

# Promoting Environmental Awareness through Context-based Composition

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**Cheryl E. Leonard is a San Francisco-based composer, performer and instrument maker who utilises sounds from natural objects and field recordings to create innovative compositions that are aesthetically appealing and also promote environmental awareness. This article examines Leonard's work *Antarctica: Music from the Ice* (2009–2014), which comprises ten context-based pieces created from sounds produced with natural objects (such as penguin bones, rocks and shells) and field recordings the composer collected during her visit to Antarctica in 2008–9. In particular, the article focuses on the pieces *Lullaby for E Seals*, *White on White*, *Greater than 20 Knots* and *Ablation Zone*, showing how Leonard draws attention to pertinent environmental issues through her work, while at the same time producing compositions that are aurally pleasing and engaging for performers and listeners alike.**

## 1. INTRODUCTION

Despite the tendency in recent decades for soundscape composition to move 'towards a more abstracted approach, one that leads to the creation of virtual soundscapes', as noted by Truax (2012: 200), the past few years have nevertheless witnessed an increase in the number of works produced in connection with real-world experiences and that address pertinent issues affecting the environment (Allen 2013: 418). For example, Hildegard Westerkamp's *At the Edge of Wilderness* (2000), Annea Lockwood's *A Sound Map of the Danube* (2005), Leah Barclay's *Sound Mirrors* (2009–11) and Matthew Burtner's *Iceprints* (2010) and EcoSono projects have all resulted from a focus on deep, in-place listening and a dedication to raising environmental awareness. For these composers, as well as many others, in-person engagement and collaboration with the environment are integral aspects of the compositional process (Westerkamp 2002; Burtner 2011; Nagai 2011; Barclay 2016), influencing the shape and sound of their works and helping to intensify relationships between composer, place, composition and listener.

Context-based works have considerable potential to communicate with listeners, especially if the composer has engaged with the real-world environment of the work at a deep level and has given careful consideration to matters of representation and interpretation

(Truax 2012: 200). Such works can even help to inform listeners about places they have never experienced (and are unlikely to ever visit) first-hand, by enabling them to hear sounds that are unique to those locations from vantage points that are geographically distant from the original sources. Moving beyond merely providing 'sonic tourism' (Drever 2002: 21), the artistic mediation of remote sonic environments can help listeners to form meaningful connections with foreign places, enhance their knowledge of such places and encourage them to engage with the world in new ways. This work is particularly valuable when it comes to places that are difficult to access physically and/or under threat due to environmental change, such as Antarctica. In the case of inaccessible and vulnerable environments, soundscape compositions can help to shape 'public conception of "unknowable" spaces that are beyond the reach and view of the average person' (Kolb and Needham 2014: 7) and can inspire 'appreciation, management and conservation of the organisms and resources that create them' (Pijanowski et al. 2011: 1227).

According to Truax (2001: 237, 240), an effective soundscape composition is one that 'has the effect of changing the listener's awareness and attitudes towards the soundscape, and thereby changing the listener's relationship to it' and usually results from social and political aims, as well as artistic ones. Similarly, Norman (2012: 266) writes, 'environmental art is effective, and affective, if it changes our relationship to the world and makes us more aware of our "connectedness" to that world – and its places – in a sustained and fundamental sense'. The success of a context-based composition largely depends, however, on the listener's 'understanding and interpretation' (Truax 2012: 195) of a sonic environment, and this is itself dependent upon the composer's knowledge of the environmental context and their skill in invoking the listener's knowledge of that context (Truax 2001: 237; Westerkamp 2002: 56; Truax 2013). This can potentially present difficulties to both composer and listener when the 'context' of a soundscape composition is a place that is at the margins of our world and relatively inhospitable to humans, like Antarctica.

In spite of the logistical challenges associated with visiting the southernmost continent, increasing

numbers of established composers are now travelling there (especially through government-sponsored Artists and Writers programmes) and creating Antarctic-based soundscape compositions. For example, Craig Vear, Ian Tamblyn, Andrea Polli, Douglas Quin, Jay Needham, Lawrence English and Philip Samartzis, among others, have visited the far south and created sonic artworks inspired by their experiences there (Philpott 2016). The most successful Antarctic-based soundscape compositions appear to be those from composers who have visited the continent in person, sought to engage deeply with the place by listening to the unique sounds of the environment, and then aimed to capture their experiences in their works. Some have also actively engaged with scientific research being undertaken in the region, particularly in relation to climate change, and then responded to such matters in their creative work.

Antarctica is a particularly relevant site for composers of context-based compositions who are keen to promote environmental sustainability and protection, given that the continent is at the centre of many of the pressing contemporary environment-related issues facing our world, especially climate change. The work of composers in this space is also very timely given there is now wide recognition of the importance of considering Antarctica from a variety of perspectives in order to broaden our knowledge of its scientific, cultural, historical, social and political meanings (Leane 2011; Griffiths 2015). Furthermore, music, in all its myriad forms, has been singled out as ‘one of the most powerful mediums to communicate environmental messages to billions of people worldwide – irrespective of race, religion, income, gender or age’ (United Nations 2016), and therefore, there is great potential for composers of Antarctic-related compositions to make significant and lasting impacts upon diverse audiences in relation to environmental problems.

One of the leading contributors of Antarctic-based compositions is San Francisco-based composer, performer and instrument maker Cheryl E. Leonard, who has successfully combined aesthetics with environmental advocacy in her collection of pieces *Antarctica: Music from the Ice* (2009–14). Leonard travelled to Antarctica during 2008–9 to gain inspiration and collect materials (including natural objects such as penguin bones, rocks and shells, as well as field recordings) from the environment for her compositions. *Antarctica: Music from the Ice*, which is the focus of this article, explores aspects of the Antarctic environment under current scientific investigation within ten individual pieces that are aurally engaging and in which the sounds and contexts remain easily identifiable to the listener. This article focuses on four pieces from this collection in detail – two which represent species whose changing populations reflect

dramatic changes in the region’s ecosystems (the southern elephant seal and the Adélie penguin), and two that capture non-biological or ‘geophysical’ (Pijanowski et al. 2011: 1213) sounds from the environment (including a glacier melting and Antarctica’s wind) – in order to demonstrate Leonard’s approach to combining aesthetics and environmental issues within her context-based compositions. Excerpts from these works, in the form of sound examples, are included with the article as supplementary materials. Prior to discussing these pieces, however, it is necessary to begin with a brief overview of Leonard’s compositional work and connection to Antarctica in order to provide a backdrop for the examination of her Antarctic-based compositions.

## 2. CHERYL E. LEONARD, CONTEXT-BASED COMPOSITION AND ANTARCTICA

Leonard’s Antarctic-based pieces form part of a larger series of context-based compositions that she has been developing for more than a decade. Since 2003, she has dedicated herself to ‘investigating sounds, structures and materials from the natural world’ and then composing ‘musical works that explore and express wild realms and our human relationships to them’ (Leonard 2016a: 50). She has utilised natural materials, such as rocks, sticks, pinecones, sand and water, as musical instruments within various projects and has crafted innovative compositions designed for live performance with these instruments, some of which are played in combination with her field recordings.<sup>1</sup> Techniques she uses to extract sounds from solid objects include brushing, bowing, rubbing or tapping; blowing air through them; or setting the items in motion by spinning or wobbling them. Substances such as water, mud or sand are manipulated to produce sounds through the processes of stirring, draining, sifting, pouring, dripping or filtering them. According to Leonard (2016a: 50), such techniques ‘beget a spectrum of sounds, from clear, pitched tones to gritty, textural noises, and each specific item has its own unique voice’. She employs condenser, underwater and contact

<sup>1</sup>For example, her *Instruments in Trees* (2003) employs arboreal materials (e.g. sticks, leaves, needles, pinecones and bark) as sound sources in combination with an ‘upside-down’ string quartet (comprising two violoncellos, viola and violin) in pieces that explore cycles and processes related to trees; *Tides: Estuary* (a collaborative project with visual artist Rebecca Haseltine, first presented in 2009) utilises shells, mud, sand, rocks, kelp, water and salt as musical instruments in compositions that explore aspects of tidal flows in estuaries; and *Adfreeze Project* (a collaboration with visual artist Oona Stern) incorporates sounds from natural materials such as rocks, shells and ice with field recordings in multidisciplinary art works that engage with the region around Svalbard (a remote archipelago in the Arctic Ocean above Norway) and issues related to climate change. More information about Leonard’s projects is available on her website: [www.allwaynorth.com](http://www.allwaynorth.com) (accessed 2 May 2016).

microphones in order to capture very quiet sounds, and in most of her pieces, the instruments and their sounds are not manipulated electronically, other than through amplification. Likewise, the field recordings she incorporates into her pieces are shaped only minimally through editing and layering. According to the composer, the sonorities she is able to capture in her field recordings and create with the natural objects are ‘so rich and unique “as is” that they give [her] plenty to work with on their own’ (Leonard 2015a: 50).

While Leonard has recorded her compositions for commercial release, most are designed for live performance by one or more musicians, and for this reason, she has developed her own system of notation that combines graphics with textual instructions. Extracts from her scores are included in the detailed discussion of her pieces below.

Leonard’s compositional approach and processes are largely shaped by the objects and field recordings she has chosen to use within a given piece, as well as the environmental context from which they were collected. She writes:

I prefer to develop compositions out of timbres, melodic fragments, and/or rhythms inherent in the original sonic materials ... Once I find a lexicon of intriguing sounds I shape them into musical forms that embody or demonstrate a specific theme. This might be reflected in a piece’s instrumentation, playing techniques, melodic and rhythmic content, organizational structures, and/or process of creation. Many of my projects touch on or are directly inspired by environmental issues like climate change. (Leonard 2016a: 50–1)

The environmental themes of the pieces are apparent within their titles as well as their sonic properties.<sup>2</sup> While environmental advocacy is important to Leonard, her primary concern is for the way her pieces *sound*, as she has recently stated:

I strive foremost to create works that are sonically engaging whether or not listeners are aware of the extra-musical issues behind them. That said, I believe sound and music can be uniquely effective in forging intimate and visceral connections with audiences and actually elicit changes in thought and behavior. I try not to hit people over the head with issues I care about ... I prefer a more subtle approach that includes sharing my personal experiences of nature within the music itself ... In making music with natural materials I hope to inspire others to hear the world in new ways, find music in unexpected places, and to consider the human relationship within the natural world. (Leonard 2016a: 51)

Leonard’s deep interest in ‘remote, wild places’ and ‘special fondness for snow and ice’ (Leonard 2016d) began during her childhood in rural Wisconsin, and

<sup>2</sup>Additionally, Leonard has written about her compositional practices and the impetus for many of her works in book chapters and on her extensive website, and has given many media interviews. Several of Leonard’s publications are included in the list of references provided with this article.



**Figure 1.** Leonard making field recordings inside a crevasse in Antarctica in 2009. Photograph by Oona Stern, used with permission.

intensified after attending college, when she became an avid hiker and mountaineer. She writes, ‘along the way I discovered I was utterly fascinated by glaciers, these elemental forces that shaped vast landscapes seemed alive, and were full of hidden beauties and dangers. For me, Antarctica represents the Holy Grail of remote, snowy, icy wilderness ... of course I wanted to go there!’ (ibid.).

Leonard travelled to Antarctica during the 2008–9 austral summer, as part of the Antarctic Artists and Writers Program run by the United States’ National Science Foundation, to develop a series of compositions inspired by the unique environments and ecosystems of the Antarctic Peninsula (Leonard 2015b: 139). She spent five weeks at the United States-operated Palmer Station on Anvers Island, the largest island in the Palmer Archipelago, situated off the north-west coast of the Antarctic Peninsula. During her residency on this mountainous island, Leonard made numerous field recordings of biological and non-biological (or ‘geophysical’) sounds, including from Adélie penguins, southern elephant seals, icebergs, glaciers, wind and blizzards (Figure 1).<sup>3</sup> She also improvised musically with stones and ice ‘in situ’ (Leonard 2016b), and with permission from the

<sup>3</sup>Some of Leonard’s soundscape recordings from Antarctica are available on the compact disc *Chattermarks* (Great Hoary Marmot Music, see Leonard 2010 in Discography).



**Figure 2.** Musical instruments made by Leonard from natural objects collected in Antarctica: 'Bone Slug' (front left), 'Octobones' (front centre), 'Keel' (front right), 'Coracoids' (middle left), 'Skull' (middle right), 'Limpet Shell Spine' (back centre) and 'Vertebrae Mobile' (hanging at back left). Photograph by Cheryl E. Leonard, 2011, used with permission.

National Science Foundation, she collected a small number of rocks, penguin bones and limpet shells to take back to the United States for use in her compositions and live performances (Leonard 2015b: 143).

Once back in the United States, Leonard used the natural objects to create a set of musical instruments; she retained some of the stones, bones and shells as unaltered objects (Leonard 2016b), while others she mounted on driftwood to form unique sculptural instruments (Figure 2). She then experimented with different ways of playing the objects – bowing, scraping and tapping them until she uncovered distinctive and desirable 'voices and textures', including sounds that for Leonard (2015b: 145), 'evoked elements of Antarctica'. She then created a series of compositions under the collective title *Antarctica: Music from the Ice* by combining sounds from her natural-object instruments with her Antarctic field recordings.

### 3. ANTARCTICA: MUSIC FROM THE ICE (2009–2014)

Each of the ten pieces in Leonard's *Antarctica: Music from the Ice* is based on a theme relating to the environment surrounding Palmer Station and connects with scientific research currently being undertaken in the region (ibid.: 139, 146). The theme of each piece is evident in its title (see Table 1), and in Leonard's words, 'is embodied in its instrumentation, the manner in which the objects are played, melodic and rhythmic content, and musical structures' (Leonard 2016b). Most of the pieces relate to environmental changes in the Antarctic Peninsula region and highlight the impact of these changes upon the local wildlife, wind and precipitation patterns, glaciers and sea ice. Some

of the pieces also provide reflections on human exploration and exploitation in Antarctica, drawing attention to broader environmental problems, such as anthropogenic influences on climate change.

The unique wildlife of Antarctica features particularly prominently in the collection. Three of the pieces centre on species whose populations are in flux (*Lullaby for E Seals* focuses on the southern elephant seal; and *Rookerie* and *White on White* are both about Adélie penguins), while the seven remaining pieces also feature objects derived from various biological species (such as Adélie penguin bones, and shells from clams and limpets) within their instrumentation – objects that contribute directly to the unique sound profile of the individual pieces. Of the seven remaining pieces, three emphasise themes relating to Antarctic wind patterns and the structure and circulation of the Southern Ocean (*Greater than 20 Knots*, *Oceanus Meridiam* and *Fluxes*), and the other four (*Brash Ice*, *Point Eight Ice*, *Ablation Zone* and *Meltwater*<sup>4</sup>) all concentrate on ice, albeit in different forms (such as melting glaciers, icebergs, drifting brash ice and so-called 'bergy bits') and from both above and below the water. As this brief overview of the collection suggests, all the pieces are intimately located to place, and the real-world contexts that have prompted these works have informed the design, composition and resulting sound of the pieces. The experiential aspect of Leonard's field work in Antarctica has, therefore, been essential to her composition of the pieces. Ultimately, through this collection, Leonard aims to 'share a little bit of Antarctica, especially with people who cannot visit the continent themselves ... [and to help] people feel a meaningful connection to Antarctica' (Leonard 2015b: 148).

While there is insufficient space within this article to discuss all ten pieces in detail, four representative examples have been selected for examination here: *Lullaby for E Seals*, *White on White*, *Greater than 20 Knots* and *Ablation Zone*. These four highlight the range of different environmental subjects that Leonard has responded to in her works, and capture the diversity of the instruments she employs, as well as her innovative approaches to composing and performing the pieces. As the following discussion will reveal, through her work Leonard is able to build upon the listener's contextual knowledge of Antarctica and extend it by educating her audiences about pressing environmental concerns affecting the region and the impact that these issues are having on a global scale.

#### 3.1. *Lullaby for E Seals* (2009)

*Lullaby for E Seals* was the first piece Leonard composed after returning home from Antarctica in 2009. She describes it as 'a love song for Antarctica featuring

<sup>4</sup>For a detailed discussion of *Meltwater*, see Leonard (2016a).

**Table 1.** Pieces within Cheryl E. Leonard's *Antarctica: Music from the Ice* (2009-2014), listed in order of composition and with instrumentation<sup>5</sup>.

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| <b><i>Lullaby for E Seals</i></b> (2009) for three players on kelp flutes, Antarctic limpet shells, and wobbly rock, with field recordings of southern elephant seals napping on Amsler Island.                          |
| <b><i>Brash Ice</i></b> (2009) for three players on ice, glass, stones and Adélie penguin bones, with field recordings of bergy bits.  |
| <b><i>Rookerie</i></b> (2010) for four players on kelp horns, stones, Antarctic limpet shells and Adélie penguin bones, with field recordings of Adélie penguins.  |
| <b><i>Greater than 20 Knots</i></b> (2011) for three players on Adélie penguin bones, sea salt, stones, and Antarctic limpet shells, with field recordings of Antarctic wind.  |
| <b><i>Point Eight Ice</i></b> (2011) for two players on Adélie penguin bones and Antarctic limpet shells, with field recordings of bergy bits.   |
| <b><i>White on White</i></b> (2012) for three players on Adélie penguin bones, stone slabs, sea salt and Antarctic limpet shells.  |
| <b><i>Ablation Zone</i></b> (2013) for one player on Adélie penguin vertebrae and nesting stones, with field recordings of the Marr Ice Piedmont and icebergs.   |
| <b><i>Meltwater</i></b> (2013) for two players on icicles, scientific glassware, stone slabs, feather quills and Adélie penguin bones, with field recordings of the Marr Ice Piedmont.                                   |
| <b><i>Oceanus Meridiem</i></b> (2013) for two players on sand, sea salt, feather, limpet shell, stones, and kelpinets (kelp played with saxophone mouthpieces), with field recordings of bergy bits and Adélie penguins. |
| <b><i>Fluxes</i></b> (2014) for two players on sand, stones and clam shells, with field recordings of ocean waves and bergy bits.  |

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snoring elephant seals and kelp flute' (Leonard 2016c). 'E Seals' is a term used by residents of Palmer Station to refer to southern elephant seals, which are the largest pinnipeds in the world, with males weighing up to 3,700 kilograms and capable of diving to depths greater than 1,500 metres (Hindell 2002: 370, 373). Although populations of southern elephant seals have been declining on several sub-Antarctic islands due to climatic and oceanographic change, among other factors (Australian Government Department of the Environment 2016), the opposite phenomenon has been observed in relation to the populations near Palmer Station. In recent years, the numbers of southern elephant seals close to Palmer Station have been steadily increasing, and this is an indicator of how the marine ecosystem of the Western Antarctic Peninsula has been shifting as sea ice in the region declines (Ducklow et al. 2012: 147; Pyper 2014).

Leonard encountered southern elephant seals regularly during boating excursions she undertook to a sheltered cove on Amsler Island, not far from Palmer Station. She had been eager to record the seals' vocalisations; however, during most of her visits to the island, she found them 'piled up along the granite shoreline, fast asleep' (Leonard 2016e) (see Figure 3). She recalls, 'I was able to get marvellously close to the slumbering seals and record their loud, lumbering snores and deep, resonant breaths, but these were not the sounds I was looking for' (ibid.). She eventually decided to camp overnight on Amsler Island, and it was then that she was able to capture the full range of the seals' calls. Although she was delighted with the resulting recordings, when she listened to them back at home, she realised that she felt a stronger connection to



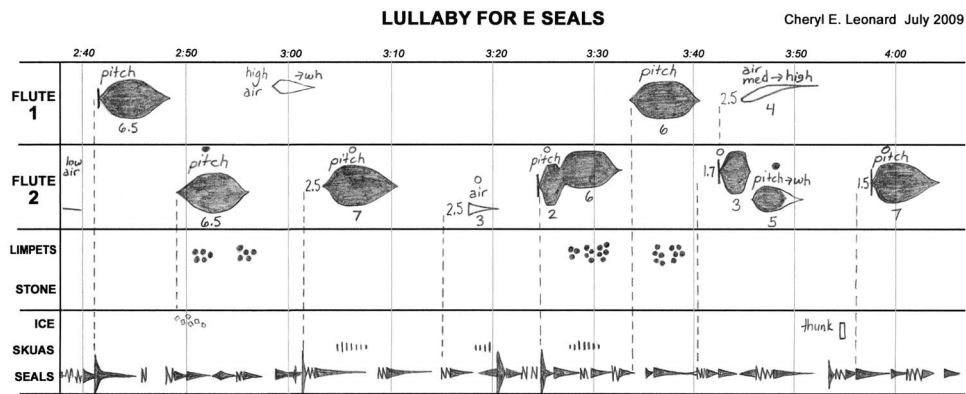
**Figure 3.** Southern elephant seals on Amsler Island, Antarctica. Photograph by Cheryl E. Leonard, 2009, used with permission.

the sounds of the seals sleeping, rather than their raucous calls. In her programme notes for the piece, she reflects:

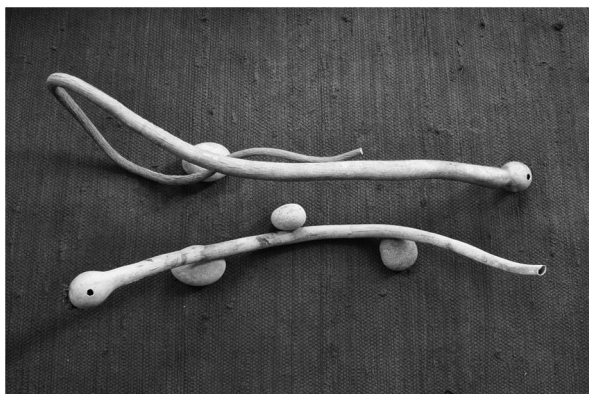
After returning home, I realized I felt much more connected to the sounds of the sleeping E Seals. I suppose this is only natural, having spent so much time up close with these slumbering giants listening intently to their intimate respirations. So when it came time to start composing my music from Antarctica I began with the E Seals, inserting myself via kelp flute into the rhythmic cycles of their breaths. (Ibid.)

In addition to incorporating the sounds of seals breathing, the field recording sounds heard in *Lullaby for E Seals* include seal sneezes and snorts, as well as the calls of south polar skuas (large scavenger birds similar to gulls), and sounds created by small chunks of ice falling and a glacier calving in the distance, which bears a close sonic resemblance to thunder (Sound example 1).

<sup>5</sup>Leonard is planning to release eight of these ten pieces on compact disc and in digital format in the near future.



**Figure 4.** Excerpt from the score of *Lullaby for E Seals*. Supplied by the composer, used with permission.



**Figure 5.** Kelp flutes. Photograph by Cheryl E. Leonard, 2016, used with permission.

These sounds are represented in Leonard's score for the piece, which features the time in seconds written across the top of each system, with each instrumental part notated graphically below in horizontal rows and the field recording part at the bottom (see Figure 4). The instrumentation includes two flutes ('Flute 1' and 'Flute 2') made from dried bull whip kelp (see Figure 5), as well as Antarctic limpet shells and an egg-shaped granite rock set on a piece of driftwood. The kelp flutes are played like transverse flutes. The flute players are instructed to produce long notes and each tone is represented on the score with a shape: the height of the shape indicates how loud each part of the tone should be played (the thicker the shape, the louder the volume); the relative pitch of each tone is shown by the vertical placement of each shape within the row; and the number underneath indicates the duration (in seconds) of the tone. Most of the notes played by the kelp flutes fade in and out, imitating the sonic shape of a natural breath. In contrast, the limpet shells are laid out close together with the concave side up and are played by the third performer with another limpet shell suspended on a string, creating gentle clinking sonorities that are reminiscent of the sound of floating brash ice. The rock

(labelled 'stone' in the score) is played by the same performer by pushing it gently, so that it wobbles back and forth on the driftwood, generating low-pitched rhythms that bear a striking resemblance to the sounds of a glacier calving. These rhythms are amplified by the use of an underwater microphone attached to the driftwood.

By combining her field recordings of Antarctic wildlife and ice with sounds produced from natural objects from the region, Leonard has composed a piece that is entirely derived from and intrinsically connected to the context that inspired its creation. *Lullaby for E Seals* is a highly original piece that vividly evokes the soundscape Leonard experienced when visiting the sleeping southern elephant seals on Amsler Island. The piece provides a peaceful, meditative listening experience, and allows audiences to engage sonically with aspects of the Antarctic continent that they may otherwise never have an opportunity to encounter, potentially prompting deeper understanding of and wider appreciation for the environment it represents among listeners.

### 3.2. *White on White* (2012)

Composed in 2012, *White on White* is a reflection on the decline of Adélie penguin colonies in the northern part of the Western Antarctica Peninsula (Figure 6), a phenomenon that has attracted much scientific research in the area in recent years (Clucas et al. 2014; British Antarctic Survey 2015a). According to Leonard, the title of this piece refers to 'snow on penguin bones' (Leonard 2015a). It is the only piece in the set that does not feature field recordings; instead, it is scored for specific penguin bones and rocks that Leonard collected during her visit to Antarctica. The bones utilised in this piece include Adélie penguin coracoid bones (which are part of the bird's shoulder girdle), a skull and a keel (sternum/breastbone) (see Figure 2), while the rocks consist of small slabs – each capable of producing a different pitch – from Breaker



**Figure 6.** Adélie penguins in the snow on Torgersen Island. Photograph by Cheryl E. Leonard, 2009, used with permission.

Island, which is located off the south-west coast of Anvers Island.<sup>6</sup>

Although it does not employ field recordings, *White on White* is nevertheless closely linked to the place that inspired it through its instrumentation and sounds, as well as its extra-musical ideas. In this piece, the rock slabs are rubbed in circles at varying speeds and the coracoid and keel bones are bowed to produce ‘eerie, howling sounds’ (Leonard 2010), while sea salt is dropped on the penguin skull to represent the increased precipitation which is one factor contributing to the failure of local Adélie colonies (see Figure 7 and Sound example 2). Even more so than *Lullaby for E Seals*, *White on White* projects a strong sense of concern for the environment of the Antarctic Peninsula. Leonard (2016e) writes:

I envision *White on White* as being set several years in the future, after all the Adélie penguin rookeries on the islands around Palmer Station have expired. Instead of the raucous kazooing that once filled the air, among the piles of polished stones that comprise abandoned colony sites we hear only wind, snow, and the ghosts of Adélie vocalizations.

*White on White* can, therefore, be interpreted as a poignant elegy for the decline of Adélie penguins in this particular region. As the only piece in the collection that does not employ field recordings, the composition provides a clear example of how Leonard uses relevant natural-object instruments – in this case, objects drawn from abandoned Adélie penguin colony sites – to create sounds that are intimately connected to a specific part of Antarctica and a significant environmental problem

<sup>6</sup>Although *White on White* was originally designed so that all the sounds could be produced live by three performers, Leonard has also created a solo version for amplified Adélie penguin keel bone, accompanied by recordings of the other instrument parts, so that she can play the work in solo performances.

associated with that area. Through this engaging and affecting piece, she is able to raise awareness of the plight of Adélie penguins in this locale among audiences in a time of considerable environmental change.

### 3.3. *Greater than 20 Knots* (2011)

*Greater than 20 Knots* also employs penguin bones, among other natural objects from Antarctica, as instruments in order to create a strong nexus between the piece and its environmental context. The piece is ‘about the elemental force of Antarctic wind’ (Leonard 2016c), and the title refers to the fact that Leonard’s opportunities for exploring and recording outside were greatly restricted if wind speeds were in excess of 20 knots. She elaborates:

In Antarctica all my sound work was done outdoors, and thus my days were bound and defined by the weather ... Wind, more than any other factor, determined what could or could not be achieved each day ... when wind speeds exceeded twenty knots boating was not allowed. Above this threshold it became cold and unpleasant to stay outside for any extended period of time, and it was difficult or impossible to make good recordings of anything other than wind. (Leonard 2016e)

Leonard’s experience of the wind in Antarctica is not atypical: the intensity of wind in the region has been a recurring theme in the diaries of explorers since the earliest days of human activity in Antarctica, and the continent is now widely recognised as the windiest on earth (Wayman 2013: 19).<sup>7</sup> In fact, wind speeds in Antarctica have been shown to be on the increase in recent decades (Turner et al. 2005: 280, 289). This is having impacts upon the atmosphere and the spread of sea ice (British Antarctic Survey 2015b), as well as upon the rate of ice shelf melting along the coastline of East and West Antarctica, which in turn may accelerate global sea level rise (Spence et al. 2014).

Leonard, who is acutely aware of the influence of climate change on Antarctica’s atmospheric patterns (Leonard 2016e), has captured the essence of the continent’s changeable wind conditions in *Greater than 20 Knots* by combining her own field recordings of wind in Antarctica with wind-like sounds produced from natural objects she collected in the region. The notated score for the piece instructs three performers to play an assortment of Adélie penguin bones, Adélie penguin nesting stones, granite stones, sea salt and Antarctic limpet shells, layered over an accompaniment of field recordings of wind on Anvers Island (see excerpt in Figure 8). Her use of Adélie penguin bones and nesting stones, in particular, further emphasises the connection between the piece and climate change. Adélie penguins build their nests with stones, and due

<sup>7</sup>Antarctica is not only the windiest continent on earth, but also the coldest and driest of all continents, with the highest average elevation.

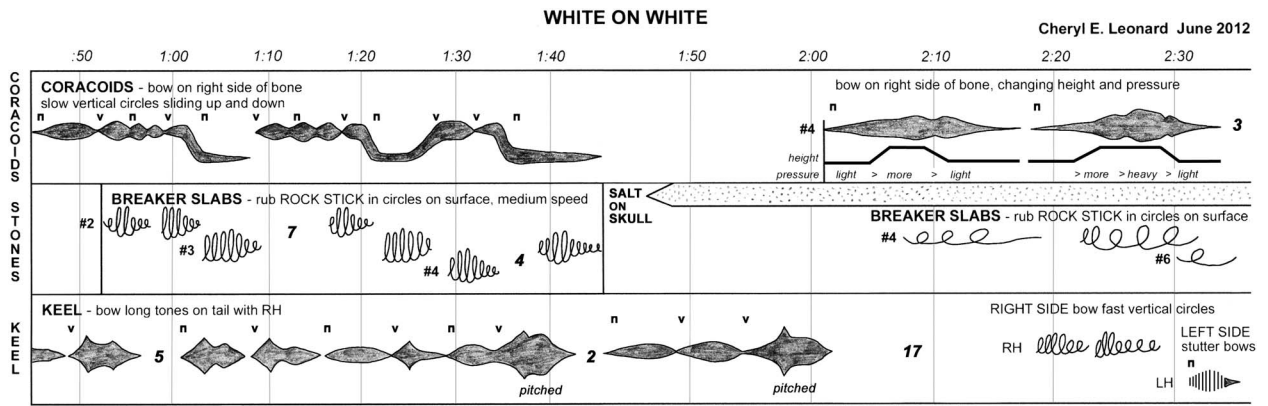


Figure 7. Excerpt from the score for *White on White*. Supplied by the composer, used with permission.

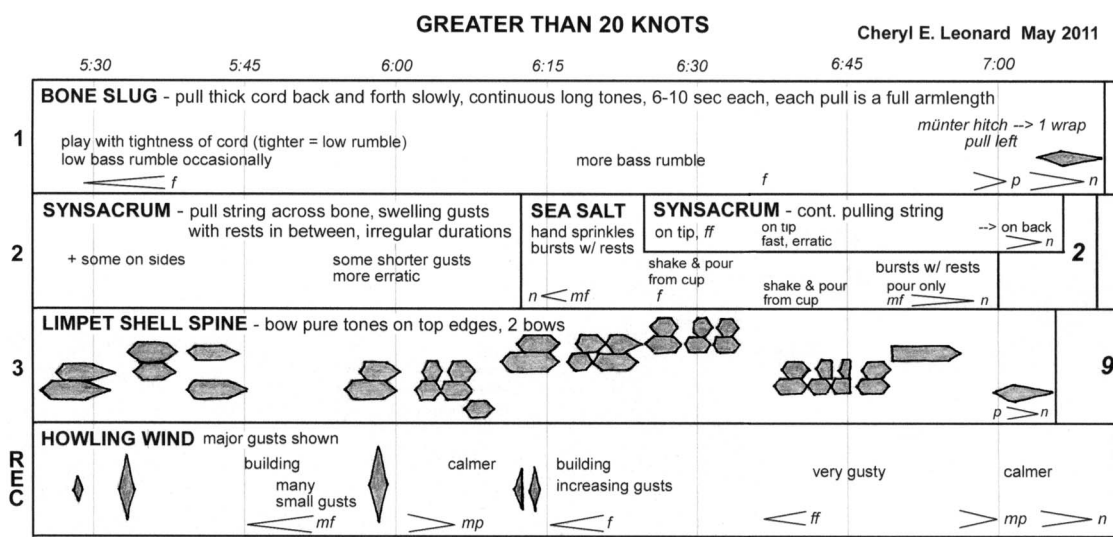


Figure 8. Excerpt from the score for *Greater than 20 Knots*. Supplied by the composer, used with permission.

to rising temperatures in the northern part of the Western Antarctic Peninsula, there has been an increase in snowfall, which has shortened the window of time in the summer months when Adélie penguins are able to safely raise their offspring in the region. This, combined with other environmental changes (such as a decline in sea ice and a related reduction in the penguin’s main food supply, Antarctic krill), has led to a radical decrease in the number and size of local colonies (Clucas et al. 2014). The nesting stones used in Leonard’s pieces are ones she collected from an abandoned nesting site on Torgersen Island, near Palmer Station, and they are ‘highly polished’ from ‘hundreds of years’ of prior use (Leonard 2015b: 127).

In *Greater than 20 Knots*, the field recording of the wind does not enter the texture until approximately half way through the piece. Instead, from the outset, sounds that closely imitate gusts of wind are produced by the performers alone, suggesting the prominent role of humans in influencing environmental change. One performer blows air through a hole on the top of an

instrument made from an Adélie penguin synsacrum, another bows the backs of Antarctic limpet shells (which have been mounted on driftwood to form an instrument named ‘Limpet Shell Spine’, see Figure 2) to produce ‘airy tones’, and the other drops sea salt into a bowl to evoke the sound of snow falling. Further into the piece, one of the performers rubs Adélie penguin nesting stones and other rocks together in circular motions, producing aural effects similar to those made by ‘high gusts of wind’ (Leonard 2015b: 128), while another plays an instrument constructed from Adélie penguin leg bones mounted on wood, known as the ‘Bone Slug’ (see Figure 2). This instrument is sometimes bowed in the piece, and alternatively, cords of different thicknesses are wrapped around one of the bones and pulled back and forth to produce long, continuous tones that ‘literally replicate the sound of the wind’ that Leonard heard in Antarctica (Leonard quoted in Haskoor 2015). Sound example 3, which is taken from the second half of the recorded composition, features the ‘Synsacrum’,



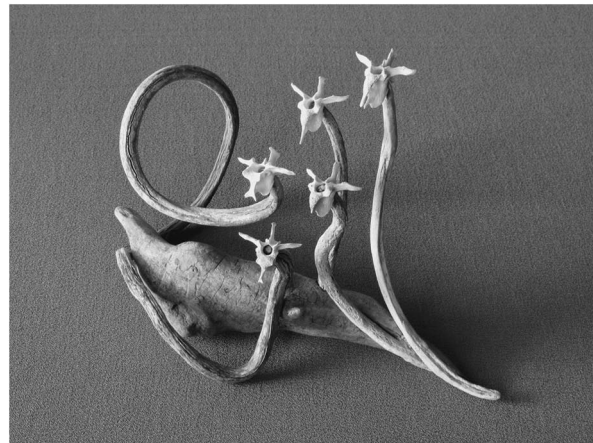
‘Limpet Shell Spine’, ‘Bone Slug’ and sea salt, layered upon a field recording of howling Antarctic wind. Overall, the piece effectively translates Leonard’s experience of the intensity of the wind in Antarctica, and simultaneously engages the listener with pertinent issues affecting the continent in relation to climate change – specifically, changes to Antarctica’s storm patterns, and the decimation of Adélie penguin colonies on the northern part of the Western Antarctic Peninsula.

**3.4. Ablation Zone (2013)**

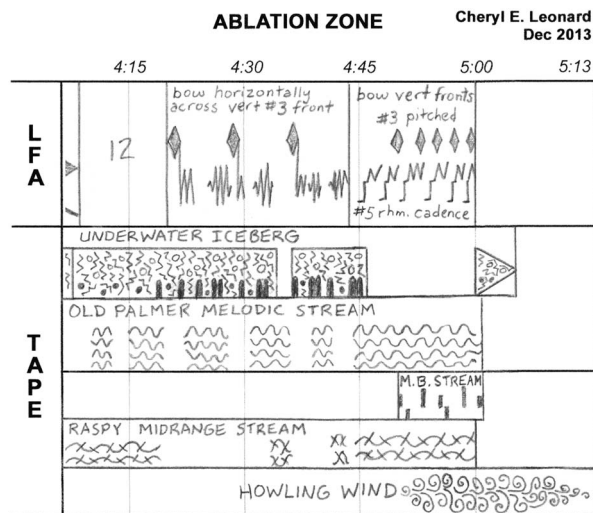
*Ablation Zone* also employs sounds produced with Adélie penguin bones and nesting stones; however, this time they are combined with field recordings of glacial meltwater streams and icebergs to create an entirely different aural impression of the far south. The ‘ablation zone’ is the area of a glacier (usually in the outer or lower part) where there is a net loss in ice mass due to factors such as melting, calving, evaporation, sublimation and wind scouring (Benn and Evans 1998: 5, 69). In creating this piece, Leonard utilised her own field recordings of the Marr Ice Piedmont, which covers roughly half of Anvers Island. Like most glaciers in the Antarctic Peninsula region, the Marr Ice Piedmont has retreated over the previous few decades due to environmental changes, including increasing air and water temperatures (Sobota, Kejna and Arazny 2015). During her visit, Leonard observed that the surface of the Piedmont was ‘fractured by exposed crevasses’ and its periphery was ‘collapsing into the sea’ – changes that are ‘dramatically transforming local landscapes and soundscapes’ (Leonard 2016e). In addition to witnessing ice calving off the waterfront edges of the Marr Ice Piedmont, she recorded small meltwater streams at its fringes, was able to explore parts of it on foot, and even had the opportunity to descend into two of its crevasses, in which she discovered ‘ornate azure caverns adorned with thousands of icicles’ (Leonard 2015b: 126). She later described some of the myriad sounds that she heard the Marr Ice Piedmont produce, many of which she was able to capture in her field recordings:

The Marr Ice Piedmont punctuated the soundscape with great booms and gunshots as it calved immense towers of ice into the sea. The remains of these demolitions disintegrated into snapping, popping icebergs and great swathes of clinking brash ice that were regularly washed out into the open ocean. Beneath the glacier’s dissolving walls water drips played gamelan-like melodies, and on the surface of the Marr small meltwater streams gurgled in cyclical rhythms or moaned and sang. (Ibid.: 123)

The field recordings that Leonard incorporated into *Ablation Zone* include sounds of meltwater streams, icebergs, water dripping from ice, and the wind – all of



**Figure 9.** ‘Last Flight of the Adélie’s’ instrument used in *Ablation Zone*. Photograph by Cheryl E. Leonard, 2013, used with permission.



**Figure 10.** Excerpt from the score for *Ablation Zone*. Supplied by the composer, used with permission.

which are related to ablation processes (and the loss of ice). These recordings are layered within the piece, and over the top of these sounds, Adélie penguin nesting stones are rubbed in circles to ‘create windy susurrations’, and then an instrument created with Adélie penguin vertebrae (called ‘Last Flight of the Adélie’s’ – see Figure 9) is bowed in various ways to ‘emit otherworldly moans and howls’ (Leonard 2016e) (see Figure 10 and Sound example 4).

Combined with the field recordings of the melting Marr Ice Piedmont, the sounds produced with the penguin bones and nesting stones are stark reminders of the effects that climate change (particularly warming in the Peninsula region) have had, and are continuing to have, upon Antarctica’s ecosystems. While the piece carries a clear message of environmental advocacy, it is also a rich listening experience that successfully captures Leonard’s personal encounters with the sound world of

the Marr Ice Piedmont, and allows others to engage with, and develop a deeper sense of connection to, this remote and icy wilderness.

#### 4. CONCLUSION

*Antarctica: Music from the Ice* is just one of Leonard's compositional projects that is closely tied to place and the environment, and each of the pieces within the set is a fine example of context-based composition. The individual pieces are novel and engaging, and have clearly been shaped by the composer's deep knowledge and first-hand experiences of the Antarctic environment. By combining sounds that ought to be familiar to the listener (such as those produced by ice, water and wind) with some that are heard less frequently (such as those created by species unique to the region), the works effectively invoke and then extend the listener's understanding of Antarctica, enabling deep engagement between the listener, the compositions and the sound sources. In other words, audiences are able to form meaningful connections to Antarctica through listening to these pieces, which is in line with the composer's initial aims for the collection (Leonard 2015b: 148).

Although Leonard's pieces do not exclusively contain sounds from field recordings of the environment, the 'real world' contexts of the pieces – that is, her experiences of Antarctica and her engagement with environmental issues affecting the region – have informed the design and composition of the works at every level. In most of the ten pieces, sounds from her minimally edited field recordings from Antarctica are heard in dialogue with sounds produced from natural objects she collected there. What is more, the natural objects and object-instruments are played in such ways as to create sounds or 'voices' that resemble the real-world sounds Leonard heard within Antarctica. This innovative approach expands upon the work of other professional composers, such as Frances White (e.g. in *Centre Bridge*, 1999) and Hildegard Westerkamp (e.g. in *At the Edge of Wilderness*), who have employed sounds of 'played' objects or traditional instruments in combination with recordings of found sounds to represent their *private experiences* of specific environments within their works (Westerkamp 2002: 54–5; Nagai 2011). Many of the qualities of Leonard's pieces also align with the principles of effective soundscape composition outlined by Truax (2001: 240), Westerkamp (2002: 52, 56) and Norman (2012: 266). Furthermore, Leonard's pieces are compelling examples of context-based compositions that combine musicality with messages of environmental advocacy. The environmental themes she has chosen to represent within her Antarctic pieces connect with pressing contemporary issues, and they have clearly informed every aspect of her approach to composing the pieces, from the choice

of field recordings and relevant natural objects, to the techniques she uses to play the objects and integrate the sounds within the compositions. Her methods could potentially serve as models for future composers wishing to create context-based compositions that also promote environmental awareness, although any collection and/or use of natural objects of course needs to be carried out with due regard to matters of ethics and sustainability.

Ultimately, Leonard's aim with these pieces is, in her own words, 'to try to make something beautiful that people can connect with viscerally or emotionally, that makes them feel something ... We already know we should be scared [about climate change] ... but it's not encouraging change ... we need to go for the heart, and that's where music and other art forms can be very effective' (Leonard quoted in Haskoor 2015). This view of the arts as an appropriate vehicle for raising awareness of climate change due to its capacity to provoke an emotional response is one that is held by many, and not just by those working in the field (e.g. Rehding 2011), as many scientists appear to share a similar perspective (Curtis, Reid and Ballard 2012). As prominent ecologist Mark Moffett has stated, 'Modern ecologists may have reached a limit on how effectively they can convey messages to the public, and they may now need to draw upon the emotional vibrancy offered by the arts' (Moffett quoted in Chadabe 2016: viii). The environmental themes within Leonard's pieces are fundamental to their conception and realisation and are translated to audiences in a powerful way; however, she does not intend for these ideas to overshadow the musicality of the compositions. To Leonard, aesthetic considerations are just as important as ethical ones, and have been vital in ensuring large audiences for the compositions.

Pieces from Leonard's *Antarctica: Music from the Ice* have been presented in the United States, Japan, France, New Zealand and Australia at a range of different venues, including concert halls, theatres, universities, museums, art galleries, private salons and radio stations, and she continues to perform them today. Her work is timely, and critically important in the broader context of significant global problems such as environmental change. Her focus on Antarctica, in particular, reaches right to the core of the current environmental crisis. At the same time, her Antarctic-based pieces enable listeners to simply hear the sounds of a place that they are unlikely to ever experience in person, encouraging them to think about and listen to the world in new ways.

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