ECHOES OF A DISAPPEARING PLANET:

Discovering Pluralism in Soundscapes Using Natural Pitch Resonance and the Sonic Properties of the Alphorn

By Michael Cumberland

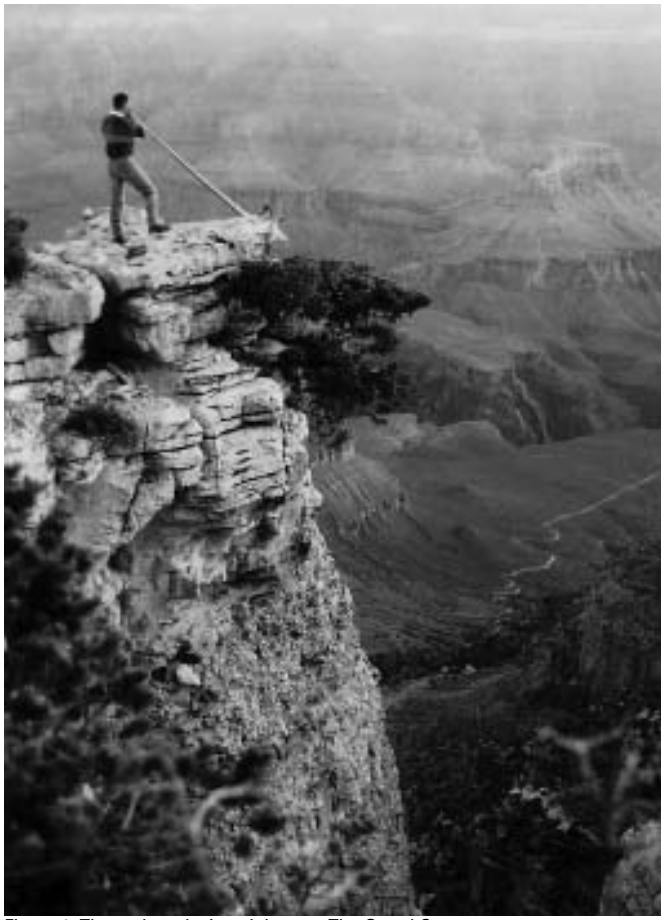

Figure 1: The author playing alphorn at The Grand Canyon

The title for this paper came after much thought and because the instrument I play is the alphorn, an ancient instrument dating back to 1400 BC in Denmark and Germany. It relies heavily on the subtleties of natural acoustics and echoes, which result from natural resonances. It is unique in its ability to create natural resonances in soundscapes and to carry its sound literally over miles of mountain ranges, across lakes and through forests.

The sub-heading refers to this text as a selected study of my own discoveries in natural pitch-resonance properties and acoustics from the past twenty years. From the outset I have chosen the Oxford Dictionary meaning of pluralism: "form of society in which members of minority groups maintain independent traditions." It is precisely these independent traditions—a unique element of our own world and local soundscapes—to which I refer when speaking of pluralism in this context.

From the listener's soundpoint, the alphorn's natural resonance in a large out-of-door acoustic environment is a sound which, in the immortal words of Richard Burton, "is a sound sweetened by distance". The reason for this is found in physics and in the understanding of resonance properties in "air filled spaces, set oscillating by an oscillating body". (Westphat, p. 154) It would be impossible for the instrument to sound the same indoors as out-of-doors.

I try, as Canadian author Farley Mowat once said on my behalf, "to be a pioneer of repertoire for this beautiful and neglected instrument which comes as close to any instrument to echoing the true voice of nature" as well as, "to be a tireless educator and experimenter using the alphorn to bridge the chasm between man and the rest of animate creation... performing for concert and out-of-door audiences alike, emphasizing Canada's unique soundscapes and the living sounds of our land". (Mowat, p. 1).

If this paper seems like a travelogue it is perhaps not surprising, for it has only been through traveling and going to specific places—through *doing*—that I have been able to observe and discover!

Since my earliest youth, summering in the Canadian North, I have been acutely aware of the contrast between the soundscapes of the north and those of Toronto, where I endured the other three seasons of each year. This awareness became heightened as I began studying music. While still a teenager, studying at the Banff Centre School of Fine Arts I met Canadian composer R. Murray Schafer. I had the opportunity to perform in his *The Princess of The Stars* hierophony. Becoming enchanted with the rehearsals at 3:30 am, with the way the composer integrated human activity, the arts, the natural stage and the soundscape of this particularly beautiful mountain setting and transformed it into a sacred music drama, became a pivotal point in my life.

Since that time twenty years ago I have continued to pursue my interest in soundscapes with a passion. I have found in my travels, throughout North America and in the few European locations I visited, that a sound *imperialism* is gradually taking over the world, leaving in its wake the death of pluralism in soundscapes. This seems particularly ironic in the social and political context of Canada, where the "cultural mosaic" is being touted as a benefit to society. To call into question the ideals of Canada's pluralism and to give examples of how sound imperialism is destroying Canada's unique soundscapes and those of other countries is reasonable.

However and more importantly, it is my hope that I can answer the question of what relevance today's cultural diversity and the

preservation of particular soundscapes may have for future generations. In fact, the study of world soundscapes is of paramount importance in today's society, as it allows for continued diversification and enrichment of people's lives through observations and discoveries. Otherwise these aspects could be lost to the bland wash of sound imperialism, which is threatening to smother the world's sonic environments and to deafen its inhabitants.

My observations of acoustics, echoes and what I term natural pitch-resonance properties in soundscapes were done in twenty-three locations in the United States, from Alaska to New Mexico (Figure 1); over twenty-four locations in Canada, from British Columbia to Nova Scotia; and three locations in Switzerland. These locations differ not only in extremes of geographical topography—mountains, canyons, deserts, caverns, lakes and fjords—but also in humidity and temperature extremes, all of which affect how sound travels.

Four soundscapes were selected for this paper: the Mt. Patullo area in northern British Columbia, Canada; the Grand Teton mountain range, Wyoming, United States; the Valais, Switzerland; and Bon Echo Provincial Park in Ontario, Canada. With these four locations the reader will be taken on a step-by-step progression through the theory of natural pitch-resonance property and pluralism in soundscapes.

Location One: Mount Patullo, Northern British Columbia, Canada (1984)

This was my first alpine experience with alphorn acoustics, while playing by ice-capped mountains and glaciers in the Mt. Pattullo area at an altitude of over 2000 meters. It was there that I discovered the incredible, large scale, resonant spaces and the resultant echoes. One particular mountain range where I performed split the top of a glacier into a "Y" shape (Figure 2). As I played to the glacier, I heard the sound divide into two. The two resulting sounds traveled behind the central peak, became silent, and then returned to me from opposite sides approximately six seconds later. The speed of sound at 20 degrees Celsius is 344 meters per second (Asimov, p. 164). The sounds thus had traveled over two kilometers, creating an extraordinary choric and overlapping texture of subtle sonorities. This led to, for me, a unique performance practice in highly unusual spaces. At the risk of throwing academic convention to the wind there was something special here—it was as if the mountains had been awakened from their eternal slumber and were speaking to me. It was love at first sound!

Later on that same trip I had a chance meeting with Canadian composer and pedagogue, R. Murray Schafer, at the Banff Center School of Fine Arts. We traveled to Canmore, a small town nearby. For an afternoon we listened to and recorded the sounds of alphorn and voice echoes in varying locations—experimenting with short and long distances; high, steep bluffs and gradual inclines; culverts in ditches; and two-mile long lakes backed by mountain sides. Responses varied from instantaneous, brass-choir effects to the subtlest of distant echoes repeating five times and lasting up to eight seconds. At 344 meters per second the sound must have traveled nearly three kilometers. For a sound to travel such great distances, audible to the human ear, is powerful and awesome. But the space and the extremely low ambient noise level required to accomplish this, is likewise staggering.

It was in this way that I became acutely aware of the uniqueness of certain soundscapes and to what extent we are polluting much of our remaining soundscape. In fact and generally speaking, many people have become so accustomed to environments with a poor signal-to-noise ratio that they tend not to be aware of the

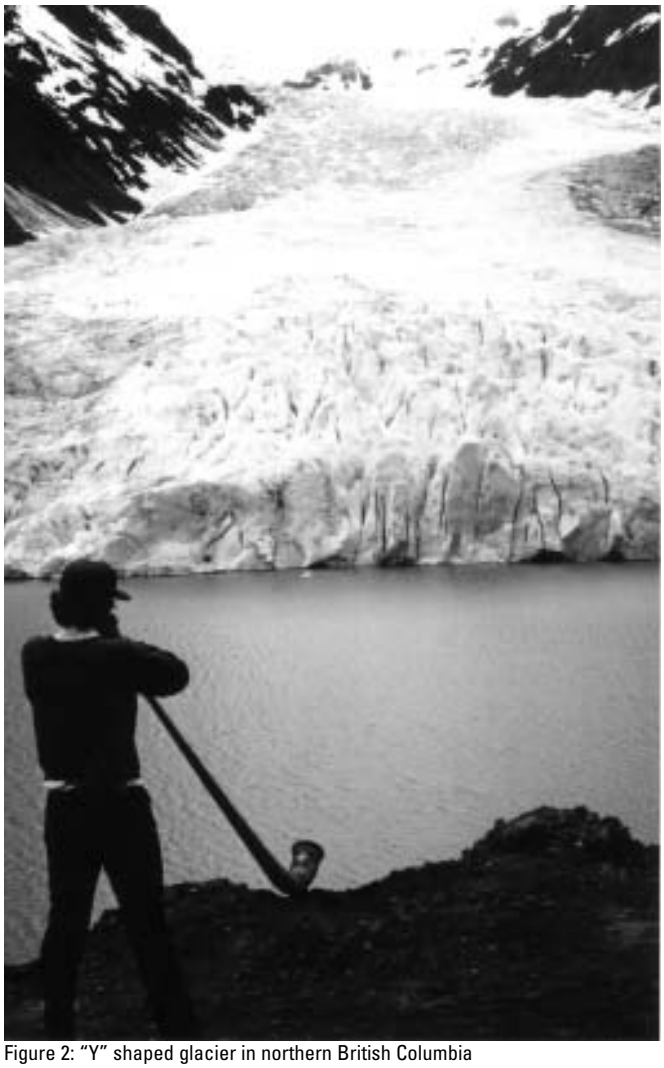

Figure 2: "Y" shaped glacier in northern British Columbia

natural resonances and acoustical wonders surrounding them. In other words whole populations are becoming desensitized and literally deafened, because of the constant barrage of close-quarter sounds imposed upon them, like an aural stench and putrefaction of sounds. Is it possible that life in such lo-fi environments creates cravings in us for the hi-fi sound of the studio recording? In many city streets of the world it is impossible to hear beyond twenty feet, -let alone perceiving the subtleties of resonance, echoes and sounds over distances of two to three kilometers.

Location Two: Grand Teton Mountain Range, Wyoming (1990)

The Teton Range in western Wyoming is a fairly heavily populated tourist area. Although considered wilderness by Americans, from a Canadian's perspective it hardly seems like wilderness and the ruggedness of the actual mountain terrain discourages "Winnebago Warriors" from stepping too far from their lawn-chairs. My observations here were made during the summer months. From past experience I had learned that dawn usually is the best and quietest time to play, experiment and record echoes in natural soundscapes—literally, from the last hour of total darkness to first light, well before sunrise. There are several reasons for this.

Firstly, temperature difference has important effects: "During the night the upper levels of the atmosphere are generally warmer than air at ground level. Because sound moves faster in warmer air, at about 355 metres per second, the upper part of a beam of sound waves will quicken and, the whole beam will veer downwards. It is for this reason sound can be heard more clearly

and over greater distances by night than by day."(Asimov, p. 164)

Secondly, there is more moisture in the air as the dew point occurs and this moisture can help the sound and enable the sound waves to transfer their sound energy more efficiently through the airborne water molecules. These characteristics give the sound a warmer, fuller quality and a sound, which is able to do, what I term "echo gymnastics", with much agility. As soon as the sun is up for an hour these conditions are usually gone.

Thirdly, as the natural fauna, and I might venture to say flora, are still in states of repose, there is less noise. Fourthly, as tourists, the world over, rarely get up on their own accord before they have to—anywhere from seven to ten o'clock—there is much less likelihood of running into curiosity seekers and potential noise makers. In fact, I have never met a tourist climbing at the top of a mountain prior to 6:00 am. Most of my work is done between 3:30 and 7:00 am. Lastly, extraneous sounds such as jets, helicopters, chainsaws, cars, trucks, boats and so forth are more likely to be absent.

Figure 3: peasant alphorn player by precipice of the Wetterhorn, cattle in distant background, photographed c. 1904 in Switzerland by the author's great-grandmother.

In the Grand Tetons I hiked to a location called Amphitheater Lake, close to the base of the Grand Teton glacier, to experiment and record. The physical properties of the soundscape—the sound resonance and echo—created a magical moment. Again it felt as if the alphorn had evoked the spirit of the mountains. I heard the mountains and the entire environment engage in a dialogue with the alphorn.

It is easy to explain scientifically how a given air-filled space that has been set into oscillation by an oscillating body, created a resulting resonance (Westphat, p. 154). On a small scale this is analogous to finding the resonance—i.e. the strongest fundamental frequency, the *Eigenton*—of a small enclosed space such as a bathroom while singing. It is equally easy to record the event with words and tape recorders. It is, however, probably best to discard such terms as magic and super natural in the context of academic and performance practice. Nevertheless, an experience such as this gives a special meaning to music, performance and resonance in natural soundscapes. It was here—I will venture to say—that I heard the mountains speak and the environment respond in dialogue with the alphorn.

This begs the question: is this possible? The answer could be a simple yes, it is possible to set soundscapes into oscillation by using an oscillating body and thus, for resonance to occur. In other words: "It is true a vibrating object may force another to vibrate in unison, so the second sets up the same wave pattern and produces the same sound. Such a forced vibration need not be the result of direct physical contact between solids. Indirect contact through air may be enough to accomplish this."(Asimov, p. 164)

The experience of such an extraordinary natural phenomenon may be rare for human beings, especially on such a magnitude of space. However, perception and interpretation of such experiences can differ. Certainly, in some cultures it is understood that the environment can speak. Is this a result of explaining physical properties? It could be.

But the answer could be more complex, as it depends upon ones cultural perspective: imbuing inanimate creations with animate characteristics is not generally accepted as a commonly held belief in twentieth and twenty-first century western civilizations. Certainly the inculcation of anthropomorphism, both historically and recently, would pose an intriguing debate for this argument. Besides the literal response of the alphorn echoes, there was a natural liveness in the response itself that came from the mountains and forests below. This was generally not the kind of performance or performance practice of which people in the twentieth and twenty-first centuries would be aware.

Is this the scientific explanation for how the land responds? Does this explain the feeling that the land is communicating to the performer and the listener? Certainly, if one is still and listens, the land responds as if it wants to do so. But as a people we rarely hear this, because we tend to be too loud and too full of continuous motion. This makes it all the more important that we find ways to communicate such experiences and acoustic phenomena.

This alphorn—environment dialogue was not an isolated event, due to the capricious whims of a performer after hours of hiking in the early morning dark. Even serious musical academics relate that there are such things as the spirit of music, rarely, if ever, told in music handbooks. A listener or an audience member can easily sense the spirit of a sound or performance. Putting the experience into words is a different matter. But it was this experience, which strengthened my alphorn vision—alone amongst the peaks and glaciers of the Grand Tetons.

Location Three: Canton of Valais, Switzerland (July 1999)

I was visiting this area to achieve three goals. The first was to pick up a custom-made alphorn from the master alphorn builder Gerald Pot. The second was to study traditional folk alphorn techniques and participate in master classes with virtuoso alphornist, Jozsef Molnar. My third goal was to experience the rarely seen Fete des Vignerons—festival of the vintners—which features alphorn players and the traditional Swiss Ranz des Vaches. This festival has its roots in ancient Greek mythology and dates back to performances and traditions of the seventeenth century. Performances now occur only four times each century.

As an added activity I hiked in the Alps taking my alphorn and recording equipment. The following describes what transpired during one of my impromptu hikes.

I hiked for hours above the steep mountain village of Mayens-de-Riddes. The first day I found a herd of cattle at noon. As I walked above a ridge the sound of their bells suddenly enveloped me like a duvet of thick, sonic texture that had fallen across the land. It was intriguing how the sound came upon me so quickly. Mesmerized, I sat and listened till after the sun went beneath the horizon. I had no alphorn or recording equipment. I had simply been out for a walk. It was near darkness when, in awe, I began my descent.

The next day I hiked up the mountain again for another four hours this time with my alphorn and recording equipment. This time I was prepared. As I walked above the ridge, still so clear in my memory, I heard nothing and saw nothing. The cattle were gone!

Despondent, I trudged further up the steep mountainside, crossing small glacial rivers, hoping to find the herd in the now-decreasing sunlight. After another hour of going up and down the irregular slopes, fully laden with gear, I came upon another steep ridge—and once again the sound of the bells reached me in a heavenly chorus. It was a truly remarkable sound to encounter in a mountainous region, one I am sure no one who has heard it could ever forget.

Rejoicing, I once more set up my recording equipment in the oddest of locations and began to play and record. The magical sounds of the cows playing their bells, the alphorn rendering traditional folk tunes, the shepherd calling to the cows and the dog barking to alert its owner that three cows had gone astray—all of these are the sounds of historic Swiss folklore. It is what I call the "fugue of life", for themes repeat themselves in intervals, whether daily or otherwise, which are in recognizable forms or in counterpoint.

To some of the Swiss, including a few herders, the sounds of bells represent strict and rational functions. They would not think of these sounds as having potential musical or artistic value. But to an outsider like me, the aleatoric nature of the sounds, combined with the repetition of sounds, seems truly musical.

While I was recording, many other sounds occurred. Most were acceptable, but not such twentieth-century ones as the motorcycles used by the herders and the helicopter which flew over during my recording. Needless to say that recording was made useless by the digital accuracy with which the equipment captured the sound of the helicopter. Manufactures of the internal-combustion engine rejoice, your sounds are indeed everywhere!

The sound of "les vaches avec cloches" (the cows with bells) is part of the folklore of Switzerland, one of the unique soundscapes of the world. In the canton of Valais, where many observations were made, the bergers (shepherds) and their families have, for the past thousand years, brought their cows from the tiny Swiss mountain village of Iserable across the valley to graze in the lush, summer, alpine meadows of Mayens-de-Riddes. For the bergers and their peasant families life was difficult in Valais and the people were very poor (Figure 3).

The original function of the bells in alpine or deep forest environments was twofold. On the spiritual side, they were used to scare away evil ghosts or wild animals; to combat misfortune, unhappiness, and epidemics; and to ward off robbers and thieves. This may likely be related to myths of old magic in which the blessing of iron and steel, through tempering or truing, would help to keep evil spirits away (Hambraeus, p. 1). This is also why many bells are decorated with a crucifix and religious motifs. Their other function was to help shepherds, mostly women and children, locate any stray cattle in the many crags and valleys of the alpine meadows.

Along this line I had a conversation with a friend, Bengt Hambraeus, Professor Emeritus McGill University. He told me about his youth in the 1930's in the rural regions of Sweden. Bells there had a similar cultural significance for the farmers and certain magical rites connected to the bells survived into the nineteenth century. During the middle ages, the bells were removed from the cattle during the dark winter months, when all animals remained in the stables and barns. They were placed upside-down, and filled with specific dried flowers, collected during the night of Midsummer Day. These flowers were ground up, mixed with other natural components, and given to the animals as a Christian inspired, Holy Communion just before they were sent out for the first pasturing in the spring. As liturgical objects, the bells represented and conveyed magical powers to protect the animals from evil spirits and beasts of prey (Hambraeus. p. 1).

Professor Hambraeus also related to me first-hand information of the use of the bells in some rural Swedish regions. Amazingly, they were used for many types of animals. The herder could direct calls to individual animals within the herd and had different types of calls for sheep, goats and cows. In Switzerland, the use of bells is similar and commonly includes vocal calls as well as alphorn calls. Yodeling is common Swiss folklore. Herding calls in Sweden, especially the "kulning" which is used by women on remote mountain and forest farms in the central region as a means of communicating with the cattle—are less common sounds, though equally captivating (Hambraeus, pp. 74-75).

This ancient custom of using bells is falling into disuse because of a number of new trends. In Switzerland itinerant bergers, often from Tunisia now, ski during the winter months. They have no real connection to the Swiss folklore traditions and do not pass these traditions on to younger generations. Motorcycles are often used for herding. Portable electrical fencing is being used to contain the cattle. Walkie-talkies to communicate between herders and walkmans/discmans (actually worn to block out the sound of the bells) make the bells less necessary. Tourists carry off bells as mementos of their visit. All of these situations have led to a decline in the use of traditional cowbells. Now the herds with bells can only be heard in the highest, most isolated regions of the southern Alps and in some parts of Austria, far above the motorways where tourists languish in their rented vehicles and air-conditioned buses.

While in the rural areas of Switzerland I was able to make some interesting observations. I believe it is important to note that in this sonic/aural culture there is an unusual disposition to the pitch F# = c. 370 Hz. This paper will not go into the historical nuances and fluctuations of pitch over the past centuries. It should briefly be noted, however, that F# at 370 Hz corresponds, for example, to A1 = c. 442 Hz. Depending on which temperament is used, Gb/F# could at least be anything between 364 and 380 Hz, even if the standard tuning pitch is an A1 = 440 Hz, the usual practice in international orchestras during the last thirty to forty years. For the purposes of this discussion I will use F# at about 370 Hz (Hambraeus, p. 2).

The historic tuning of the Swiss alphorn is F#, a slightly odd pitch for westernized musicians. When I asked around nobody knew exactly why—it was just the way it had always been done. While researching further into the folklore it was written that the alphorn is traditionally the combined height of two men. Is this length equivalent to F#? It seems so! Obviously the combined length of two men could be any number of measurements. It could be slightly longer creating an F fundamental or slightly shorter creating a G fundamental. Suffice it to say that a canon was developed and F# chosen. This is not to say other tunings are not used, only that the Swiss favour the F# fundamental pitch.

While traveling the rail system in Switzerland I noticed that the high-pitched whistle of the trains was also in F# with a C#

(the dominant of F#) also being used. A bit odd, I thought, but perhaps there is a connection. As I had dinner with a retired Swiss rail engineer shortly thereafter, I mentioned my observation. He noted that it was correct. He also noted I was the only tourist he had ever met to make this observation. When questioned about a possible folklore connection with the alphorn he thought it very plausible, but could not corroborate it, either as a fact or the intention of Swiss Rail engineers (Source: interview by Michael Cumberland with retired Swiss Rail engineer Charles Thevenin, Vevy, Switzerland, July 29, 1999).

Later, on reviewing my recordings of the cows with bells, I realized that I had captured a half dozen repetitions of shepherd calls to the cows (la, la, la, la, la, la, la) all based on the tonality of F#. I had recorded two different herds of cows, in different valleys, with different shepherds—but the call was very similar: the first six "la's" were pitched on F# with the final "la" being a G. It was sung with great volume and considerable rapidity, and the tempo was a quarter note, equal to a metronomic marking of seventy-two, and each "la" was a sixteenth note.

While driving past a farm in the Luzern region I noticed a couple of cowbells for sale by a barn. The large bronze bells had lovely tones and I purchased one. When I got home I realized the bell was pitched in C#—the dominant of F#. For all I know the bell beside it was in F#.

Are these merely a set of charming and very fine observations? The coincidence seems too strong to be just that. I believe there is a "natural pitch-resonance property" of F# which belongs to the Alps. This led me to wonder whether, if the Alps have this property, all regions could have "natural pitch-resonance properties". Hence, this led me to additional, more careful studies of soundscapes in the lake regions of Ontario in Canada.

The idea of a geographic space having a natural pitch-resonance property supported my observations made with the alphorn in many places and over many years. The basis for this tenet can be corroborated using physics.

For example a pitch of F (44Hz), a minor sixth above the lowest A on the keyboard, has a wavelength of 25.7 feet. If a corresponding soundscape space had dimensions equal to a multiple

Figure 7: Mazinaw Lake rock face.

of the wavelength produced and with sufficient amplitude (dB), the space could be made to resonate by using an oscillating body (the alphorn) and indirect contact through air to create sympathetic vibrations. Thus, a clairaudience would occur when pitches, which have wavelengths that are arithmetical factors of the out-of-door space, are played using the instrument.

Approximate measurement of distance of a large space like a lake, canyon or natural amphitheatre could likewise be determined using the speed of sound—344 meters per second—and listening to time measured echoes per second during the period of one minute. Experiments using this tenet have been done in Ontario at: The Haliburton Forest and Wildlife Reserve at Noname Lake and Bone Lake, in the Kawarthas at Stony Lake (Figure 4) and Methune Lake and in Bon Echo Provincial Park at Mazinaw Lake.

When assessing the natural pitch-resonance properties of a soundscape it is necessary to try to keep as many factors as common as possible. Factors which the listener/performer must be aware of are: exact location of the sound source; the pitches examined must be consistent and the reflecting surface must be consistent for each of the test sounds; the time of day, the time of year; and lastly, weather conditions, particularly wind must be taken into account. Next, each pitch and its wave length must be examined along with the distance from the sound source to the reflecting surface and back, at the speed of sound in an ideal temperature of 20 degrees Celsius. This is a time consuming process and one with which I have laboured to experiment in Ontario since 1999.

To keep the nomenclature simple, three guiding pitches will be referred to when relating the test pitches to the soundscape. These are: A, at 28Hz (frequencies in Hz are to the nearest 1.0) with a physical wave length of sound of 40.4 feet, this is the lowest A on the conventional keyboard; C at 262 Hz with a physical wave length of sound of 4.3 feet, this is middle-C on the keyboard; and A 440 Hz, with a physical wave length of sound of 2.6 feet, the tuning A for many contemporary orchestras (Egan, p. 4).

The alphorn used in the acoustic experiments can be played in the keys of F, F#, G and A^b. Each extension has the possibility for 17 playable testing notes. All of these are in the harmonic series and range from the lowest fundamental in each key to the sixteenth partial. This allows for a four-octave range. The lowest possible sounding note is the F at 44 Hz, with a physical wave length of 25.7 feet; and the highest sounding note is the A^b at 934 Hz, with a physical wave length of 1.25 feet. This top note is the A^b above the treble clef. The first two octaves, or fundamental, and the following three partials will be referred to as the low range. Partials five through twelve are the mid-range. Partials thirteen to seventeen are the high range.

Location Four: Mazinaw Lake in Bon Echo Provincial Park (September, 2004)

Mazinaw Lake is ideal because its physical geography is extraordinary: the lake is long and narrow—to the east a 300 foot sheer rock face plummets into a lake and continues underwater for another 300 feet (Figure 7); the rock face width is close to two kilometers with a natural amphitheatre and bay to the south. To the west are rolling hills and to the north the lake continues for approximately six kilometers twisting and turning. The width of the lake where I was recording was approximately 1312 feet from the west shore to the rock face on the opposite east shore of the lake

This location is also notable because it is a historic and sacred location for the indigenous native tribes. It is considered the centre of their local world because it is a meeting of the sky, symbolic of the spirit; the earth and rock face, symbolic of the living; and what was perceived to be a bottomless lake, symbolic of the underworld. For thousands of years this has been a sacred location. When one listens to the echoes in the location there is no doubt this too would have held a special place in the conceptions of the native world in communicating with their spirit world.

At Mazinaw Lake in Bon Echo Park the following summary was observed and recorded. In the key of F# the fundamental and second partial, at physical wave lengths of 24.4 feet and 12.4 feet respectively, resonated reasonably well. This is notable, as these partials tend not to resonate well in many soundscapes. The seventh partial, F#, and ninth partial, A#, with physical wave

lengths of 2.45 feet and 3.05 feet respectively, both just above middle C, resonated particularly well.

In the key of G the third partial, G below middle C, with a physical wavelength of 5.8 feet; and the seventh to eleventh partials, with physical wavelengths of 2.9 feet – 1.9 feet resonated well.

In the key of A^b notable resonance was heard with the fundamental, first, third, seventh and ninth partials. Of particular note were the fifth partial, middle C, and the C one octave above.

The most outstanding observations were noted in the key of F. From the fundamental F at 44Hz, with a physical wavelength of 25.7 feet, to the thirteenth partial D# fourth line treble clef, with a physical wave length of 1.8 feet, resonance in this key was outstanding. Although a generalization, many of the physical wavelengths of this key tended to divide fairly evenly into the distance from the sound source to the echoing rock face—which is about 1312 feet. The fundamentals echoed better than any other key and the mid and high ranges resonated exceptionally well.

Observations made from recordings at Mazinaw Lake also clearly indicate an interconnectedness between man-made sounds, music on the alphorn, and the fauna: a crow caw pitched at F above middle C, a nuthatch call at C two octaves above middle C, a blue-jay cry at G above middle C, and a robin's call note of C an octave above middle C. It would seem these animal sounds are literally in tune with the natural pitch-resonance of their soundscape. The alphorn in the key of F with a strong dominant C corroborates these observations.

Other observations recorded demonstrated that when sounds in F# were played the caw of the crow sounded F#, a semitone rise from the F; the chatter of a red squirrel was recorded in F# and the nuthatch call ascended temporarily to a C#. In the key of G the nuthatch call descended to a B. In the key of F the blue-jay cry ascended from a G to an A. When the playing ceased the animal calls resumed their previous pitches. For me these observations beg the question: are we interconnected with a sonic web of life?

Other examples of natural pitch-resonance properties have been: F# on Noname Lake in the Haliburton Forest and Wildlife Reserve; G on Bone Lake in the Haliburton Forest and Wildlife Reserve; and F on MacKenzie Bay on Stony Lake in the Kawarthas.

Although natural pitch-resonance properties seem to be more than coincidence the tenet is not yet an exact science. In theory, observations can be corroborated using physics and mathematical formulae. From a practical standpoint it is certain that ranges and patterns of notes tend to resonate more clearly than others, given ideal conditions in a soundscape.

This may explain the ancient Swiss cultural tradition of alphorns being pitched in F#. Could this explain the sacred and pluralistic traditions surrounding native cultures around site-specific cultures like Bon Echo Provincial Park in Ontario, Devil's Tower in Wyoming and the Gilla Cliff Dwellings in New Mexico? All are locations, which I have performed and recorded, and all have had a certain spirit evoked by the alphorn.

How many more sacred soundscape locations can be discovered? Can compositions be harmonized with the natural pitch-resonance properties of a soundscape, its fauna and flora? Some of my own compositions are created relating the most resonant pitches of a location. They are location specific. Could R. Murray Schafer's performances on Wildcat Lake in The Haliburton Forest and Wildlife Reserve be realizing a sacred soundscape through the performances and re-enactments of the Patria series and the Canadian masterpiece "The Princess of the Stars"?

Photography by Michael Cumberland

Figure 4: a typical dawn on a lake in northern Ontario, the ideal conditions for playing

Currently, R. Murray Schafer is working on a composition for alphorn and soprano, alto, tenor and bass voices. It is being discussed that Mazinaw Lake in Bon Echo Provincial Park may be a performance venue. Of interesting note is the orchestration. The soprano, alto, tenor and bass (SATB) voices are scored for two reasons; the first practical, it is hoped that with SATB the work will have more opportunity for performances as choirs are more common than orchestras in Canada. Secondly, for more experimental reasons, there is a relative ease with which keys can be changed by the alphorn and choir. This ease of changing keys is not possible with written music for orchestras. This has the unique possibility of creating an out-of-door work, which could be transposed depending upon the natural pitch-resonance properties of the soundscape. This is certainly a first—at least as a compositional technique for Canada! Could this be a beginning of a new Canadian tradition?

Central Europe is an old well established culture where change, particularly in rural settings, can be slow to occur—and where some older traditions are still practiced. Could it be that these older well established cultures are literally in-tune with their environments? Could the relatively closely spaced mountains of certain locations create the circumstances for natural resonance to exist as a phenomenon, explained by the physical properties of space? Could this kind of phenomenon be discovered in a newer culture such as Canada or from the old traditions and spaces of native North American populations?

Could the ancient Chinese elaborate acoustics based upon the huang-chung or "yellow bell" fundamental—derived from blowing air through a bamboo tube 9 inches long and 0.9 inches wide—relate to a "natural pitch-resonance property" phenomenon found in certain regions in ancient China? Chinese records, dating back to the third century BC, note that a set of pitch pipes was tuned, using the cycle of fifths, to the love song of a pair of phoenixes. Could this even date back to the records from the reign of Emperor Huang-Ti and his musical minister Ling-lun c. 2698 B.C. (May, p. 11). The ability of the Chinese to hear subtle changes in tone and timbre of sound is well documented in the ancient performance practice of the Ch'in, which could easily be said to go far beyond the nuances of much western music. Is this a sign of a culture highly attuned to its aural senses?

A corollary to this on a macrocosmic scale would be the ancient Greek Pythagorean concept, furthered by Johannes Kepler in *The Music of the Spheres.* In the ancient Greek story from the end of Plato's Republic, is the wonderful and apocalyptic-eschatological myth of Er, son of Armenius and by descent a Pamphylian, who died in battle and was, on the tenth day, carried off and taken up—and later found to be still fresh. On the twelfth day Er was laid upon a funeral pyre. It was about to be lit when he revived. He told of what he had seen in the next world and of his vision of the sounding of the cosmic spheres. He saw a distaff in motion with eight circles going around it. On the upper side of each circle was seated a siren which uttered a single note in a single tone. As the total number of sirens was eight, they composed one harmony. This story provides the best-known description of the phenomenon of the music of the spheres (Plato, p. 304).

It could be purported that our present culture has lost touch with sacred relationships to soundscapes due to worldwide sound imperialism, the manufacturing of mass media and the internal combustion engine.

It is crucial to understand under the current circumstances of and attitudes towards the world's soundscapes—that is, the insidious nature of noise pollution and its inculcation and legitimization into our psyches through basic societal misconceptions such as "progress for the sake of progress at all costs"—that these kinds of observations may not be able to occur in the near future and could be lost forever. Some of the world's northern countries, such as Canada, still have relatively large areas untouched by constant sound imperialism.

It would behoove us as a population to study these areas while they are still audibly available for research. Let us remedy ignorance with education and knowledge before our global village continues to shrink to a micro-chip, is lost to progress, and all sense of exploration is gone forever from our planet.

In conclusion let us not forget that pluralism in soundscapes is important. It preserves and creates traditions, which may or may not become sacred, but allow for continued diversification and enrichment of our lives. Now, more than ever, people must become aware and help to preserve soundscapes for generations to come.

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Credits/Thank You:

Bruce Bateman (Superintendent of Bon Echo Provincial Park); Mildred Cumberland, the author's Great-grandmother, photo of peasant alphorn player c. 1904 taken in Switzerland on tour of Europe (figure 3); Mark Malby, photo Stony Lake (figure 4); Farley Mowat; R. Murray Schafer; Laura Steen; Geoffrey Tait, photo "Y" shaped glacier (figure 2); Mary Talbot; Hildegard Westerkamp.

Michael Cumberland was born in Toronto and currently resides in Port Hope, Ontario with his wife, two sons and daughter. He received his Bachelor of Music and Education Degrees from the University of Toronto, his Master of Music from The University of British Columbia and continued his studies at Trent University and McGill University. Mr. Cumberland currently teaches and performs with alphorn and tuba in Southern Ontario. He has premiered numerous compositions, writes his own alphorn music and has been recorded for CBC. He has produced his own alphorn/soundscape recordings, has just released an alphorn DVD and can be heard on Centrediscs—Composer Portrait Series: R. Murray Schafer. Mr. Cumberland would welcome comments regarding this paper. Email: alphorn@mikecumberland.com or 347 Lakeshore Road, Port Hope, ON L1A 1R2, Canada. www.mikecumberland.com