and by listening as a means of engagement, thereby revealing sound art to be a strongly 'ecological' art form in core aspects of its form and operation. Crucially, however, this research has also revealed the existence of an abundance of works of sound art which build on these inherent ecological characteristics by adding the additional layer of subject matter which actively engages with contemporary ecological issues, demonstrating the validity of the curatorial dimension of this research in its contention that such works should be recognised as a distinct new genre, for which the new terminology of ecological sound art has been proposed. In compiling an initial list of works of ecological sound art, it has been revealed that there are certain subjects or tropes which currently dominate the field – the polar regions, forests and trees, rivers and seas, atmosphere and climate, and extinct and endangered species – and that therefore, conversely, there are

others which are under-represented, such as investigations of urban environments, political ecological issues, and proposals for positive action. Over the course of ecocritical listenings to these works, meanwhile, it has been found that the issue of a given work's ecological footprint can impact its wider ecological meaning and significance, and that works of ecological sound art tend to be held to account in this regard to a much greater degree than non-ecological works; and that the wider context of a work's creation may also reveal the influence of external motivations and agendas upon its subject, meaning and message. It has also been discovered that not all works which focus upon ecologically resonant subjects, such as the polar regions or rainforests, necessarily engage with the ecological issues associated with those subjects; and further, that individual works may demonstrate different degrees of engagement with contemporary ecological issues, and can therefore be recognised as existing on a spectrum of ecological sound art, as represented by the four categories developed here of explicit, implicit, marginal and non-ecological sound art. Crucially, however, a number of common characteristics have also been revealed, serving to unite ecological sound art as a coherent genre. Taken as a whole, these findings clearly demonstrate both the fertile nature of ecocriticism as a critical approach toward both classic and contemporary sound art, and the importance of recognising ecological sound art as a distinct new genre, so that the rapidly growing field of sound art might not continue to lag behind other art forms in addressing the immensely significant area of contemporary ecological issues.

The problematics which have arisen over the course of this research, meanwhile, have served to highlight some of the areas of inherent conflict and tension within both ecocriticism and ecological sound art. These have included a recognition both of the inherent limitations of an ecocritical listening strategy, and of the inescapably subjective nature of both the critical and curatorial aspects of this research, as well as the question of the degree to which programme notes should be taken into account as part of an ecocritical listening. Perhaps the most significant problematic encountered in the course of this ecocritical engagement with sound art, however, has been the issue of how the ecological footprint of works should be assessed, and the implications of the tendency to hold works of ecological sound art to a much higher standard, and judge them much more harshly, than other works in this regard. This, along with the fact of the immense difficulty of assessing the positive impact such works may have upon the ecological issues they address, constitute not only the most problematic aspects of ecocritical sound art research, but also the most significant challenges facing works of ecological sound art in their fight, not only to be more widely recognised, but also to be taken seriously – a fight which, in many respects, closely parallels that of the environmentalist movement. It is sincerely hoped, however, that some of these problematics may be addressed in future research, proposed directions of which have been outlined in the final section of this chapter. I intend to follow these directions in my own future research into ecocritical approaches to sound art, and the new genre of ecological sound art; however, it is also sincerely hoped that

the present research might also provide a foundation for others to build upon, contributing to the further growth of this important and timely new field.

Conclusion

A few months prior to my participation in Mongrel's *Antarctic Data Jam* in February 2007, I had been to the cinema to see Al Gore's new film *An Inconvenient Truth*. While I had long been aware of the issue of climate change, Gore's cinematic Keynote presentation succeeded in impressing upon me the scale and urgency of the problem in a way that nothing had done before – something which almost certainly contributed to my subsequent drive, following *Antarctic Data Jam*, to explore the possibilities of sound art as a cultural response to ecological issues. A little over ten years later, as I sit by the sea in the Cornish village of Carbis Bay in August 2017, writing the conclusion to my doctoral thesis while listening to the crash of the waves as they creep ever-closer up the beach (and indulging in a sneaky spot of ecomimesis), UK cinemas are currently screening *An Inconvenient Sequel: Truth to Power*. This follow-up documentary provides a timely assessment of what has changed in the intervening decade since Gore's original film, including the increasing evidence and worsening effects of climate change, and the progress made, and obstacles encountered, in the battle to halt humanity's ongoing ecocide (which, it is crucial we realise, is also by definition the slow suicide of our own species), and the work to mitigate its effects.

A look back at the same period of time in the history of sound art, meanwhile, reveals – just as it does in other art forms – an exponential increase in works addressing the issue of climate change, along with a host of other contemporary ecological issues, demonstrating that *Antarctic Data Jam* was just the tip of an iceberg which has since been growing as surely as the polar ice sheets have been shrinking. As if to assist me in illustrating this point, the first eight months of 2017, during which I have been engaged in writing up this thesis, have seen a plethora of sound artists engaging with ecological issues as never before. The first week of the year was also the final week of *The Great Animal Orchestra*, a major exhibition based on the work of Bernie Krause which had been installed at the Fondation Cartier in Paris since 2nd July 2016, featuring a surround-sound installation of Krause's recordings of extinct and endangered species with wrap-around visuals by United Visual Artists, accompanied by an exhibition of works by many other artists exploring the earth's biodiversity. The exhibition's central installation of Krause's work was also subsequently restaged later in 2017 at the Seoul Museum of Art from 30th May – 15th August as part of the *Highlights* exhibition of works from the Fondation Cartier collection. From 28th – 29th January, meanwhile, two works of ecological sound art were featured as part of *Space to Breathe*, an interactive exhibition at London's Somerset House curated by Cape Farewell and Shrinking Space on the theme of air pollution: Caroline Wright's *Breath Control: Sounding Scape*, which collected sung notes from passers-by alongside information about their respiratory health, which was analysed in relation to air pollution data from the surrounding environment; and Wesley Goatley and Tobias Revell's *Breathing Mephitic Air*, a surround-sound soundscape which combined sonifications of six months of air pollution data gathered in

the area surrounding Somerset House with the sounds of traffic, a catalytic converter and a refinery, and a visual display which dynamically depicted the data reflected in the soundscape.

From 1st April – 12th May, Edinburgh's Summerhall was home to Sebastián Verea's *Sounds of the Anthropocene*, an interactive audio-visual installation whose soundscape constitutes a sonification of various markers of the Anthropocene which sound according to where sunlight hits the earth in real time, but whose timeline could also be controlled by the audience, allowing them to hear the progression of the Anthropocene since the mid-twentieth century. On 25th April, meanwhile, the Visions du Réel film festival in Nyon, Switzerland screened the world premiere of *Dusk Chorus*, a new documentary film about David Monacchi's ongoing *Fragments of Extinction* project, which has since gone on to win a number of awards at international film festivals over the summer. On 26th June, meanwhile, a new soundscape theatre designed by Monacchi opened at the Naturama natural history museum in Svendborg, Denmark, which will run a daily programme of hour-long presentations of his work until the end of November. On 17th June in London and 8th July in Newcastle, art collectives Disobedient Films and Forma Arts ran day-long *Climate Symphony Labs*, workshops in which climate scientists, data analysts and sound artists explored the creative possibilities of working with sonifications of climate change data and enabled members of the public to create their own sound works, culminating in evening concerts featuring performances by sound artists Kate Carr, Lee Patterson and Jez Riley French. On 7th July in Alaska, meanwhile, Matthew Burtner performed a new 'ecoacoustic' work at Anchorage Museum's Planetarium composed for solo saxophone and the sounds of melting glaciers; while 26th – 29th July saw Burtner stage the first EcoSono Festival of Environmental Music and Sound Art, with performances of ecological sound works by numerous artists in various venues across Anchorage. Back in the UK on 20th August, London's Café OTO hosted *Amplification / Annihilation: In Sonic Defiance of Extinction*, featuring ecologically-themed sound works by Leah Barclay, Robin Buckley, Kate Carr, Minerva Cuevas, Graciela Muñoz, Anja Kanngieser and Polly Stanton, Andrea Polli, Leanne Betasamosake Simpson, and Ziibiwan. Speaking to *The Wire*, organisers Anja Kanngieser, Paul Rekret and Rory Gibb explained the event in the following terms:

> While 'nature' has always been a theme and component of music and sound art, it seems that these fields are increasingly engaging with the current ecological crisis in more pointed ways … Given that this is the case, can ecological collapse be sonically represented, or it does it just become the fetishisation of mass extinction? Is there a meaningful place for music and sound in environmental advocacy? Can sound artists and musicians intervene in environmental crises that hit poor communities and communities of colour hardest? We're interested in pulling together work that responds to these questions implicitly or explicitly. (The Wire, 2017)

For Leah Barclay, meanwhile, this event represented just one of the many and varied ecological sound art projects she was involved with in 2017. On World Water Day on 22nd March, she launched her new project *Sonic Reef* at the World Science Festival in Brisbane, with a brand new augmented reality soundwalk along the Brisbane River. Currently being developed in collaboration with the Queensland Conservatorium Research Centre, Australian Marine Conservation Society and JASCO Applied Sciences, *Sonic Reef* is planned to take a variety of approaches towards using sound art as a means to increase awareness of the threats currently facing the Great Barrier Reef, and the importance of taking action to protect it. The project was also contextualised as part of the new *100 Ways to Listen* project, also launched at the festival, which focuses upon art-science crossovers in sound, and whose events at the festival also included a programme of ecologically-focused performances and installations entitled *Sonic Environments*, featuring works by Barclay, Daniel Blinkhorn, Ricardo Dal Farra, Matt Hitchcock, Toby Gifford, Mauricio Iregui and Scott Smallwood. Three months later, Barclay gave the world premiere of *Intrinsic Connections*, the first of her compositions to emerge from the *Sonic Reef* project, at the Sound + Environment conference, held at the University of Hull from 29th June – 2nd July, which also featured a plethora of other ecologically-themed sound works including James Wyness's installation *If We Do Nothing*, involving sonifications of data concerning CO2 levels and glacier ablation, and a new 'eco-acoustic' composition from David Monacchi's *Fragments of Extinction* project, entitled *The Vanishing Brain of Ecosystems*.

During her keynote presentation at *Sound + Environment*, meanwhile, Leah Barclay also officially launched the latest development in the *Biosphere Soundscapes* project: *Biosphere Open Microphones*, developed in collaboration with Locus Sonus and SoundCamp in the UK (who also discussed the project in greater depth during their own presentation at the conference), and with Jasper Ridge Biological Preserve in Stanford, CA, and Cyberforest in Tokyo. This initiative will see open microphones being set up in UNESCO Biosphere Reserves around the world to which anybody will be able to listen at any time, and in real time, over the internet, and which will be used both for environmental monitoring and as a tool to engage both local communities and global listeners. An initial demonstration of this new project was staged later in the summer at the Balance-Unbalance conference of digital arts and ecology, held at Plymouth University from 21st – 23rd August in partnership with Ear to the Earth and the World Forum for Acoustic Ecology, with a live stream from the North Devon Biosphere Reserve at Braunton Burrows being set up to stream throughout the conference, along with presentations and workshops which explored the project in greater depth. Over in Queensland on 18th August, meanwhile, Barclay staged a special *Biosphere Soundscapes* concert as part of Australia's National Science Week, featuring sound works resulting from expeditions and residencies across six different Biosphere Reserves in Mexico, Brazil, Australia, USA and Cambodia.

The flood of ecological sound works, projects, events and conferences which occurred during the writing-up of this thesis in the first eight months of 2017 serves to demonstrate just

how significant the new movement of ecological sound art has become, and the rate at which it is growing. As demonstrated in the first chapter, in other areas of art and culture such as the visual arts, literature, film, theatre and music, the increasing engagement with ecological issues has long been recognised and supported both by ecocritical studies which have analysed the ways in which these art forms speak to contemporary ecological issues, and by the curatorial recognition of distinct new 'ecological' genres in papers, books, exhibitions and festivals, which has in turn led to its wider public recognition, and increased its potential to have an impact regarding the ecological issues it addresses. The impetus for the research detailed in this thesis was the discovery that no such critical or curatorial strategies had been applied to sound art, which led to a desire to take the first steps in addressing these significant gaps in sound art, eco-art and ecocritical scholarship: firstly through developing an ecocritical framework for sound art and demonstrating its application in ecocritical listenings to canonical and contemporary works of sound art; and secondly through compiling an initial catalogue of ecological sound works, and conducting ecocritical analyses of a selection of these works to explore the precise manner of their engagement with contemporary ecological issues, resulting in a list of common characteristics which support the recognition of ecological sound art as a distinct and coherent genre.

Indeed, there are signs that this recognition is already becoming more widespread, and that the terminology of ecological sound art which I have proposed is beginning to be adopted by others. In the third year of my research, I had two journal papers published on the subject: 'Sounding the Alarm: An Introduction to Ecological Sound Art', published in Musicological Annual in December 2016; and 'Ecological Sound Art: Steps Towards a New Field', published in Organised Sound in April 2017. In July, at the Sound + Environment conference, I met two lecturers who are already using these papers in their teaching and passing on the concept of ecological sound art to their students; and Leah Barclay demonstrated that she has also adopted the term, using it in her keynote presentation. Shortly after this conference, I was invited by Barclay and Joel Chadabe to conduct an ongoing interview series with artists engaged in ecological sound art for Ear to the Earth in conjunction with the World Forum for Acoustic Ecology; and an article on ecological sound art, based on my research, was featured in the online publication *GlacierHub*. Perhaps most significantly, in August I was invited to contribute a chapter on ecological sound art to the forthcoming *Bloomsbury Handbook of Sonic Methodologies*, suggesting that it has already begun to gain acceptance as a new subgenre of sound art within the wider academic community.

It would be absurdly optimistic to claim that ecocritical listenings to sound art, and works of ecological sound art, are the answer to solving climate change, halting deforestation or preventing pollution – of course they are not. However, these and other ecological issues have now been widely recognised for a long time as urgent global problems which represent a serious threat, not only to the abstract concepts of 'nature' or 'the environment', but to human

civilisation itself; and it is therefore imperative that we do not merely relegate them to the concerns of science and politics, but learn to engage with them in every aspect of our lives, in which regard our arts and culture is immensely significant. This fact has been reflected for many years now in the critical scholarship and curatorial practices surrounding the visual arts, literature, film, theatre and music, as well as being a growing concern in areas such as fashion, design and architecture; and this can only grow in significance as the global issues it addresses grow ever more urgent. The current lack of engagement with ecological issues in sound art scholarship, which the research in this thesis has taken the first steps towards addressing, should not just be a concern for those who wish to see these issues addressed as widely as possible in contemporary culture, but for anyone who cares about the future of sound art itself. While it may represent a fast-growing contemporary art form, sound art has not yet reached anything approaching the level of public recognition enjoyed by the other art forms mentioned in this thesis; and it is not going to help itself in this regard if it fails to keep up with the times and remain relevant to contemporary concerns, of which ecological issues are among the most significant. It is time – in fact, it is way *past* time – for sound art scholarship to open its ears and listen to this growing cultural movement, and then to start making noise about the ways in which sound art can contribute to how we understand and respond to contemporary ecological issues, lest future generations see in it just another example of something which did not speak up until it was too late – initially for itself, and ultimately for the humans and other living creatures without whom sound itself is condemned to become forever unheard.

Appendix: A Catalogue of Ecological Sound Art

This catalogue of ecological sound art has been developed through the curatorial process of taking each of the identified works of potential ecological sound art listed in Chapter One, and distributing them amongst the four categories proposed in Chapter Four, representing their position in a spectrum of ecological sound art. Those works which were judged to fall into the fourth of these categories – that of non-ecological sound art – have not been included within this catalogue. As detailed in Chapter One, this selection of works represents only those which were found to engage with ecological issues relating to five key areas or tropes: the polar regions, trees and forests, rivers and seas, atmosphere and climate, and extinct and endangered species. It is thus not intended to represent a complete or definitive list, but merely an initial catalogue of ecological sound art, representative of the potential breadth of this important and timely new genre; and it is offered here in the hope that it may subsequently be developed and built upon.

Explicit ecological sound art In which an engagement with ecological issues is explicitly declared within the work itself.	
The polar regions	Andrea Polli – *Sonic Antarctica* (2009)
	Matthew Burtner and Scott Deal – *Auksalaq* (2012)
	Holly Owen and Kristina Pulejkova – *Switching Heads: Sound Mapping the Arctic* (2015)
Trees and forests	David Monacchi – *Fragments of Extinction* (2002-present)
	David Dunn – *The Sound of Light in Trees* (2006)
	Leah Barclay – *Rainforest Listening* (2015-present)
	Mikel R. Nieto – *Dark Sound* (2016)
Rivers and seas	Leah Barclay – *The Dam(n) Project* (2011-present) / *River Listening* (2014-present) / *Sonic Reef* (2017-present)
	Matthew Burtner – *Microplastic PET* (2012)
	Graciela Muñoz – *El Sonido Recobrado* (2014)

Atmosphere and climate	Andrea Polli – *Heat and the Heartbeat of the City* (2004) / *Airlight* (2006-7)
	Wesley Goatley and Tobias Revell – *Breathing Mephitic Air* (2017)
	James Wyness – *If We Do Nothing* (2017-present)
Extinct and endangered species	Various – *Suspended Sounds* (2006)
	Maya Lin – *What Is Missing?: Sound Cone* (2009) / *Sound Ring* (2014)
	Sally Ann McIntyre – *Collected Silences for Lord Rothschild* (2012) / *Huia Transcriptions* (2012) / *Collected Huia Notations (like shells on the shore when the sea of living memory has receded)* (2015)
	Krista Caballero and Frank Ekeberg – *Birding the Future* (2013-present)

Implicit ecological sound art In which an engagement with ecological issues is not specifically declared within the work but is still clearly part of its implicit or conceptual meaning.	
The polar regions	Max Eastley – *Glacial Soundscape* (2005)
	Katie Paterson – *Vatnajökull (the sound of)* (2007) / *Langjökull, Snæfellsjökull, Solheimajökull* (2007)
	Cheryl E. Leonard – *Antarctica: Music from the Ice* (2009-15)
Trees and forests	Hildegard Westerkamp – *Beneath the Forest Floor* (1992)
	Adrian Newton – *Heartwood* (2014)
Rivers and seas	Softday – *Nobody Leaves till the Daphnia Sing* (2009) / *Marbh Chrios (Dead Zone)* (2010)
	Jana Winderen – *Silencing the Reefs* (2011-14)
	Peter Cusack – *Soundscapes of Water Use and Abuse* (2012-present)
Atmosphere and climate	Peter Cusack – *Sounds from Dangerous Places* (2006-12)

Marginal ecological sound art In which individual listeners may or may not interpret a connection with ecological issues, depending upon whether they bring this concern to the work.	
The polar regions	Chris Watson – *Vatnajökull* (2003)
	Max Eastley – *ARCTIC* (2007)
	Jana Winderen – *+4°C* (2007) / *Evaporation* (2009) / *Energy Field* (2010)
	Douglas Quin – *FATHOM* (2010)
	Daniel Blinkhorn – *frostbYte* cycle (2012-15)
Trees and forests	Douglas Quin – *Forests: A Book of Hours* (1999)
	David Dunn – *Autonomous Systems: Red Rocks* (2003)
Extinct and endangered species	Sarah Peebles – *Resonating Bodies* (2008-present)
	Softday – *Amhrán na mBeach (Song of the Bees)* (2014)
	Bernie Krause – *The Great Animal Orchestra:* symphony (2014) / ballet (2015) / exhibition (2016-17)

Research Outputs

Publications

Book Chapters

'Ecological Sound Art', in Bull, M. and Cobussen, M. (eds.) *The Bloomsbury Handbook of Sonic Methodologies*. London: Bloomsbury (forthcoming).

'Introduction', in Bianchi, F. and Manzo, V.J. (eds.) *Environmental Sound Artists: In Their Own Words*. New York: Oxford University Press, 2016, pp. xix–xxvii.

Journal Articles

'Ecological Sound Art: Steps Towards a New Field', *Organised Sound* 22 (1), 2017, pp. 32-41.

'Sounding the Alarm: An Introduction to Ecological Sound Art', *Musicological Annual* 52 (2), 2016, pp. 71-84.

Conference paper presentations

'Ecological Sound Art', *Balance-Unbalance 2017: A Sense of Place*, Plymouth University, UK, 21–23 August 2017.

'Ecological Sound Art', *Sound + Environment*, University of Hull, UK, 29 June – 2 July 2017.

'Ecology and Environmentalism in Contemporary Sound Art', *Sound Art Matters*, Aarhus University, Denmark, 1–4 June 2016.

'Sounding the Alarm: An Introduction to Ecological Sound Art', *International Symposium on Music and Ecology*, Ljubljana, Slovenia, 28–29 August 2015.

'Ecoacoustics', *Network Ecologies*, University of Scarborough, UK, 4–6 June 2015.

Other research outputs

Artistic residency, 'Biosphere Soundscapes' project, Sian Ka'an Biosphere Reserve, Quintana Roo, Mexico, 26 Oct – 4 Nov 2015.

'Ecoacoustics', composed radio documentary, broadcast on Resonance FM as part of *Critical Waves*, 23 June 2015.

Works Cited

Leah Barclay

The Dam(n) Project (2011-present)
Format: Ongoing collaborative project with multiple outcomes (including community workshops, soundscape compositions, a dance work and a short film)
Duration: Various
Documentation available at: http://thedamnproject.com (Accessed: 4 January 2018).
Video available at: https://vimeo.com/75530367 (Accessed: 4 January 2018).

Biosphere Soundscapes (2012-present)
Format: Ongoing collaborative project with multiple outcomes (including community workshops, soundscape compositions, artist residencies, live streams and soundscape ecology research)
Duration: Various
Documentation available at: http://biospheresoundscapes.org (Accessed: 4 January 2018).

Sonic Explorers (2012-present)
Format: Ongoing collaborative project with multiple outcomes (including field recording workshops with young people, soundscape compositions, live performances, installations and sound map)
Duration: Various
Documentation available at: http://sonicexplorers.org (Accessed: 4 January 2018).

River Listening (2014-present)
Format: Ongoing collaborative project with multiple outcomes (including community workshops, soundscape compositions, installations and soundscape ecology research)
Duration: Various
Documentation available at: http://barclay2014.blog.anat.org.au (Accessed: 4 January 2018).

Rainforest Listening (2015)
Format: Installation (geotagged rainforest field recordings, accessed via Recho app)
Duration: Unspecified
Documentation available at: http://www.rainforestlistening.com (Accessed: 4 January 2018).

Sonic Reef (2017-present)
Format: Ongoing collaborative project with multiple outcomes (including community workshops, soundscape compositions, installations and soundscape ecology research)

Duration: Various
Documentation available at: http://www.100waystolisten.com/soundwalks.html (Accessed: 4 January 2018).

Various other ecological sound art works and projects
Format: Various
Duration: Various
Documentation available at: http://leahbarclay.com (Accessed: 4 January 2018).

Natasha Barrett
Viva la Selva! (1999)
Format: Soundscape composition
Duration: 17min 34sec
Available on: Barrett, N. (2002) *Isostasie* [CD]. Montreal, QC: Empreintes DIGITALes.

Daniel Blinkhorn
frostbYte cycle (2012-15)
Format: Soundscape composition
Duration: Various
Available on: Blinkhorn, D. (2015) *frostbYte: one dog night* [CD] (*red sound / chatter / wildflower*). Sheffield: Audiobulb.
Documentation and excerpts available at:
http://www.bookofsand.com.au/frostbYte/?page_id=37 (Accessed: 2 January 2018).

Matthew Burtner
Microplastic PET (2012)
Format: Electroacoustic composition (voice, percussion, plastics and electronics)
Duration: 3min 30sec
Documentation and excerpt available at: http://matthewburtner.com/microplastic-pet/
(Accessed: 2 January 2018).

Various 'ecoacoustic' compositions (1996-present)
Format: Various
Duration: Various
Documentation and excerpts available at: http://matthewburtner.com/ecoacoustics-list/
(Accessed: 2 January 2018).

Matthew Burtner and Scott Deal

Auksalaq (2012)

Format: Performance (voices, instrumental ensembles, percussion quintet, computer sound and video media)

Duration: 50min

Available on: Burtner, M., Deal, S. and EcoSono Ensemble (2013) *Auksalaq* [DVD]. Charlottesville, VA: EcoSono.

Also available to stream at: http://vimeo.com/ondemand/auksalaq (Accessed: 3 January 2018).

Documentation available at: http://matthewburtner.com/auksalaq/ (Accessed: 3 January 2018).

Krista Caballero and Frank Ekeberg

Birding the Future (2013-present)

Format: Installation (field recording of extinct and endangered bird species, video, stereoscopic cards)

Duration: Unspecified

Documentation available at: https://www.birdingthefuture.net (Accessed: 4 January 2018).

Peter Cusack

Sounds from Dangerous Places (2006-12)

Format: Sonic journalism (field recording / photography / writing)

Duration: Various

Available on: Cusack, P. (2012) *Sounds from Dangerous Places* [CD / book]. Surrey: ReR Megacorp / Berlin: Berliner Künstlerprogramm des DAAD.

Documentation available at: http://sounds-from-dangerous-places.org (Accessed: 4 January 2018).

Soundscapes of Water Use and Abuse (2012-present)

Format: Sonic journalism (field recording / photography / writing)

Duration: Various

Documentation available at: http://sounds-from-dangerous-places.org/water.html (Accessed: 3 January 2018).

David Dunn

Autonomous Systems: Red Rocks (2003)

Format: Audio documentation of installation (autonomously operating computer system)

Duration: 9min 59sec

Available on: Dunn, D. (2007) *Autonomous and Dynamic Systems* [CD]. New York, NY: New World Records.

The Sound of Light in Trees (2006)
Format: Field recording
Duration: 59min 13sec
Available on: Dunn, D. (2006) *The Sound of Light in Trees* [CD]. Albany, NM: EarthEar.

Max Eastley
Glacial Soundscape (2005)
Format: Sound sculpture (ice, stones, amplified metal plates)
Duration: Unspecified
Audio documentation available on: Eastley, M. (2006) 'Two 150 Kilo Blocks of Melting Ice with Layers of Stones Embedded Falling onto a Metal Plate for Climate Change Project Cape Farewell', on *Atlantic Waves 2006 Festival Sampler*. London: Wire Magazine.
Photo documentation available at: http://www.capefarewell.com/who-we-are/creatives/64-max-eastley.html (Accessed: 2 January 2018).

ARCTIC (2007)
Format: Soundscape composition
Duration: 54min
Available on: Eastley, M. (2007) *ARCTIC* [CD]. London: Cape Farewell.

Raviv Ganchrow
Long Wave Synthesis (2015)
Format: Installation (site-specific low frequency sound generators)
Duration: Unspecified
Documentation available in: Ganchrow, R. (2015) 'On Long-Wave Synthesis', in Altena, A., Belina, M. and van der Velden, L. (eds.) *The Geologic Imagination*. Amsterdam: Sonic Acts Press, pp. 179-198.
Video documentation available at: https://www.youtube.com/watch?v=RhpWw-Y0ru8 (Accessed: 2 January 2018).

Wesley Goatley and Tobias Revell
Breathing Mephitic Air (2017)
Format: Installation (sonification of air pollution data, visual display)
Duration: Unspecified
Documentation available at: http://www.wesleygoatley.com/breathing-mephitic-air/ (Accessed: 4 January 2018).

Bernie Krause and Richard Blackford

The Great Animal Orchestra: Symphony for Orchestra and Wild Soundscapes (2014)

Format: Composition (orchestra, field recording)

Duration: 31min

Available on: Krause, B. and Blackford, R. (2014) *The Great Animal Orchestra: Symphony for Orchestra and Wild Soundscapes* [CD]. BBC National Orchestra of Wales. Monmouth: Nimbus Alliance.

Bernie Krause, Richard Blackford and Alonzo King

Biophony (2015)

Format: Ballet

Duration: Unspecified

Documentation available at: https://www.linesballet.org/biophony (Accessed: 4 January 2018).

Bernie Krause and United Visual Artists

The Great Animal Orchestra (2016-17)

Format: Installation (field recording, spectrogram visualisation, water)

Duration: Unspecified

Documentation available in: Fondation Cartier pour l'Art Contemporain (2016) *Le Grand Orchestre des Animaux*. Paris: Fondation Cartier pour l'Art Contemporain.

360° video documentation available at: https://artsandculture.google.com/asset/the-great-animal-orchestra/tgG3Y3y3uOFdfg (Accessed: 4 January 2018).

Cheryl E. Leonard

Meltwater (2013) (from *Antarctica: Music from the Ice*)

Format: Performance (two performers playing scientific glassware, stone slabs, feather quills, and Adélie penguin bones; suspended icicles; field recordings of the Marr Ice Piedmont glacier)

Duration: 20min

Documentation available at: http://www.allwaysnorth.com/antarctica.html (Accessed: 2 January 2018).

Video documentation available at: https://www.exploratorium.edu/arts/resonance/see-and-hear/cheryl-e-leonard-performance (Accessed: 2 January 2018).

Maya Lin

What Is Missing?: The Listening Cone (2009)

Format: Sound sculpture

Duration: Unspecified

Documentation available at: https://whatismissing.net/info/about-us (Accessed: 4 January 2018).
http://www.brucedamonte.com/projects/listening-cone/ (Accessed: 4 January 2018).

What is Missing?: Sound Ring (2014)
Format: Sound sculpture
Duration: Unspecified
Documentation available at: https://whatismissing.net/info/about-us (Accessed: 4 January 2018).
https://www.allaboutbirds.org/maya-lin-unveils-newest-sculpture-in-her-last-memorial/ (Accessed: 4 January 2018).

Annea Lockwood
A Sound Map of the Hudson River (1982)
Format: Installation (stereo soundscape comprising twenty-six field recordings of the river; headphones featuring separate recorded interviews with people who work on the river; numbered map) / CD (fifteen field recordings of the river; numbered map)
Duration: 2hr (looped) (installation) / 1hr 11min 31sec (CD)
Available on: Lockwood, A. (1989) *A Sound Map of the Hudson River* [CD]. New York, NY: Lovely Music.

Francesco López
La Selva (1998)
Format: Field recording
Duration: 1hr 10min 49sec
Available on: López, F. (1998) *La Selva* [CD]. Rotterdam: V2_Archief.

Sally Ann McIntyre
Collected Silences for Lord Rothschild (2012)
Format: Field recording (recordings of extinct bird silences collected from The Museum of New Zealand, Te Papa Tongarewa)
Duration: Unspecified
Documentation available at: http://radiocegeste.blogspot.co.uk/2013/07/collected-silences-for-lord-rothschild.html (Accessed: 4 January 2018)

Huia Transcriptions (2012)
Format: Field recording (recording of site-specific performance on hand-cranked music box with paper strips punched with renditions of the calls of the extinct huia bird)

Duration: Unspecified
Documentation available at: http://everyleafisanear.blogspot.co.uk/2012/04/huia-transcriptions.html (Accessed: 4 January 2018).

Collected Huia Notations (like shells on the shore when the sea of living memory has receded) (2015)
Format: Installation (wax cylinders cut with piano renditions of transcriptions of the extinct huia bird, Edison Gem phonograph)
Duration: Unspecified
Documentation available at: http://radiocegeste.blogspot.co.uk/2015/02/collected-huia-notations-like-shells-on.html (Accessed: 4 January 2018).

David Monacchi
Fragments of Extinction (2002-present)
Format: Installation / performance (field recording, live electronics, spectrogram visualisation)
Duration: Unspecified
Field recordings available on: Monacchi, D. (2007) *Prima Amazonia: Portraits of Acoustic Biodiversity* [CD]. Glen Ellen, CA: Wild Sanctuary.
Compositions available on: Monacchi, D. (2008) *Eco-Acoustic Compositions* [CD]. New York, NY: EMF / Albany, NM: EarthEar.
Documentation available at: http://www.fragmentsofextinction.org (Accessed: 3 January 2018).

Robert Morris
Box with the Sound of its Own Making (1961)
Format: Sound sculpture (9¾ inch square walnut wood box, speaker, tape recorder)
Duration: 3hr 30min (looped)
Video documentation available at: https://www.youtube.com/watch?v=_nrTxgLaXTQ (Accessed: 2 January 2018).

Graciela Muñoz
El Sonido Recobrado (2014)
Format: Installation (twenty-eight speakers set in the dry river bed of the Petorca, Chile)
Duration: Unspecified
Documentation available at: http://laboratoriodeartesonoro.cl/lab/esr (Accessed: 3 January 2018).

Adrian Newton

Heartwood (2014)

Format: Installation / performance (tree audification using contact microphones, ultrasound detectors and sensors)

Duration: Unspecified

Documentation available at: http://eartotheearth.org/2016/11/adrian-newton/ (Accessed: 3 January 2018).

Remixes of sound recordings from installation available on: Nemeton (2015) *Cyniver*. Available at: http://archive.org/details/nocti28 (Downloaded: 4 April 2017).

Mikel R. Nieto

Dark Sound (2016)

Format: Field recording / book

Duration: 1hr 4min 53sec

Available on: Nieto, M.R. (2016) *Dark Sound* [CD / book]. Frankfurt: Gruenrekorder.

Holly Owen and Kristina Pulejkova

Switching Heads: Sound Mapping the Arctic (2015)

Format: Video

Duration: 13min 23sec

Available at: http://vimeo.com/148020348?utm_source=email&utm_medium=vimeo-cliptranscode-201504&utm_campaign=29220 (Accessed: 3 January 2018).

Documentation available at: http://www.switching-heads.com (Accessed: 3 January 2018).

Katie Paterson

Vatnajökull (the sound of) (2007)

Format: Installation (neon sign displaying phone number linked to hydrophone in Jökulsárlón lagoon)

Duration: Unspecified

Documentation available at: http://katiepaterson.org/portfolio/vatnajokull-the-sound-of/ (Accessed: 2 January 2018).

Langjökull, Snæfellsjökull, Solheimajökull (2007)

Format: Installation (looped video documentation of glacial ice records playing)

Duration: Unspecified

Documentation available at: http://katiepaterson.org/portfolio/langjokull-snaefellsjokull-solheimajokull/ (Accessed: 2 January 2018).

Sarah Peebles

Resonating Bodies (2008-present)

Format: Ongoing collaborative project with multiple outcomes (including multimedia installations, community outreach projects and educational initiatives)

Duration: Various

Documentation available at: https://resonatingbodies.wordpress.com (Accessed: 4 January 2018).

Susan Phillipsz

Lowlands (2010)

Format: Three-channel sound installation

Duration: 8min 30sec (looped)

Video documentation available at: https://www.youtube.com/watch?v=UWeKzTDi-OA (Accessed: 2 January 2018).

Andrea Polli

Heat and the Heartbeat of the City (2004)

Format: Interactive website (sonification of projected temperature increases in Central Park due to global warming)

Duration: Unspecified

Available at: http://archive.turbulence.org/works/heat (Accessed: 3 January 2018).

Airlight (2006-7)

Format: Installation (sonification of air pollution in three different cities)

Duration: Unspecified

Documentation available at: https://web.archive.org/web/20130515112756/http://www.andreapolli.com/airlight/ (Accessed: 3 January 2018).

Sonic Antarctica (2009)

Format: Field recording / sonification of Antarctic climate data / climate scientist interviews

Duration: 1hr 9min 4sec

Available on: Polli, A. (2009) *Sonic Antarctica* [CD]. Frankfurt: Gruenrekorder.

Douglas Quin

Forests: A Book of Hours (1999)

Format: Soundscape composition

Duration: 55min 35sec

Available on: Quin, D. (1999) *Forests: A Book of Hours* [CD]. Santa Fe, NM: EarthEar.

FATHOM (2010)
Format: Field recording
Duration: 42min 33sec
Available on: Quin, D. (2010) *FATHOM* [vinyl]. Minneapolis, MN: Taiga.

Philip Samartzis
Antarctica: An Absent Presence (2014/16)
Format: Soundscape composition / book
Duration: 56min
Available on: Samartzis, P. (2016) *Antarctica: An Absent Presence* [CD / book]. Melbourne: Thames and Hudson Australia.
Original radio work available at: http://www.abc.net.au/radionational/programs/soundproof/antarctica-an-absent-presence/5930156 (Accessed: 3 January 2018).

Softday
Nobody Leaves till the Daphnia Sing (2009)
Format: Performance (live sonification of the activity of *daphnia magna* water fleas, instrumental ensemble performing a score generated from contaminated water supply data)
Duration: Unspecified
Documentation available at: http://www.softday.ie/nlutds/ (Accessed: 2 January 2018).
Video documentation available at: https://vimeo.com/4357140 (Accessed: 2 January 2018).

Marbh Chrios (Dead Zone) (2010)
Format: Performance (live sonification of ecological data from oceanic 'dead zones', instrumental ensemble performing a score generated from marine and environmental data)
Duration: Unspecified
Documentation available at: http://www.softday.ie/deadzones/ (Accessed: 2 January 2018).
Video documentation available at: https://vimeo.com/20871829 (Accessed: 2 January 2018).

Amhrán na mBeach (Song of the Bees) (2014)
Format: Performance (8-channel recordings of bees inside a hive, electroacoustic transformations of the sounds, instrumental ensemble performing a score based on scales which are 'in tune' with the bees)
Duration: Unspecified
Documentation available at: https://softday.ie/bees/ (Accessed: 2 January 2018).
Video documentation available at: https://vimeo.com/81992373 (Accessed: 2 January 2018).

David Tudor

Rainforest IV (1973)

Format: Installation (performers and various amplified materials)

Duration: Unspecified

Available on: Tudor, D. (1998) *Rainforest* [CD]. New York, NY: Mode.

Tudor, D. (2013) *The Art of David Tudor 1963-1992* [CD]. New York, NY: New World Records.

Edgard Varèse

Poème Électronique (1957-8)

Format: Electronic composition

Duration: 8min (looped in original installation)

Available on: Varèse, E. (1998) *Varèse: The Complete Works* [CD]. Royal Concertgebouw Orchestra and Asko Ensemble, conducted by Riccardo Chailly. London: Decca.

Craig Vear

Antarctica: Musical Images from the Frozen Continent (2005)

Format: Soundscape composition / book

Duration: 26min 14sec

Available on: Vear, C. (2005) *Antarctica: Musical Images from the Frozen Continent* [DVD / CD / book]. Anthony Craig Vear.

Sebastián Verea

Sounds of the Anthropocene (2017)

Format: Installation (interactive map with sonification of markers of the Anthropocene)

Duration: Unspecified

Documentation available at: http://theanthropoceneproject.net (Accessed: 4 January 2018).

Chris Watson

Vatnajökull (2003)

Format: Field recording

Duration: 18min

Available on: Watson, C. (2003) *Weather Report* [CD]. London: Touch.

Hildegard Westerkamp

Kits Beach Soundwalk (1989)

Format: Soundscape composition

Duration: 9min 42sec

Available on: Westerkamp, H. (1996) *Transformations* [CD]. Montreal, QC: Empreintes DIGITALes.

Beneath the Forest Floor (1992)
Format: Soundscape composition
Duration: 17min 23sec
Available on: Westerkamp, H. (1996) *Transformations* [CD]. Montreal, QC: Empreintes DIGITALes.

Jana Winderen
+4°C (2007)
Format: Soundscape composition
Duration: 4min 48sec
Available on: Various Artists (2009) *Sleppet* [CD]. Bergen: +3dB.

Evaporation (2009)
Format: Soundscape composition
Duration: 18min 22sec
Available at: http://janawinderen.bandcamp.com/album/evaporation (Downloaded: 22 February 2016).

Energy Field (2010)
Format: Soundscape composition
Duration: 50min 15sec
Available on: Winderen, J. (2010) *Energy Field* [CD]. London: Touch.

Silencing the Reefs (2011-14)
Format: Project with multiple outcomes (including field recordings, compositions, concerts, installations and workshops)
Duration: Various
Documentation available at: https://www.tba21.org/#item--belize--571 (Accessed: 3 January 2018).
http://www.janawinderen.com/fieldtrips/ (Accessed: 3 January 2018).

Christian Woolf
Stones (1969) / *Sticks* (1971)
Format: Text scores for performers with stones / sticks
Duration: Unspecified

Scores available in: Wolff, C. (undated) *Prose Collection*. Lebanon, NH: Frog Peak Music. Available at: http://www.frogpeak.org/unbound/wolff/wolff_prose_collection.pdf (Accessed: 29 November 2016).
Recordings available on: Woolf, C. (1996) *Stones* [CD]. Wandelweiser Komponisten Ensemble. Berlin: Edition Wandelweiser Records.
Woolf, C. (2007) *Stones* and *Sticks*. Seattle Improv Meeting. Available at: http://www.spiralcage.com/improvMeeting/Recordings.html (Accessed: 2 January 2018).

Caroline Wright
Breath Control: Sounding Scape (2017)
Format: Installation (vocalised notes combined with information about respiratory health)
Duration: Unspecified
Documentation available at: http://www.carolinewright.com/portfolio/breath-control/ (Accessed: 4 January 2018).

James Wyness
If We Do Nothing (2017-present)
Format: Installation (sonifications of climate change data)
Duration: Unspecified
Documentation available at: https://artistsandclimatechange.com/2018/02/01/if-we-do-nothing/ (Accessed: 14 March 2018).

Various
Suspended Sounds (2006)
Format: Installation (8-channel sound works composed from the sounds of extinct and endangered species)
Duration: Unspecified
Documentation available at: https://eartotheearth.org/2015/01/suspended-sounds/ (Accessed: 4 January 2018).

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——— (2012) 'Ecomusicology: Music, Culture, Nature…and Change in Environmental Studies?', *Journal of Environmental Studies and Sciences*, 2(2), pp. 192-201.

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Allen, A.S. and Dawe, K. (eds.) (2016) *Current Directions in Ecomusicology: Music, Culture, Nature*. Abingdon: Routledge.

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Bandt, R., Duffy, M., and MacKinnon, D. (eds.) (2007) *Hearing Places: Sound, Place, Time and Culture*. Newcastle upon Tyne: Cambridge Scholars Publishing.

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——— (2014) *Sonic Ecologies: Environmental Electroacoustic Music Composition in Cultural Immersion*. PhD Thesis. Griffith University. Available at: http://www120.secure.griffith.edu.au/rch/items/78a39e69-9039-4a61-bb89-2fb716f3f2cc/1/ (Accessed: 14 August 2017).

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Bate, J. (1991) *Romantic Ecology: Wordsworth and the Environmental Tradition*. Abingdon: Routledge.

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