BONNIE LAMMAR

Ice Boat, 2015
Archival pigment print, 12 x 12 in

COURTESY: THE ARTIST

DAN LINEHAN

Surfing on Rocks of Ice

Observing Penguins at the Glacier

Once I caught sight of the little wood hut on the foothills of Mount Skittle at the northern edge of St. Andrew's Bay, South Georgia, my decision where to go first was obvious. A subantarctic island about 1,100 miles east of the southern tip of Argentina, South Georgia is the world's largest breeding ground for king penguins. I figured that the half a million of them waddling around weren't going anywhere. My boots had gotten swamped in the waves getting off the Zodiac, but after a few minutes, I didn't notice the sloshing thanks to my thick wool socks.

After I reached the hut, I could see why this landing was one of the most impressive in all of South Georgia. Not some abandoned shack from the whaling days, the hut was a solidly constructed outpost with four steel cables stretching from the roof to heavy-duty anchors in the ground, similar to how campers tie down tents with stakes. This precaution would have been completely overblown any other place on Earth. But here at the bay, two dominant glaciers—the Cook and the Heaney—loomed ahead of me.

The glaciers extend down from the mountains toward the coast, and deadly, high-speed winds form over these glaciers with little warning, racing downward from the mountain peaks to the shore at speeds greater than 100 miles per hour. Called katabatic winds, they can occur all over South Georgia, but they are notoriously powerful and rapid forming here at St. Andrews Bay. Before I had set off on my own, the expedition leader, Ron, still clad in his waterproof survival suit, reminded everyone who came ashore of an incident that happened here while he was leading an expedition in 1998. Furious winds had stranded members of his landing party. It had taken nine hours before the winds had died down enough for them to be evacuated. "We'll be watching for signs," he told us. "If we see something developing, we'll have the ship sound its horn. Come to the landing site immediately."

Wind was not the only force that could knock open the hut's door. From time to time a venturous elephant seal would find its way uphill, break in to seize some shelter, and leave behind a housekeeping disaster.

The view from the hut was good but not good enough. I hiked farther up, reaching an overhang on a high cliff wall. Enormous black patches draped over the glaciers, the slow moving shadows of clouds. Straight out ahead, where

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the curve of bay reached farthest inland at the base of the Cook Glacier and beyond, the largest king penguin colony in the world amassed. From up this high, they blanketed the surface like black and white confetti. The kings covered the beach, congregated around the banks of the meltwater lagoon at the face of the glacier, clustered along the rivulets flowing from the other glaciers farther inland, and seemed to collect in all the remaining space.

I checked a map of St. Andrews Bay made in 1980 by the British Antarctic Survey, England's scientific body that studied this region. It showed the Cook Glacier at the edge of the bay and the two glaciers merged together. Staring down, I realized this was far from reality now as each glacier retreated from the coast and from one another. Heaney, now farther inland than Cook, had receded about 130 feet per year over the past couple of decades.

I wanted to reach the top of Mount Skittle but again had to reel myself in. My purpose was not to try climbing every single mountain no matter how much the reverse of gravity pulled me up. I turned my back to the peak and surveyed the expanse of land bounded by the bay, glaciers, and mountains. Time to set off for Heaney, which looked to be more than a mile away. Since there were no paths, I needed to forge my own across this battered, sometimes ragged, sometimes rounded terrain.

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Of all the animals that have ever charged, lunged, leered, or sneered at me, the Antarctic terns and their incessant screams gave me the biggest fucking headaches. I've had an easier time getting away from swarms of enraged yellow jackets. During this time of year, these whitish, pale-gray birds sported black heads—well-deserved hooded masks for these little villains.

At first they buzzed me a little bit. A couple hit my boot when I held it out. I was desperate for anything that might help, and this move worked to keep the fur seals from getting too close. After having first encountered the terns on a previous day's landing, I tried to be better prepared for them. So, I had asked a guide who was a bird expert how best to deal with them. She had suggested that if I heard them screech and they started swooping at me as I walked, then I should change my direction. I took her advice now but ended up changing my direction so many times that I became almost dizzy from feeling like a pinball ricocheting off flippers and bumpers. I would have been more than happy to steer clear if they had just stopped taunting me and made up their tiny bird-brained minds about where they wanted me to go.

I hadn't gotten tagged on the head yet, but they came close enough that I felt the crisp wind off their wings as they flapped away just before contact. When the Sun was at my back, I saw my shadow in front of me and the shadows of these feather-clad missiles swerving at the last millisecond.

Slowly they herded me away and finally started to relent. All except for the last one, whose job was apparently to trail me and make sure I left town and never returned. Caracaras and skuas have swooped at me before—never really a problem. But these dive-bombing gnats probably bombarded me a thousand times by now. I never saw a nest. Given the choice, I'd rather face bloodsucking mosquitos than Antarctic terns. Alfred Hitchcock made a big mistake by not mixing in a few of these bastards in his movie. For a brief moment, I contemplated the dimensions needed to build an adequately sized bug zapper…

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Days ago, Ron had said during a lecture aboard the *Southern Aurora* as we steamed to South Georgia, "Glaciers are like sleds, sandpaper, and wedges." Everywhere I looked, the rocks confirmed this was true. The movement of glaciers pulverized and ground and rock-tumbled. Every mound and pile marked the history of retreats and advances, and the loose rock of this glacier-etched terrain hindered nearly every step of my travel.

Made of sharp rock fragments, the deep scree that coated hillsides gave way easily underfoot, and I often slipped and slid down their knifelike edges as if I were skidding down a sand dune. Some smooth rocks shone with luster, while others appeared metallized. Others were jagged and fractured or rounded from long exposure to wind and water. So many rich colors, from orange to bronze to deep red and colors in between, all juxtaposed like an Impressionist's painting. I passed a region of only gray gravel, then the ground turned gritty and damp from meltwater. I looked back at my boot prints and had the sensation of seeing them as dinosaur footsteps along a source of ancient water.

As I closed in on the glacier, I found myself not alone. The surest way paralleled the largest meltwater river. Along this route, king penguins took short pauses from their frolicking or standing around to look me over as I walked on by. Many of these penguins couldn't go out to sea because they were in the process of molting or they were too young. Lost penguin feathers spread over wide swaths of ground and accumulated in areas of standing water.

Reaching the edge of the Heaney Glacier, I was again confronted by a body of water. Not the ocean, not the bay, but a giant meltwater lake where small icebergs and reflections of the surrounding mountains did the swimming. Wayward torrents poured from the glacier. Rapids rushed forth with weary roars. Meltwater ran off the face and rained off the edges in hapless deluges. As the glacier's edges melted inward and tumbled apart, the splashes of ice chunks and debris—sediment, pebbles, rocks, and boulders—that fell from its top punctuated the constant sound of gushing.

With my chance of touching the face of the glacier plunged to zero, I worked my way around the lake to the right of the glacier and found it dramatically undercut by a deep groove sliced into its base. This sharpened the glacier at its corner into a point about 4 feet high, which extended over the ground for 10 feet. It looked like a giant bird's beak. Collapsed ice plates, ranging from at least 1.5 to more than 3 feet thick, made up the edge. I was stunned to see the glacier release so much water from every direction. And I was only looking at one tiny part of it. This kind of melting occurred all along the glacier.

The glacier wasn't frozen solid like a cup of water in a freezer. It consisted of ice crystals, roughly as wide as coins, like the cells that make up the human body. Nothing more than solid water, ice is a rock by definition. In fact, individual snowflakes are also just single crystals. Glaciers are then metamorphic rocks because the snow that falls on their surfaces squeezes tightly together due to the immense weight of subsequent snowfall. The compacted snowflakes then transform into small crystals that grow and grow over time.

I once tried to get a frozen bottle of water through airport security. I informed them that the bottle contained only ice not liquid, and I explained that it was not only as solid as a rock, but it *was* a rock as defined by science. So, since there wasn't any restriction on rocks, there obviously was no issue. The security forces didn't buy it. I feared that if I argued more about why they should let me through with my rock of water, then not only would I miss my flight but the ice would melt and my argument would no longer hold any water.

Up to now it was too risky to attempt to touch a glacier. But here I actually found a spot where I could climb onto it. Ironically, I was safer *on* Heaney Glacier than standing next to it. Before getting up there, just as I had finished taking photos and moved to get my backpack, a rock twice the size of my head had come crashing down from the glacier to where I had stood. As I walked on top of my first glacier after this close call, I envisioned a vast field of white rising all the way to the distant mountain peaks. But from all the battles the glacier ice won over the mountain rock, dark debris of moraine covered much of its surface.

The Heaney Glacier had made a retreat, but this did not mean that the whole glacier physically moved like a frozen blob up the mountains and away from the bay. Essentially, the glacier shrank as its face and edges continually melted away and their positions crept upward and inward. But no matter whether a glacier retreats or advances, all glaciers move downhill. Glaciers are massive. And nothing escapes the force of gravity.

So, as this glacier retreated, it moved against the ever-present downhill slide due to gravity, as if paddling a canoe up a river against the flow of its current. As I stood still on the glacier, I was slowly moving toward the bay, but if I waited long enough, then the glacier's face would shrink back to where I was standing and dump me into the meltwater lake with the penguins. If I waited even longer, and the glacier never stopped melting this way, then both it and all the meltwater would eventually disappear. If, on the other hand, this glacier were advancing, then I could slowly surf it all the way to the ocean. What a long ride that would be.

I soon discovered a small cavern that opened down into a river flowing under the glacier. Underground water acted like a lubricant and accelerated the glacier's movement downhill. In other words, the glacier as a whole slipped downhill faster because of this, but still the rate that the face melted far outpaced this sliding. Meltwater etched and eroded many more large openings in the glacier's surface, revealing deep drains of falling meltwater lined by crumbled sheets of ice 3 to 4 feet thick. The darker sheets had more rock debris on top. The lighter ones were more freshly exposed.

Ron had said that, overall, the glaciers of South Georgia were retreating about 1 to 3 feet per day. Based on what I observed, that rate seemed on the conservative side.

Beyond the surrounding mountain ridges, 40 miles to the northwest, was the Trident. Nearly 100 years ago, conditions had forced Sir Ernest Shackleton and a handful of crew to sled down a glacier next to its three peaks into the dark and the unknown. Shackleton and his men had spent almost 7 months of defying death day to day while traveling 1,400 miles by foot and lifeboat. Mountains now shielded from my gaze were the last obstacles between their ship *Endurance*—crushed by ice in Antarctica—and their safe return to civilization. They had plunged down the ice blind to its hazards, letting chance and their best judgment steer them away from plummeting off a tall cliff or disappearing down a deep crevasse. Back then, no maps existed far past the boundary of the coastline. They were the first humans to penetrate this unknown.

A few years ago, Ron had retraced Shackleton's trek here in South Georgia. "Due to climate change, the place where Shackleton sledded down is now nothing but rock," he would later tell me.

The cloud cover broke, revealing a vibrant blue sky. This probably indicated that the winds were ready to pick up soon, and I took it as a sign that it was time to head back. I passed four of my footprints in a small section of soft mud and now placed four more in the other direction. I wondered how long those footprints would last. Would anyone ever see them? If I disappeared from the face of the planet, would they be the last sign of me?

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I heard the roar of river rapids ahead and searched for a spot to cross. I figured the water would be shallower here since the rocks weren't completely covered by water. As I reached them and pondered whether to cross, kings walked up to the opposite bank and prepared to forge across to my side. When kings waddle, they don't sway side to side as much as the smaller penguins. And when they look at you or something else, it isn't always just their eyes moving up and down, but their entire heads gyrating atop their slender necks.

I watched them go in up to their waists. That didn't look too bad. The water level would be over my boots, but not being trapped on this side of the river was more important than staying dry. Besides, I had already soaked my boots to start the day off and wasn't suffering. Once more wouldn't hurt. Then the kings went in up to their chests. That was about 2 feet deep. I started to lose my bravado. Then they slipped down into the rapids and had to swim. I turned away from the river and walked on.

The farther I ventured away from the glacier, the less pristine the water became. Along the shores, where the water moved more slowly than in the middle, the banks had collected a putrid green gook, which may or may not be the scientific name for it, from the penguin colony upstream. The day before at Fortuna Bay, I had enjoyed the taste of glacier water from the time of the dinosaurs, but I was not in the least bit interested to try glacier water fresh off the tap from the time of these penguins. Just as you want to take precautions not to be downwind of a penguin colony, you want to avoid being downstream of them as well.

We had 14 hours at St. Andrews Bay. During breakfast, I had grabbed some ham, cheese, and crackers on the down low to take with me. I also took my reusable water bottle. So, I did eat a little food and had to take a piss at some point. Hours of marching up and down mountains and navigating all sorts of challenging terrain left me little choice. I justified this to myself. Since I was on a mission, not a vacation, I tried to extract as much as I could in the time I had for something greater than just personal experiences. This was my work to reveal the wonders and the travesties. This was bigger than me. I was a scientific explorer. And though my work wouldn't end up in some peer-reviewed, dusty old journal, I planned to spread the word about climate change to the world one way or another.

Still, I was extremely careful to make sure that any food I brought ended up only in my stomach and that I relieved myself in a low-impact manner. Besides, whenever I saw trash—which even for these remote places was unbelievably far too common—I picked it up. This helped put my mind at peace by balancing my indiscretions of eating and taking a bathroom break ashore. I did my best to leave the lands I visited better than when I found them. Every little bit made a difference. Picking up just one piece of plastic or other garbage didn't take much effort. I felt that if everyone adopted a similar approach with the natural resources they enjoyed, then the results would compound into something extraordinary.

The weather stayed fantastic. Katabatic winds never materialized. I climbed a ridge. It was good to be up high again as I got closer to the heart of the colony. I passed more interesting rocks, these with deep, dark, blood-red and copper colors. They looked like small armor plates or the scales dropped from dinosaurs. Below, wall-to-wall penguins lined the banks of braided streams and rivulets from the glaciers, a river system outlined in penguins. I wore a bandana for a few reasons. First, it helped keep me warm. Second, it helped keep the sunrays off me. And third, it helped reduce the odor coming from the half million king penguins, not to mention all sorts of other birds, as well as elephant and fur seals.

Three king penguins traveled with their funny movements up the slope toward me. When it was too steep for them to walk, they leaned down on their stomachs and used their beaks like ice axes to drag themselves up. Their feet pushed forward, and flippers helped stabilize and pull. The route I took back to the beach soon brought me close to curious chicks wearing completely oversized brown jackets that looked more like the fluffed-out long hair of Himalayan animals—or what happened when cartoon cats were put in washers and dryers—than the down feathers of birds. The chicks appeared so warm and content. But that didn't last long. Soon their impatient whistles chimed for parents returning from the sea with food ready to regurgitate.

As my Zodiac splashed forward and sped me back to the *Southern Aurora*, it was hard to look ahead. Instead, I turned away from the ship to watch the wake that followed and the king penguins become undistinguishable from the land they stood upon as the colony shrank from sight. My wonder melted into worry as I thought about how much time was left until they and the environment around them would also disappear in the distance.

This excerpt is taken from a longer work in progress that the author characterizes as fact-based fiction.

Author, freelance writer, and environmentalist **Dan Linehan** recently returned from a year and a half in Argentina, where he wrote about wildlife and environmental issues and worked on his novel *The Princess of the Bottom of the World*. The novel is based on his real-life adventures in Antarctica and the surrounding regions, such as the incidents described in this excerpt.