Cryophonics: Re-Performing the Ice Songs of the Canadian Sub-Arctic

By Carmen Braden

In a context that has expanded to the global stage, the Canadian North has become a sparring ground for environmentalists, politicians, and industry. In all the commotion, the sounds made by non-human organisms and elements are falling by the wayside. I seek to address this imbalance by highlighting sub-Arctic sounds through music. Looking specifically at the cryophonics (ice sounds) of Great Slave Lake, I will first examine particular acoustic properties of this environment and secondly my creative products that have resulted from in-depth study.

Cryophonics – Ice Sounds

The cryosphere is any part of the earth made up of frozen water – from glaciers to lake ice, from permafrost to atmospheric ice crystals. Cryophonics is a term I use to describe any sound produced by the cryosphere: 'cryo' being the Greek word for ice and 'phono' meaning sound. Increasingly, I have been actively listening to, observing, and recording the ice around my home in Yellowknife, Northwest Territories, Canada and currently I am using these ice sounds in musical compositions.

'Cryophonics' is not a widely-used term; the only other use of the word that I have discovered is a Sound Cloud identity with two tracks of electronic dance music (https://soundcloud.com/cryophonic). I feel the term accurately describes the sound world of ice, and in this context I am using it to describe *naturally occurring ice sounds*. Cryophonics, as I define them, do not include sounds made by instruments made of ice (e.g. ice horns or ice marimbas), nor does it include sounds made by humans manipulating naturally occurring ice such as striking of icicles with mallets.

A substantial amount of research on sounds made by ice currently exists, although the term cryophonics is not used. Generally initiated by some type of industry, research topics include the speed of sound in ice, how sounds of ice may affect marine life, ice sounds interfering with underwater communication, and how the sound of melting ice can be heard as a herald of climate change. Historical reports from European explorers and whalers offer dramatic descriptions of cryophonic activity during the winters their ships were frozen into the Arctic ocean. Oral traditions also share information on the sounds of ice. This oral sharing of information can be found in the Dene and Inuit peoples of northern Canada as well as among truck drivers working on the ice roads of the Arctic and sub-Arctic (Personal communication 2000–2015).

A brief list of cryophonic examples includes: lake ice cracking, icebergs calving or grounding, ice floe grinding, glacier calving or cracking, snow falling, snow squeaking, avalanche rumbling, ice-sheet breakup, and even booms from ice quakes (also known as frost quakes, ice-wedges or cryoseisms (MacKay, 1992) that occur in the ground.

I will now describe in some detail the type of cryophonics that I am most familiar with: those found in the lakes north of Great Slave Lake in the boreal, taiga region of the Canadian sub-Arctic (to clarify, this is an area quite distinct from tundra or sea ice of the Arctic). (See Fig. 1.)

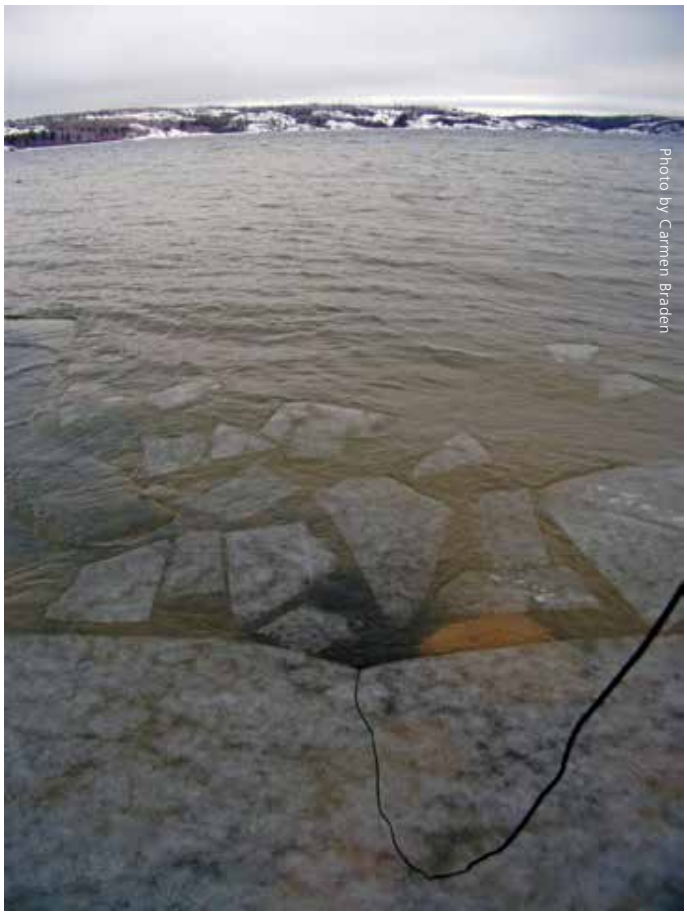

Fig. 1. Hydrophone cable during freeze-up. Prosperous Lake, NT, Canada, October 2011

Beginning in October, the lakes begin to freeze around the shoreline. The actions of the wind and waves can cause the early ice to break up into thin chunks or pans of various sizes that clatter against other pieces of floating ice, land-fast ice, and the shore itself. This mix of moving ice creates a rough, stuttering wash of mid and high frequencies, which sound very similar to the wave sounds themselves.

Through the rest of the winter, the ice covers the lakes completely and grows thicker, on average from four to six feet thick around Yellowknife. This ice appears solid, but is actually very flexible. Cracks in these huge ice sheets are caused by natural stresses such as temperature changes and also by human stresses such as vehicles driving on the ice and causing it to bend. The amazing variety of cryophonics during this time period range from small, quiet cricks to loud, violent-sounding cracks and booms (See Fig. 2).

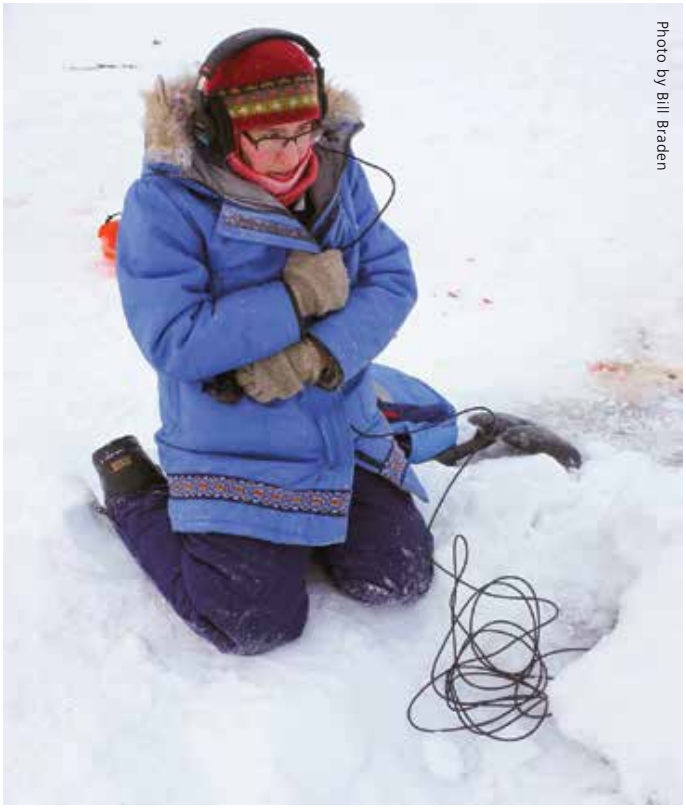

Fig. 2. Carmen recording cryophonics in mid-winter. Great Slave Lake, NT, Canada.

From early April to late May, the ice no longer grows thicker. The sun's warmth becomes strong enough to begin melting the snow on top of the ice and then the surface of the ice. As the ice weakens, water seeps upward through the bottom of the ice sheet and causes the lower part of the ice sheet to become rotten. This process has little to no cryophonic activity, and is actually a period in the ice season soundscape when both natural sounds and human sounds almost vanish from the lake surface. The ice becomes too weak or unsuitable for machines such as skidoos or vehicles, but there is not yet open water for boats or floatplanes to use.

Typically occurring in June, the final phase of the lake ice season is the break-up, or final melting back into the liquid state. As the ice disintegrates, it creaks, pops, grinds, clinks, and creates sustained washes of sound. Tall vertical drainage channels form in the ice and fill with air or water, altering the resonance of the ice sheet. Depending on the conditions of the break-up season such as sun exposure and temperature, the ice sometimes separates into individual, interlocking ice shards that look like long, sharp twisted candles. The diminishing ice cover eventually breaks apart into smaller ice pans which are moved around the lake by wind and wave action to jostle against each other like chandeliers, creating a mass of high frequency sounds (See Fig. 3).

Connecting to Natural Soundscapes as a Composer

My desire to frame the sounds in a context of geographical location and personal experiences has made categories such as 'soundscape composition' or 'ecomusic' applicable to my works. Peter Cusack's 2003 CD of ice sounds from Lake Baikal in Russia is a welcome addition to the cryophonic canon, but is a more documentary approach than what I am attempting. In my compositions such as *Candle Ice*, *Lake Skin*, and *The Ice Season,* I wish to connect the music to the sound source as much as possible.

The final musical result is filtered through my own experience of hearing and watching its cycle for many years. I don't believe this acknowledgement of the artist's perspective is a dilution of the original natural sound source; instead I view it as a kind of partnership. I transform field recordings into musical compositions and I take these sounds out of their natural space and time into concert halls and academic institutions – this is a separation and abstraction that is almost impossible to avoid. But I cannot in good conscience treat these cryophonics as mere sound objects, free from any meaning or relationship. Their connection to my life and culture is so strong that I am compelled to find out as much as I can about them. By combining the scientific, artistic, and cultural knowledge I gain with my own personal experiences, I create a re-performance of environmentally connected music.

Cryophonics – The Spirit

Sounds made by ice are particular to specific ecosystems and to specific seasonal cycles. They are the soundmarks (Schafer, 1994) of cold places and cold times. In my experience, the ice, and consequently the sounds it creates, also connects the world of living creatures such as humans with elemental, physical, and chemical forces of nature. My approach to cryophonics is based on a belief that naturally occurring ice – for example ice covering a lake – exists as a quasi-biotic phenomenon, one that embodies a spiritual bridge between living and elemental forces, a belief that has arisen from my own experiences of being on the ice as well as from discussions I have had with Inuit and Dene friends. Put simply, I feel the lake has a spirit, and the ice is a part of that spirit that interacts with the rest of the environment. Consequently, I feel the environment is performing these cryophonics as a form of music, and I am re-performing them in original compositions.

By considering ice to be an active and engaged force in the environment, I offer an alternative perspective of *who* or *what* is typically considered to be *aware* or *conscious.* This paradigm-shift of how humans understand nature is being echoed in other research about the natural world. Investigations into plant behaviour, for example, have presented scientifically-founded data that challenges widely accepted notions of the low or even non-existent level of plant sensitivity and responsiveness (Gagliano 2013).

Even if this belief in the ecological spirit of ice is not widely shared, it is difficult to deny that ice is connected to other actors in the environment such as temperature, pressure, wind, gravity and human activities. These forces all weave a complex web of interactions (Arbogast 2007, 148). As an additional contribution to this interplay, I have transformed the result of these environmental interactions – cryophonics – into my own music.

Re-performing the Ice

In 2014, I composed a work for piano trio and electroacoustics that evokes the sounds of candled lake ice. Titled *Candle Ice,* the work was premiered by the Gryphon Trio at the Ottawa International Chamber Music Festival in August 2014. In this composition I transformed observations and field recordings of candle ice in four ways.

1) Acoustic and aesthetic observations informed my approach to rhythm. I wanted to maintain the shifting quality of time that I experienced listening to the original sound source, and used groupings of notes with feathered beaming to evoke the natural rhythm of the ice shards, which ebb and flow with the wind and waves. The performer would have to fit a specific number of notes into a specific amount of time, executed unevenly and with an audible accelerando or ritardando.

2) Transcriptions of field recordings created rhythmic and melodic motives. I transcribed one specific moment that had two distinct tones and a simple rhythm. The motive was developed rhythmically and melodically in the live instruments, and the actual

excerpt from the field recordings is heard several times in the electroacoustic track.

3) Spectral analysis revealed pitch material. I created a spectral analysis from a field recording of candle ice, and chose the six strongest pitches for the main pitch material in the piece. Additionally, I structured the overall harmonic organization by arranging the pitches as formal structural pitch centres.

4) Physical structures of ice crystals were applied to the music's formal design. The form of ice commonly found in nature is a hexagonal crystal with six points, faces or sides—for example as found in snowflakes. I reflected this naturally occurring number *six* in the overall design: the number and arrangement of pitches, phrase lengths of six measures, sextuplet sub-divisions, and six states of activity in the music.

What Does the Sound of Ice Mean in Today's Society?

This question is increasingly posed when I present my works about ice. Understandably, the concept of ice melting has become synonymous with the issue of climate change and global warming. My work, however, does not attempt to reflect the changing climate or global warming; even though *Candle Ice* concludes with the melting of lake ice into water, this is not a political statement.

In the global context, ice is becoming a threatened element. In a sub-Arctic context, however, ice melting is a normal, seasonal occurrence. Every fall, almost all of the surface water around Yellowknife freezes and every spring all of the ice melts. Given this sense of normality, it is impossible for me to give the sound of melting ice on a sub-Arctic lake the same politicized meaning that has been imposed upon rapidly receding glaciers and ocean ice (Adams, *Becoming Ocean* 2014; Paterson, *Vatnajökull* 2007). When a sound is removed from its context, the sound becomes rootless, ambiguous, and can lose its original power.

Although I don't live by a receding glacier or by the increasingly ice-free Arctic Ocean, my home is not immune from the effects of global climate change. Right now the ice on the lakes still freezes in the winters and it appears there is no sign of that changing permanently in the near future. Will there be an absence of ice sounds in the sub-Arctic one day? That would be as devastating as the current loss of glaciers and the Arctic ice pack, and is a frightening possibility.

Ice, in my view, is a precious element, bordering on the spiritual. Since I consider the sounds created by ice as a type of environmental music, I consequently approach the musical transformative processes described above as a re-performance in this work as well as others. I feel an endless sense of awe and fascination with the cryospheric environment, and I owe the cryophonics that I have heard and used in my pieces a great debt of gratitude. The beauty and fragility of this particular part of the natural world invites attention, respect, and, in my case, an aesthetic, musical response.

About the Author

Carmen Braden is from Yellowknife, Northwest Territories and is currently a MMus Candidate in Composition at the University of Calgary. Her creative research has examined natural sonic phenomena, rhythms and harmonies, and draws on a life-time of aesthetic observations in the Canadian sub-Arctic. Carmen is the Canadian Association for Sound Ecology (CASE) representative with the World Forum for Acoustic Ecology (WFAE).

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Fig. 3. Spring candle ice. Prosperous Lake, NT, Canada

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