Sonic adventures in the realms of white at the bottom of the world

Antarctica:
Austral Soundscapes

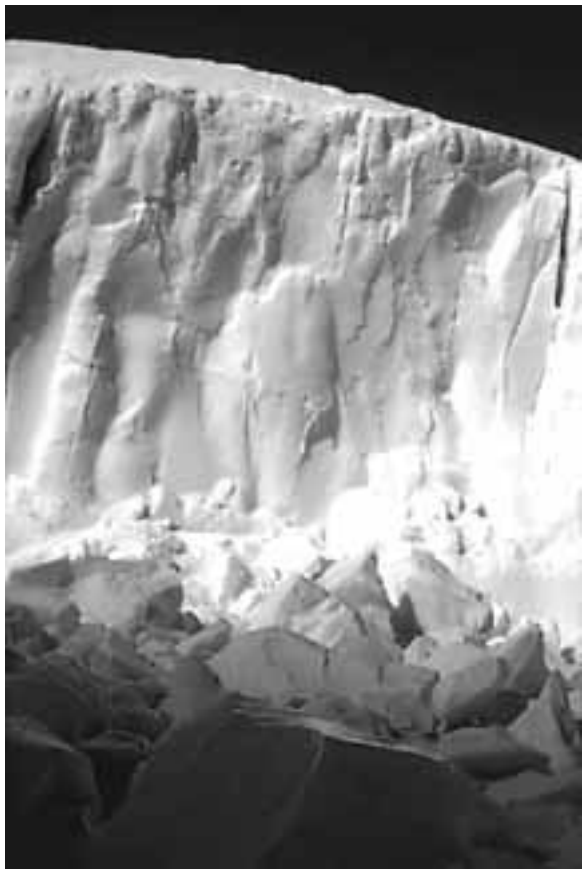
by **Douglas Quin**

Greatness of dimension is a powerful cause of the sublime.
—Edmund Burke

A Gathering of Senses/A Question of Scale

Collecting impressions about a destination is an exciting part of planning for a trip. Visceral stirrings and the anticipation of travel are fueled by images, both graphic and literary. Maps have always appealed to me as way of grasping or conceiving in the mind's eye: a means by which I might construct a notion about space and place. However abstract and limited, pulling out a map communicates a stage upon which I project many scenarios and eventualities. In this sense, consulting the atlas is a ritual beginning of sorts—the first steps taken in an imaginary landscape. Comprehending Antarctica was another matter … It was several years ago, on a sweltering summer afternoon, that I remember poring over an atlas of the world, drafting plans for a sound-recording expedition to *Terra Australis Incognita*. This voyage would be the complement to several months spent in Alaska gathering sound for a new composition, *Australis/Borealis: Sounding Through Light*. Outside my apartment window, the sky flashed

and cracked. I thumbed through the maps and turned to a Mercator projection of the largely unknown southern land we call Antarctica. It was hard to get a sense of the continent's extent and shape and I could not easily summon a mental icon—the way I could for Africa or North America, for example. The coastline meandered along the bottom of the map, describing an apparently vast region of the planet. The Antarctic Peninsula reached for Tierra del Fuego, swept into the Westerlies and Roaring Forties; ocean currents pulled archipelagos to South Africa. The plateau interior and the Transantarctic Mountains faded to white at the edges of the pages and thin blue lines traced the suggestion of glaciers and ice shelves.



In other sections of the atlas, different images were used to convey information about diverse planetary resources including food, energy, and minerals. Each topic was presented with overarching authority, in a myriad of projections with both the Arctic and the Antarctic subject to various permutations. Goode's Interrupted Homolographic projection parcelled polar regions between projecting lobes. A series of Eckert Equal-Area images attenuated the earth into a neat oval track; Antarctica appeared as a smear on the inside lane of the home stretch. The physical map of the world was presented as a van der Grinten projection. Here, pinched poles gave Antarctica the appearance of cumulonimbus cloud. My mind wandered and I conjured Pangaea and Gondwanaland, yet other projections. I saw fossil-rich forests churning for an eternity: a haphazard metamorphosis folded into geologic strata of deep time and distant space. Some pieces of this puzzle lay beneath more than several kilometres of ice at the Antarctic. Near the back of the atlas an Azimuthal Equidistant composite, based on satellite images, gave me a compelling illusion. Antarctica was at the centre of the pages. Absent detail, the white of the interior was filled with facts and superlatives: the coldest, the highest, the driest, the windiest. Nearly two years later, while I was in Antarctica, I learned about an ice shelf calving. The news media reported that a piece of ice, roughly the size of the state of Rhode Island, had fallen into the sea. I thought of the atlas map and a neat, rectangular slice being removed by cartographers. What was Rhode Island with the left-over bits of Narragansett Bay carefully reconsidered as neat azure contours? When it came to scale, it was hard to place myself: a figure in the landscape, a listening voice in the soundscape. Knowing space and developing that faculty of understanding called "spatial intelligence" is an obtuse proposition. The term refers to educator Howard Gardner's classification, described in his theory of multiple intelligences. He contends that there is not a single seat of intelligence, but rather frameworks of knowing including verbal / linguistic, logical / mathematical, interpersonal, intrapersonal, musical, bodily / kinesthetic, and spatial. Perceiving and comprehending space has its own discrete regions of cerebral processing in the human brain and, as such, represents an aspect of our intellectual capacity. Traditionally, our sense of space and the articulation of spatial relationships have been more closely associated with visual experience rather than aural—linked to tangible expression in architecture, sculpture, painting, and the graphic arts. It is, however, through both seeing and hearing that we come to know space and, through kinesthetic engagement, give it meaning.

R. Murray Schafer once commented, "We are always at the edge of visual space, looking in with the eye. But we are always at the centre of auditory space, listening out with the ear." The statement is revealing.

The language of edges, an external point of view, and being drawn into space suggest a pictorial construction—a reflection of the power of images to provide us with a lexicon for interpretation. Furthermore, we tend to look "at" the visual world. In the Oxford English Dictionary (OED) the word is taken to mean, "The most general determination of simple localization in space, expressing, strictly, the simple relation of a thing to a point of space which it touches." But when we wish to convey a heightened state of awareness, we often look "out," in the OED definition of "expressing motion or direction from within a space." Looking in, looking at, and looking out, listening in, listening to and listening out—this dynamic of sensory interaction gives us space. One of the most enduring sensations from Antarctica is how overwhelming and challenging it was to arrive at this knowledge, or spatial reckoning. For very little was scalable in the visual, acoustic, or temporal terms I knew.

Antarctica is vast in every sense. The effects of light on snow and ice have a way of attenuating space, and distances seem elastic. Mirages and scattering light can make the terminus of a glacier appear far taller and closer than in reality; mountain ranges apparently float on the horizon; flat light, a continuum of ice and sky, can intimate infinity.

If a visual imagining of Antarctica was hard to evoke, the soundscape in the mind's ear was even more remote. I read about the vocal behaviour of many of the species I was likely to encounter—seals, whales, penguins and other avifauna. I had also heard about atmospheric whistlers, Very Low-Frequency (VLF) phenomena. Prior to my journey, however, the only Antarctic sounds I had actually heard, were from nature programs on television. These seemed disembodied—soundbites and segues between narration. My expectations where "myaural," to say the least. I use the term as an aural analogy to myopia, or near-sightedness—of near-hearing or limited perceptual acuity with regard to hearing.

Sonically, an extraordinary silence embraces much of Antarctica. In this regard, my most profound listening was inward. Sitting on a scree slope in the Taylor Valley, on a windless afternoon, the only sound I heard was that of my pulse, a dull thud and swish against the hood of my parka. By contrast, concentrations of life at the continent's edge resound with remarkably varied voices. Under the sea-ice shelf of McMurdo Sound, in waters of minus one degree Celsius, Weddell seals can be heard at a distance of thirty kilometres. At Cape Bird on Ross Island, the murmurous stirrings of 160,000 Adelié penguins on a shoreline rookery is a unique soundscape. Antarctica is one of the most arid places on earth, and sound propagates uniquely in freezing dry air. Even surface sounds seemed brittle, imbued with a clarity and crisp resonance that would often belie the distance and location of the source.

I had some experience against which to measure my relationship to my surroundings "on the ice": recording in Alaska and childhood memories of Quebec, Lapland, Iceland, and the Sahara. Antarctica was different. The following are accounts of listening and recording at several locations in and around McMurdo Sound in the Ross Sea—a series of journal entries from the time, plus subsequent reflections.

Life in the Fast Ice

Big Razorback Island is one of the Dellbridge Islands, a desolate archipelago of igneous rock, bound fast in the vernal sea ice of McMurdo Sound. The island is about one kilometre long, black and narrow—a serrated silhouette against the sky. Variable snow cover, a constantly shifting network of tidal cracks, and the upheaval of associated pressure ridges give the island a different appearance daily and sometimes even hourly. The fast ice of Big Razorback provides refuge for a breeding concentration of Weddell seals (*Leptonychotes weddelli*). Here they are safe from predators like orcas (Orcinus orca) who patrol the open water of the Ross Sea. James Weddell's first encounter with these creatures in 1820 lead him to speculate that he was hearing mermaids, "making a musical noise."

I had planned the timing of my field recording to coincide with the Weddell seal mating season and joined Don Siniff, of the University of Minnesota, and his team at their camp. They were continuing nearly three decades of research into population dynamics and Weddell seal ecology. Much of my work at Big Razorback took place at the onset of rutting, in November and early December— following pupping. This is apparently a peak time of vocal activity, particularly among males. Dominant male Weddells spend very little time on the ice surface. They devote a lot of at-

tention to patrolling underwater territories, or maritories as they are called—a space twenty-metres in diameter, centred around a breathing-hole in the ice. Competition for females and maritorial defense take a toll. On more than one occasion, I saw less successful males retreat to the surface. Their chests were marred by bites and they left a bloody trail in the ice from wounded flippers. For the most part, however, the drama of mating behaviour is more often heard than seen.

Antarctic Journal, November 6, 1996
Big Razorback Island (77° 18' S 166° 50' E)

It was a relief to see the horizon again after several days of whiteness; Black Island and Mt. Discovery measured the distance across the McMurdo Sound. Over the last several days, several inches of powdery snow had fallen. We moved on snow-machines past the Erebus ice tongue, whose blues were iridescent. The wind picked up. In the distance, Tent Island seemed to hover over the sea ice; the wind blew snow in a dense sweep about twenty metres high. Occasional eddies would rise like dust devils and disappear. The surface held reticulated patterns and myriad finely tapered drifts, some no more than a centimetre wide and a few centimetres long. These indicated the prevailing wind direction—howling off Mt. Erebus and into the sound. Snow snakes meandered along the ice. The horizon features became obscured and we crawled along, keeping one track flag after another in sight. Above, the sky was a pale blue. In front of us everything was white. We arrived at camp and off-loaded gear from the Spryte, our tracked vehicle. The sky cleared. I surveyed the tidal cracks off Big Razorback and looked at groups of seals; two gatherings of mothers and pups were concentrated at either end of the island. Many had been at the surface for a while, for the snow formed a thick crust on their fur. The pups were a honey-coloured brown, their lanugo not yet shed. The surrounding snow was stained with blood and urine as skuas strained at placentas, half-buried in the ice. Their gull-like calls and the pleading of the pups pealed and reverberated off the face of Big Razorback. The island arcs slightly to yield a shallow parabolic curve. Standing at the mid-point, promontories at either end rise in peripheral vision to compress the composition. Sounds scattered and focused in the leeward shelter. In a curious collusion between *trompe l'oeuil* and *trompe l'oreille*, I could discern details in distant reflected sound, while calls closer to my ear dissipated instantly in the frozen air. Scree loosened, fell, and skated across the ice like breaking crystal. I wanted to situate myself so that I could enjoy this space. I set up my hydrophones for recording in a parallel relationship to the tidal cracks. In this way, I could listen at the surface and below to the passing parade of Weddells. In testing the ice, I could hear powerful and eerie sounds from under more than two metres of sea ice. Percussive chugs of posturing males played on the soles of my feet. A number of Weddell vocalisations have been measured at nearly 200 decibels!

With help from the "sealheads," members of the research team, I dug down to the sea ice through about fifty centimetres of snow and cleared the surface for pitching my Scott polar tent. We then paced out three sites, about fifty metres apart, and proceeded to drill a series of thirty-centimetre holes in the ice for lowering my hydrophones: one of which would be located in my tent. This first hole was drilled slightly below sea level and, when we broke through at about two metres, it gushed and flooded my floor. As the sea water froze it helped level the array of cracks that had developed over the winter; it was nice to have an even floor. The sun slanted over the sound, and it was time for a break. After dinner, as my colleagues turned in for the night, I returned to my tent, set up a pair of hydrophones to a depth of twenty metres, and listened …

The ocean seemed to be an infinite realm of otherworldly soundings—all the voices of one species, the Weddell seal. In the course of classifying more than

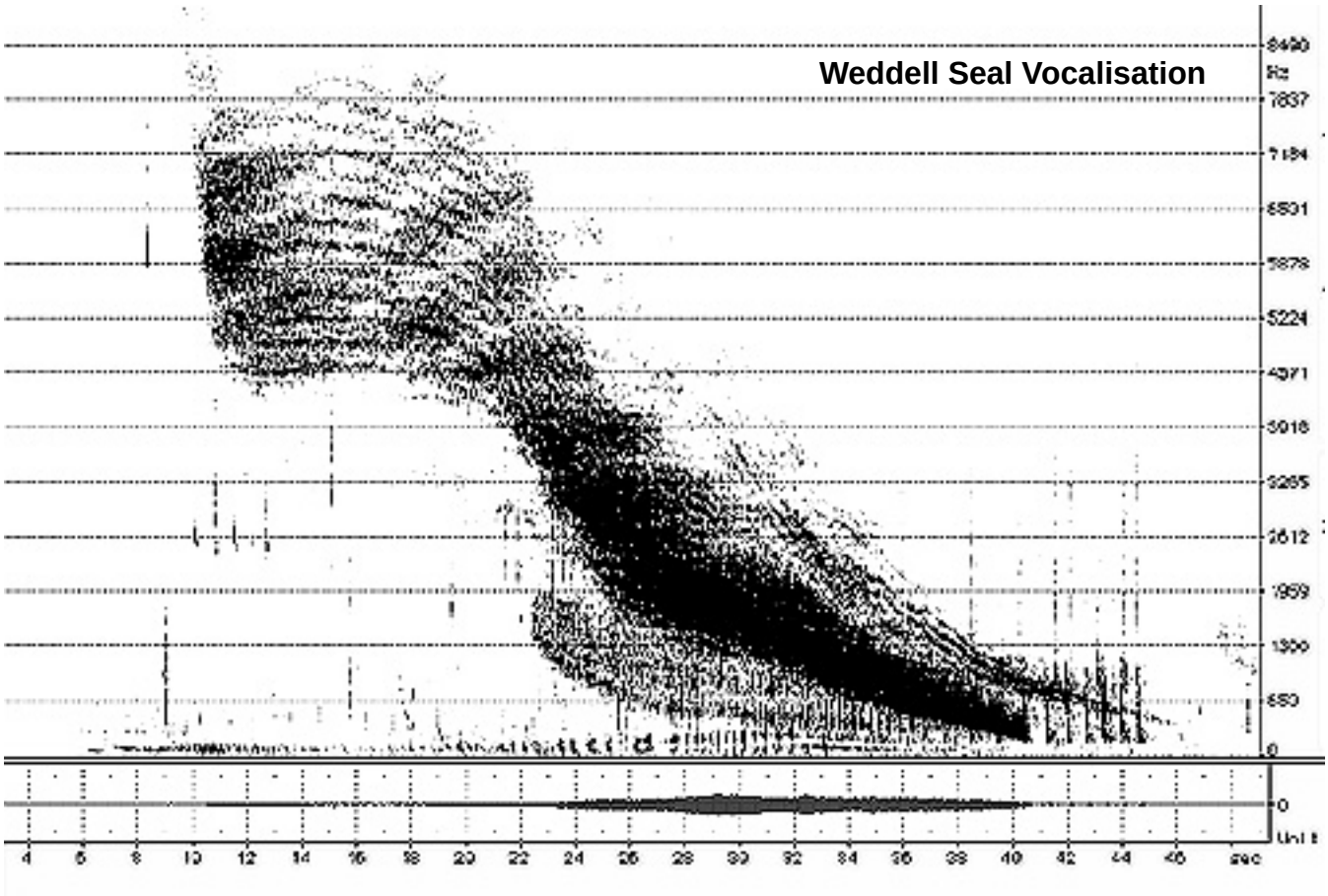
thirty calls in these vociferous creatures, Jeanette Thomas and Valerian Kuechle described and named a compendium of terms employed by various researchers. Colourful and evocative in their aural suggestion, these include trill, guttural thump, chirp, chi-chi-chi, chirrup, eeyoo, chug, what-chunk, chnk-chnk, too-loo, rr-whmp, jaw-snap, jaw-claps, chink, pulses, click, teeth chatter, guttural glug, cricket call, knock, seitz, growl, and mew. The most compelling calls were long, thin glissandi of complex tones. They whispered like radio frequencies at night, sounding one over another, in a lulling chorus that seemed to come from all over McMurdo Sound. It was hard to know from how far away the sounds were coming. Through my headphones, I discerned creakings and the occasional ping of tension being released as the ice settled at ebb tide. Tidal action was also heard as a crackling and tinkling: water pulling at a veneer of newly formed crystals on the underside of the ice. I lay in my tent, recording until 3:00 am, earwitness to an amazing-sounding world. It was hard to sleep, and I was up in a few hours to record again.

Emperor Penguins

Without a doubt, emperor penguins (*Aptenodytes forsteri*) are among the most extraordinary creatures on the planet—uniquely adapted to living in extremes. They lay their eggs on newly formed sea ice in the darkest and coldest months of the austral winter, and have been known to dive to depths of over 300 metres in search of food. Penguins are a charismatic species and seem to touch our own deepest biophylic impulses (the term "biophylia" was coined by Edward O. Wilson, to signify "the innate tendency to focus on life and lifelike processes"). Their gregarious nature, social cohesiveness and apparent curiosity are a reassuring reflection of our own humanity. And there is something about the upright posture and the clear delineation of plumage that communicates both dignity and comedy. Almost without exception, every penguin researcher I encountered smiled as they described their work. I was looking forward to my first encounter. Emperor penguin voices are an example of acoustic dimorphism, in that males and females have different calls. In fact, it is hard to tell the sexes apart at a glance, but for their sound. These had been variously described to me as overblown saxophone mouthpieces or, in chorus, as a detuned brass ensemble. I was intrigued, but wondered how I might get close enough to record them. I soon discovered that this was not a concern at all.

Antarctic Journal, November 19, 1996
Sea Ice Edge (77° 37' S 165° 48' E)

I woke up early, with excitement at the prospect of a trip to the sea-ice edge. The night before, I had seen a darkening sky over Minna Bluff between Black and White Islands, in an area known as Herbie Alley—for the "herbies," or storms, that pass this way. To my surprise, it was partly cloudy. The wind, however, had changed and was blowing offshore, down over McMurdo from the hills and the continent. This was not an encouraging situation, either for ice-edge work or for recording. Weather here is localized, and one often may encounter fair or worsening conditions in travelling. I talked to my colleague and safety instructor, Buck Tilley, and we decided it would be a "go." Quite suddenly, the wind died down completely. We decided not to waste any time, and rode out to yesterday's site—in hopes that the emperor penguins were still there. Our route had been obscured to some extent by the wind covering the tracks of the previous day with snow, but enough remained that we found the spot again, no problem. In usual fashion, our arrival was heralded by the penguins, who filed over in a single line to greet us. They formed a semi-circle around our snow-machines and watched us unpack. With the wind abated, and no guarantee that it would stay nice, I hastily set to placing the microphones near their diving hole. This enabled me to listen to the birds' diving activity: the splashing, the entrances and exits from the water, and the calling that comes as part of the ceremony and ritual of



their busy lives. As I settled in, I ran out six metres of cable, and sat down with my recording gear. Gradually, the penguins came out of the water and waddled over to me. They examined the furry microphone windscreen and pecked at it, walked around the entire rig, looking carefully at everything. The cables lying in the snow were also a source of intrigue and they followed the lines out to the recorder, stooping to inspect and nudging with their beaks. The linear aspect held a special attraction for them: they lined up on one side and stepped over to the other side in a haphazard version of line- or reel dancing—another variation on a loosely choreographed gesture which accompanies much of their social interaction. Eventually, I was completely surrounded by a throng of curious heads and shiny, round white bellies. As more emperors gathered, the circle tightened and they ventured very close—to within thirty centimetres. I realized that, from my seated position, they were as tall or taller than me. I looked down at their feet, black and scaled with three pronounced toes, toe-nails, and one seemingly vestigial thumb or dew-claw on the topside—curiously reptilian. One rather bold penguin made an exploratory peck at my jacket, as if to say, "What are you?" I was nervous about being pecked at—images from an Alfred Hitchcock movie came to mind—so I sat up and rolled my head, as I had seen them do. They all shuffled in ranks and adjusted their positions; nobody backed off but neither was another peck forthcoming, and I did not try to touch one of them—a comfortable boundary seemed to have been acknowledged. The next point of interest was the blue and pink freezer-bag that I keep my tape-recorder and batteries in. Several birds sauntered up and peered inside—no beak probing, just a quick scan and a look around. All throughout this coming together, one bird had sidled up to me and just stared. I deferred, occasionally making eye contact for nearly an hour; I had a companion. Meanwhile, a pair of birds stood belly to belly, off to my right. From time to time they drew themselves up to attention, shrugged their shoulders, lowered their heads and let loose with wonderful, ratcheting trumpet sounds. In time, most of the flock casually ambled back to the water—except for my companion, who lingered with a glisten-

ing gaze. In all my years of field work, I have rarely come across a species so overtly curious and apparently fearless. Unlike the Arctic, there are no land predators here, and penguins have no reason to avoid people. As humans, we generally relate to animals as pets, as quarry, as food, or as subjects of observation in captivity—either in a zoo or "captured" on film or video. These perspectives usually involve notions of dominance, fear, and above all, distance, both physical and psychological. I had never been in this position before with such a large group of feral individuals, and the feelings I had were new to me. It was a powerful encounter, filled with subtle nuances, mutual probing, and shared wonder, quite unlike anything I have known—or will know, I suspect.

McMurdo Dry Valleys

The opportunity to travel inland came in late November. I made arrangements to join the Long-Term Ecological Research (LTER) group at Lake Hoare. The McMurdo Dry Valleys lie some 100 kilometres across McMurdo Sound from the US base. Unique in a unique place, the valleys are among the most harshly arid deserts on earth—drier and colder than most places we could imagine. The region is also the largest area relatively free of ice on the continent—some 4,800 square kilometres. There is life in the valleys, where micro-invertebrates, microbial communities, mosses, and lichens have adapted to conditions in this environment. During the austral summer under a piercing sun, glaciers yield meltwaters: streams come to life, permanently ice-covered lakes are replenished from beneath, and a vital nutrient cycle plays out. To our ears, the microworld is far away. It was the sounds of ice that I was curious about. I wanted to know the intimate resonances of glacial movement.

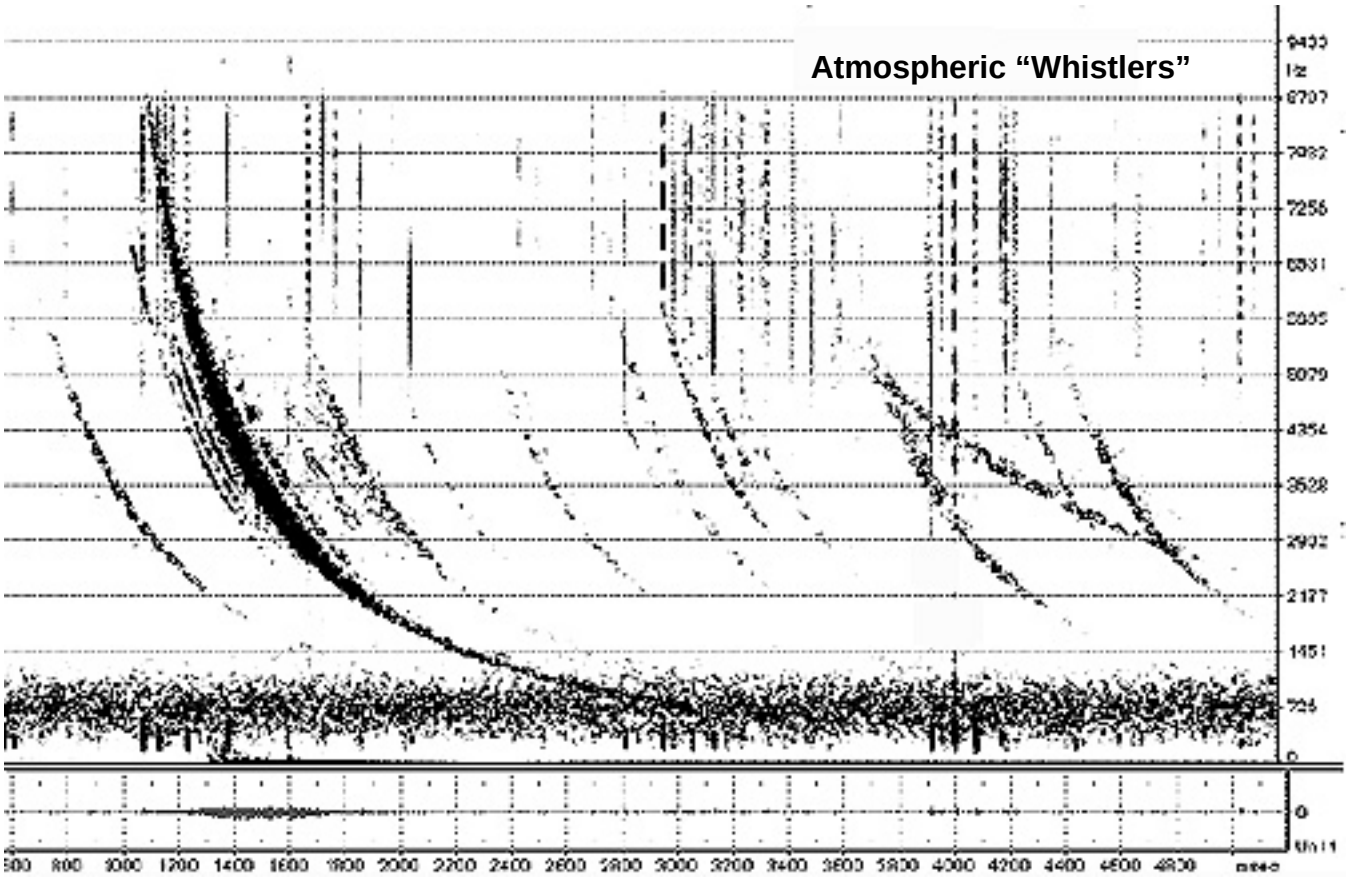
Antarctic Journal, November 29, 1996
Canada Glacier, Lake Hoare (77° 37' S 162° 54' E)

The tent had warmed considerably with the energy of the sun, which now cast long shadows across the face of the Canada Glacier. It was 2:30 am and I had been scarcely asleep for more than a few hours when a loud, resounding boom startled me. The glacier was cooling off in the shade, and refreezing channels of water heaved within the ice. It was time to get up and record some more—these were different sounds than I had experienced earlier! I quickly assembled my hydrophone rig and put on my crampons, scampering up the apron of the glacier to see if the hole I had bored eight hours ago was still viable. Sure enough, a two-centimetre ice-skin had formed over the opening. This was easy to hack through with an ice-ax, and I was in business—just topped off a little water and lowered the hydrophone in. For the next four hours I was treated to an extraordinary percussion performance, as expanding and freezing ice creaked and fractured within.

Of Whistlers and Weddells

In the mounting humidity and heat of an approaching summer convection storm, a bolt of lightning splits the sky over the eastern United States. The strike is heard a few seconds later in an associated crash of thunder. Electromagnetic energy from the lightning also propagates through the upper atmosphere and beyond, at the speed of light, so that, in less time than it takes for that thunder to be heard, the breath of a whistler can be picked up through a receiver at Palmer Station on the Antarctic Peninsula [refer to Musicworks CD 68]. Don Carpenter, professor emeritus at Stanford University's STAR Laboratory, described the phenomenon to me. Waves of energy from the lightning move through layers in the magnetosphere, measured in distances of earth's radii. They follow lines of force associated with the magnetic field around the planet. These lines of force extend in latitude away from the earth, rounding polar cusps to return along the earth's axis at the poles. Wave energy is channeled in so-called "ducts," to concentrate as atmospheric whistlers in the Arctic and Antarctic. Depending on the distance the waves travel, the media through which they pass (including dense regions of enhanced ionization), as well as the degree of electron precipitation they induce, whistlers will have various pitch, duration, and decay characteristics when they are heard as sound. I think of the process as a sort of granular synthesis on a cosmic level. Carpenter also described other related acoustic events as "hisses," for their broadband noise components, and "dawn choruses," for their indeterminately pitched material, reminiscent of birdsong.

One curious aspect of whistlers is the way in which they sound like certain vocalisations of the Weddell seal. The relationship is what I describe as



“acoustifractal”—referring to scalable sound and morphological similarity in a soundscape. It is interesting to compare several features of a Weddell seal long-duration call, known as a T-call, and an atmospheric whistler. Both sounds have a clearly descending glissando, often with discrete components. The mean maximum fundamental frequency range for the long duration calls in the seals lies between 0.9 and 12.8 kilohertz. In audio playback, whistler sounds have a characteristic signature of a descending glissando occupying variable frequency ranges between one kilohertz to ten kilohertz. They may last as long as four seconds. On the other hand, Weddell T-calls can last for forty seconds. Another shared temporal quality involves overlapping events, creating a sonic continuo. Lightning-strikes occur all around the equator and associated temperate zones, producing a layering of whistlers with varying density. I never heard a lone Weddell seal calling. My experience was one of a collective voice defining the soundscape. I was struck by the haunting sounds of both seals and whistlers and their uncanny similarity. Why are these sounds alike? Is there a reason? Can seals “hear” or sense whistlers in ways that we do not yet understand? I asked myself these questions, knowing that it may be folly to infer a direct correlation. Little is known about hearing capabilities in Weddell seals. Most Weddell vocalisations occur below twenty kilohertz and leopard seals (*Hydrurga leptonyx*) have been known to emit calls as high as 164 kilohertz. Furthermore, I had the opportunity to listen to recordings of the bearded seal (*Erignathus barbartus*), an Arctic counterpart to the Weddell. These two species share, more than other pinnipeds whose sounds I have heard, an especially rich vocal range, and aspects of their calls are not dissimilar. Weddell and bearded seals live in regions where whistlers are a common phenomenon. At this point, I can only wonder. To describe patterns and similarities is a beginning.

We often “draw” a conclusion in writing—a visual analogy and an enactment of circumscription and closure. The acoustic ecology of this remote world lies at the edge of human experience and its complexities are still only dimly perceived. I left Antarctica with an open ear, humbled by knowing spaces and voices I could scarcely have imagined.

> … to the degree that we come to understand other organisms, we will place greater value on them, and on ourselves.
> —Edward O. Wilson

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