

Crevasses, Rocks and Huskies in Greenland

My introduction to geology in the 1950s

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Greenland became a semi-autonomous part of the Danish Kingdom in 1953, having been a Danish colony since 1851. In 1950, when this story began, Greenland's population was only about 24,000, of whom perhaps 1,000 were Europeans – mainly Danes. The natives are a mixed European-Eskimo race, and many of them still followed the Eskimo way of life; they are called Greenlanders. Fishing, shrimping, sealing, and mining are the main economic activities. Most of people live on the west coast, there being only two settlements on the east coast where the pack-ice drifting from the north has been an effective barrier to ships and people.

Toward the end of my first year at the University of St. Andrews (in Scotland), where I expected to major in Physics and took an elective course in Geology, Dr. Harald Drever invited me to join his British West Greenland Expedition as an assistant. The small university expedition (only six members) was to spend the summer months of 1950 doing glaciology and geology halfway up the west coast of Greenland. I said thank you, this sounded attractive, but I could not go because I had to get a job through the summer. He said never mind, we'll cover expenses. He sent me to London for a one-day course in practical glaciology from Gerald Seligman, President of the new British Glaciological Society. So I went to Greenland, was converted to geology, and in 1952 I earned a B.Sc. in Geology and Physics.

Because I was now a confirmed geologist with Greenland experience, Drever nominated me to join the British North Greenland Expedition, a large national team (with 25 members) planning to explore Northeast Greenland and the ice sheet through 1952-54. After interviews with the Expedition Leader, Commander C.J.W. Simpson (of the Royal Navy), Professor L. R. Wager (a Greenland geology expert at Oxford University) and the Bishop of Portsmouth (who had spent three years in the Antarctic before World War II, and was converted from geology but still appreciated the subject), I was appointed Assistant Geologist to Douglas Peacock from the University of Newcastle. After two years with a husky dog team learning something about field geology, I was ready for a life of polar exploration. The following accounts consist mostly of material that I wrote in the 1950s, when ice, rocks and dogs were prominent in my dreams.

BOX 1: The Greenland-scape

Greenland (officially called "Kalādlit Nunāt") is the world's largest island, with greatest length and breadth 1,650 miles and nearly 800 miles, respectively, stretching between latitudes 60°N and nearly 84°N. A huge dome of ice that rises to over 10,000 feet above sea level covers about 80 percent of the land. This ice sheet oozes away through outlet glaciers that slice through the rim of high, coastal mountains. The long deep fjords that run between steep mountain walls demonstrate more extended glaciation in the past. Greenland is an eastern extension of the Canadian shield. It was once connected to Europe as well until breakup of the supercontinent *Pangaea* created the mid-Atlantic ridge migrating northwards between Greenland and Norway, starting in the Cretaceous Period. Most Greenland rocks are gneisses and granites of Precambrian age. The rocks near Godthaab, at least 3.8 billion years old and among the oldest on Earth, are believed by some geologists to contain the earliest records of microbial life. There are Paleozoic sedimentary rocks scattered around the coastal mountains. Greenland together with parts of Europe was affected by the Caledonian orogeny during mid-Paleozoic times. Cretaceous fossils and coal deposits near Disko Island on the west coast indicate a temperate climate about 100 million years ago. Igneous intrusions and lava flows of Tertiary age were associated with the continental breakup. These include the famous Skaergaard layered intrusion in the south-east, and olivine-rich picrite lavas in the west. The inland geology was obscured as the ice sheet formed

about 1.5 million years ago. Since then, the ice has waxed and waned repeatedly following climatic changes, with the last glacial period spanning approximately 80,000 to 10,000 years ago. We presently live in a warm interglacial period, but ice still covers most of Greenland's landscape.

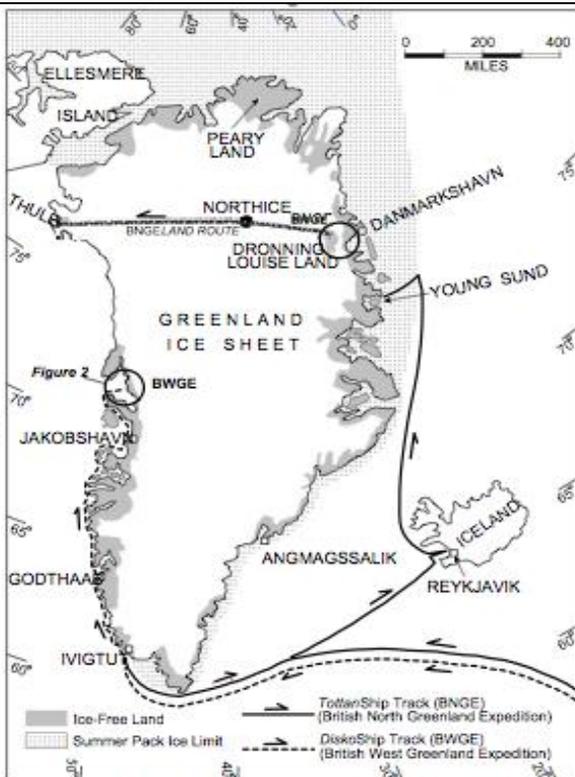


Figure 6-1. A map of Greenland showing the ship routes of the British north and west Greenland expeditions in the 1950s in which the author participated (Modified after Banks, High Arctic, 1957).

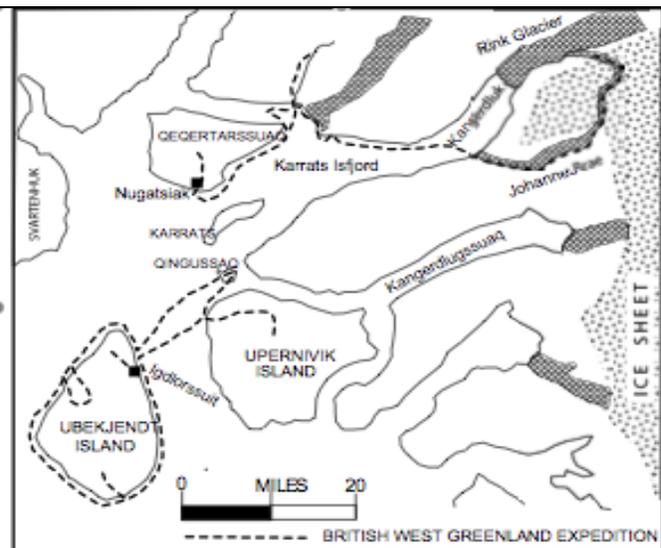


Figure 6-2. A sketch map of west Greenland showing the location of places visited by the British West Greenland Expedition in 1950.

1. The Summer of 1950: The British West Greenland Expedition

Harald Drever had been to the west coast of Greenland in three summer expeditions before World War II, and in 1947 he planned another to the same region (near 71.5°N). The primary objectives were to study the fast-moving, unexplored Rink Glacier, and the thick pile of picrite-basalt lavas on Ubekjendt Island. After permission was obtained from the Danish Government and the British Foreign Office, the British West Greenland Expedition (BWGE) comprising six scientists and mountaineers sailed from Copenhagen on July 1st, 1950, in the Danish ship *Disko*, settlement-hopping up the west coast of Greenland, and reaching Jakobshavn on July 15th. The expedition and all supplies

were then transshipped into two successively smaller boats, and we eventually reached a lonely outstation called Nugatsiak on July 23rd. This was the main base from which several exploration ventures started.

An important collaboration was with a Danish expedition led by Professor Rosenkrantz. BWGE member William Scott Mackenzie joined the Dane Hans Pauly in a geological survey of more than 300 miles of coast-line, using the Danish ship the *Ussing*. A 16-foot boat with outboard motor provided the transportation for our other ventures through iceberg filled fjords to reach the snouts of glaciers, several locations for geological reconnaissance and mapping, and Upernivik Island with peaks to be climbed. Four Greenlander hunters and a kayak were recruited to help move supplies and to supplement rations with seals, gulls, and cod.

Here I share a small selection of personal experiences in the BWGE.

1.1. The Rink Glacier: August 2 to 20, 1950

Our exploration was about 40 miles up the fjord (Kangerdluk) to the Rink Glacier, renowned for the spectacular calvings from its ice front that was about 300 feet high. Huge masses of ice fall off and send waves up to 50 feet high down the fjord, tossing the abundant, somersaulting icebergs toward any vessels in the way. By August 2nd the party of ten was camped on a quartzite ledge 30 feet above sea level near the Johannes Glacier, about 10 miles from the Rink's snout. A cooperative effort dragged the sledges and supplies over hummocky and crevassed ice and up a steep ice-fall in two trips, reaching about seven miles up the Johannes Brae by August 6th. The Expedition then split up leaving four of us to continue up and over the edge of the ice sheet and down another glacier to reach the surface of the Rink glacier about six miles upstream from its snout.

Norman Tennent was in charge of the Rink party, supported by two other mountaineers – Malcolm Slesser and Trevor Ransley. Ransley was also the surveyor, and I was the trainee glaciologist. We man-hauled our two Swedish pulka sledges from rough ice to smooth snow above about 3,500 feet, after which pulling on skis became almost pleasant as we negotiated routes across snow-hidden crevasses.

We eventually reached the top and cruised over the gentle dome of the local ice cap at about 6,500 feet elevation. After a few more miles we reached the brink of a basin that almost literally fell down to the Rink Glacier. We had to leave the sledges in a depot, hoist very heavy loads to our backs and scramble thousands of feet down ice and scree before reaching the lateral moraine of the Rink Glacier on August 10th. We camped there for six days.

We were fully established and ready to start work by 11th August. Our first job was to find the speed of the glacier, and this involved setting up markers. Tennent's leg was injured during the final descent from the plateau (later diagnosis – fractured knee), and he was unable to venture far from camp. Ransley, Slesser and I set off in brilliant sunshine for the center of the Rink Glacier.

After crossing the extensive lateral moraine, we had a very interesting journey across the ice, jumping over crevasses and melt streams in mini-gorges, and climbing or passing round high seracs. The glacier was four and half miles wide at this point, and we reached the approximate center of flow in two hours. Six bamboo canes were lashed together in the form of a tripod about 10 feet high, with the Union Jack flying from the top. The side facing our camp was liberally adorned with red bunting to make it visible. As we worked we could hear occasional thuds from within the ice; other things were obviously moving as well as us.

We headed back across the ice, and very soon found that we were unable to see the flag at all.

A halfway position was judged as accurately as possible, and we erected our second marker. When we reached land Ransley took the theodolite up the hill behind the camp in order to fix the initial positions of these markers. From this point it was at first impossible to see either marker, and the positions were located only after a search with binoculars.

We had 13 days of bad weather that handicapped the journey to and the work on the Rink Glacier. My diary has many statements like: "Had another wet, cold and miserable night; not much sleep". Despite the weather, Ransley was able to track the movement of the two markers and to confirm that the flow rate of the ice matched that of Jacobshavn Glacier, the fastest known in West Greenland, and probably in the world.

1.2. Samples from Crevasses

Another objective was to find the sizes and shapes of the ice crystals at various points on the glacier, and this could only be done in a crevasse. By a simple method, crystal records were obtained from the crevasse wall, and from these the average size of the crystals could be calculated. The procedure was the same as that used by tourists to capture the images on tomb-stones. Rubbing a soft pencil across a sheet of paper placed over the target captures the detailed relief of the image, in our example, the outlines of the individual interlocking crystals that constitute the glacier ice.

Each morning, Ransley and Slesser used the theodolite to fix the positions of the markers. Only after the day's surveying had been completed could we proceed to crevasses, where three participants were needed. We planned to obtain a series of crystal records from different locations, but because of the difficult traveling conditions over long distances, we could only work in one area of the glacier each day.

All four of us went to a crevasse close to the camp for a test and, as I was lowered down between its blue walls, Tennent checked that the rope tackle was adequate. He then returned to camp to rest his injured leg and we continued to the center glacier marker, where I was lowered into a second crevasse. Supported by the rope, with my feet braced against one wall and my back against the other, I was able to make crystal rubbings in fair comfort. After half an hour I was warned that banks of mist were approaching from both up and down the glacier. Ten minutes later I was hauled up unceremoniously to find the mist rapidly closing in on three sides. Ahead of us, the way to the camp was clear, so we set off back with the mist chasing us closely behind. It beat us in this race, and we felt the damp spots on our faces as it passed. Just as we reached the camp everything was blotted out and snow began to fall.

The following morning the sky was overcast. When Ransley and Slesser had completed their surveying, we followed the stream flowing inside the lateral moraine for about four miles and then crossed on to the ice. We could see a bank of mist lower down the glacier, so we took a compass bearing of the direction to the glacier center. As we continued on to the center the crevasses became wider and the larger seracs looked like tottering skyscrapers as we passed around them. In places there were large hollows as if the roofs of sub-ice caverns had fallen in.

Suddenly the mist surrounded us, and soon the treacherous conditions forced us to stop. We made our way back to the moraine by compass bearing, and retraced our path along the stream. It began to rain and by the time we reached camp it was snowing.

During the night there were strong winds, and a light covering of snow lay on the glacier by morning. We made an early start to a nearby crevasse. When I was lowered into it the sun was shining brightly, and Tennent took some shots of our working methods with the cine-camera. By the time I was pulled up to the surface, the sun had almost disappeared and the wind was blowing in gusts,

swirling up little clouds of snow.

We cut some blocks of ice from below the weathered glacier surface and returned to camp. There we started to shape the blocks into slabs in preparation for an investigation with Polaroid discs, from which we would obtain a photographic record of the orientations of the ice crystals. The sizes, shapes and orientations of the ice crystals are related to the nature of the ice flow. Later in the day we wished to apply the same method to ice blocks from another locality.

By midday the wind was so strong that we had to abandon all hope of further scientific work. The return journey to the fjord was started in thick mist on August 16th. After a steep climb onto the plateau we camped, recovered the sledges, crossed the ice sheet guided by compass, and stumbled down the Johannes Brae to our first fjord campsite late on August 19th. The following day we were recovered by the Danish geology ship the *Ussing* instead of our expected open boat, which was a pleasant surprise. The rubbings and records of ice crystals were later delivered to President Seligman of the British Glaciological Society.

1.3. An Island Camp: August 23-28, 1950

Qingussaq is a rocky little island, to the northwest of Upernivik Island, on which Hans Pauly had found some dikes that warranted further investigation. Harald Drever volunteered my services, suggesting that I could spend a few days there, making a geological map with a more detailed study of the rocks, and collecting a complete range of specimens. This contribution would be of some value to the Danish geological survey. Joseph Ottersen, a native hunter from Igdlorssuit, was assigned as my assistant. On 23rd August the *Ussing* took us across the sea from Igdlorssuit to Qingussaq, and marooned us there for a minimum period of five days.

We pitched our tents on the site of an ancient settlement, and sorted our equipment. Then Joseph went off in his kayak to hunt for a seal, while I reconnoitered the island to plan my work for the next day. I found that my activities would be confined to a small area half a mile square that was bounded on three sides by the sea and to the north by a cliff that rose abruptly to about 1000 feet.

I climbed up a scree to a height of 300 feet and, in the warm rays of the sinking sun, passed a pleasant hour sitting on a ledge and making sketches of the features spread out below me. Between the cliff and the camp there was a lovely little lake that seemed to have the property of changing color with the mood of the weather. From my rocky throne I had a good view across the sea. Upernivik Island was still lit by the sun, but Ubekjendt Island was a mysterious black shadow rising from the water like a huge whale among icebergs.

As I watched the subtle color changes in the scene, I noticed that the surface of the lake was ruffled by a breeze that was rapidly becoming a wind. I hurried back to camp to secure the tents with boulders. Qingussaq lies in the path of the winds that sweep down Kangerdlugssuaq ("large fjord") from the icecap. As the wind grew stronger, I became anxious about Joseph. I need not have worried, for he soon returned gliding through the heavy sea, looking as if he were a part of his fragile kayak, with only his arms moving.

Joseph went hunting in his kayak every day. He killed no seals, but he never returned empty-handed. The first evening he shot a big seagull. Subsequently, he caught many large cod, so that delicious fried fish was our main food.

It was too windy to cook the evening meal outside, so we took the Primus stove and everything else that we required inside the tent and locked the wind out. This was the first of a series of very interesting social evenings that I spent with Joseph. As a cook he was quite incompetent, and his talents as a hunter were wasted around Qingussaq, where there seemed to be no seals, but as friend and

instructor he was an unqualified success. After the meal we relaxed and smoked a cigar. Joseph loved a cigar; he even chewed the butt.

I found him very entertaining. He had a simple sense of humor and would laugh at anything. I tried to learn a little of the Eskimo language from him, and I soon had quite an extensive vocabulary in my notebook, which enabled us to converse happily and ungrammatically. I heard all about his friends and family, and, of course, he told me his life story. His father was an expert at making string figures (“cats’ cradles”), which form a part of the old Eskimo culture. Joseph showed me very many, and managed to teach my clumsy fingers some of them. Each figure illustrates a story, and I regretted the fact I could understand only parts of some of the stories. When he was not in his kayak Joseph accompanied me as I collected specimens. Even with a heavy rucksack on his back he seemed perfectly happy trudging along in his sealskin boots.

Despite the winds, the weather was good, with plenty of sunshine, which made the work pleasant as well as interesting. I was able to take color photographs of geological features for Hans Pauly. The days passed by rapidly and I just managed to complete my collection of rocks on the last morning.

Harald Drever was due to arrive on August 28th if the sea conditions were suitable. At noon I was hurriedly numbering specimens when Joseph called from his observation post to warn me that he could see the boat. Half an hour later I could hear the friendly chugging of the outboard motor, and it was not long before the equipment and rocks were packed and we were sailing away to the south with the kayak across the bow.

I consider my association with Joseph during these five days on Qingussaq as perhaps the most valuable of the varied experiences that I had in my short eventful Greenland expedition.

2. The Years 1952-1954: The British North Greenland Expedition

The existence and organization of the British North Greenland Expedition (BNGE) was due to the tenacity of Commander C.J.W. Simpson. He and a small group of officers in the Naval Mountaineering Club were always seeking new mountains to climb. The remote prospect of arctic warfare was promoted as one reason for having members of the armed forces experienced in arctic conditions, and Simpson’s salesmanship gained the support of Admiral Willis, and help from the Admiralty, the Air Ministry and the War Office. These services provided staffing, servicing, flying and provisioning. Large sums of money had to be raised in addition, from industry, private firms and individuals. The Shell oil companies provided major support in funds and personnel. H.M. Queen Elizabeth and Sir Winston Churchill became Patron and Vice Patron of the expedition. This was the first of a new kind of expedition for Britain, combining the classical exploration using back-packs and husky dog teams with the large expeditions pioneered by USA that employed aircraft and mechanical vehicles, expeditions that dominated exploration in Antarctica during the second half of the twentieth century.

In 1950, while a guest of the Danish Pearyland Expedition, Simpson flew alongside the Greenland ice sheet and saw “a distant range of mountains, and behind them a large unfrozen lake. This was my promised land: a place that had not been explored. In that aircraft was born the idea of the Expedition.” The small expedition that the mountaineers had initially envisaged grew into a large organization. The Royal Air Force supplied a squadron of Sunderland flying boats to fly the expedition in from the east coast, and of Hastings aircraft flying from the American base of Thule (NW Greenland) to airdrop supplies to station Northice that was constructed in the middle of the ice sheet. In the autumn of 1952 the expedition almost became an international affair because American aircraft

fitted with ski runners and jet-assisted take-off had to be called in to rescue the crew of a Hastings plane, which had crashed on the ice sheet.

The Admiralty, the Air Ministry and the War Office also cooperated significantly in providing selected personnel with experience in arctic conditions, as well as to test certain types of equipment under extreme conditions. The aims of the expedition were scientific and there were seven different lines of research followed. I was lucky to be appointed as the assistant geologist.

2.1. The First Field Season, 1952

It was July 1952, and Her Majesty the Queen had come to meet the members of the British North Greenland Expedition. We stood in line on Tower Pier in London with the sweat running down inside our fur-lined arctic clothing, while the Queen, looking deliciously cool, passed slowly down the line, speaking a few words to each of us. The Thames water gurgled and sparked past the Expedition ship – a small Norwegian sealing vessel, the *Tottan* – which was moored alongside. The sun shone brilliantly, making a mockery of our fancy dress. There were 25 of us, of whom half were scientists mainly from universities, and the rest were young service officers, most of them with mechanical or mountaineering experience.

We sailed from London in the *Tottan* soon after the Queen's visit. After 10 seasick days we passed through the pack-ice and spent four back-breaking days unloading our stores from the ship at Young Sound, a fjord on the east coast of Greenland at latitude 74°N. The Sunderlands flew in and landed on the fjord where they were loaded with the stores, and they conducted numerous sorties from this southern base to a lake in Queen Louise Land that is free of ice for a few weeks each summer. Towards the end of August the airlift was completed and the Sunderlands were on their way back to Britain. We were established in the shell of the base hut that we were building on the shores of Britannia Lake, and our equipment was lying in untidy heaps on the beach. We were an isolated and independent unit. There were several weeks left for field work before the sun set for the winter, so we split up into various field parties and went off to have a look at this land that was to be our home for two years.

We were operating in the unexplored Queen Louise Land – a mountainous region of 5,000 square miles in Northeast Greenland, which is separated from the coastal strip of mountains by 25 miles of rough glacier ice. The nearest Greenlander settlement was about 800 miles to the south on the coast, so we had no opportunity to observe the social customs of the Eskimo.

My first field reconnaissance was with Captain Ron Moreton of Shell tanker fleet. The senior geologist, Douglas Peacock, covered a different area with another companion. At this time of year sledging was not feasible at base camp elevations, and we all set off like true Polar Heroes with 90 pounds on our backs. It was misty and light snow was falling. On the second day we were traveling across real desert stuff with large flat sand fields separated by sand dunes and boulder ridges. As we plodded across the shifting sands with the sun glaring at us and the sweat streaming down our backs, our packs seemed to get heavier and heavier. On one occasion the wind blew and we found ourselves in a sandstorm with the sand flying so fiercely and thickly that we could see no more than a few yards. This was a fine introduction to Arctic traveling! Then there was a glacial torrent to cross. The source of the torrent was a large tunnel through a glacier, and when we came back that way a few weeks later the summer melting had ceased and the flow of water had diminished sufficiently to allow us to walk right inside the tunnel. Later in the season when the snow came, the entrance to the tunnel was completely drifted over. By this time working conditions were deteriorating, and when the sun set in October the field parties converged to the base hut where we were to spend our first winter together. We did not see

the sun's orb again until February 18th.

2.2. Two Winters in Greenland: 1952-1954

The base at Britannia Lake was a large living hut separated by a lobby from a smaller hut comprising the laboratory, radio room, photographic dark room, and a generator room. The dormitory consisted of three cubicles on either side of a passageway leading from the living room. Each cubicle contained two double tier beds – the general effect reminding one of a third class railway sleeper. During the Dark Period we worked in the laboratory, prepared our clothes for the coming field season and shared in the many general duties necessary for the smooth running of the hut. About twice a week our water supply needed replenishing. This had to be carried up from the lake in buckets after a hole had been drilled through the six feet of ice. After blizzards we had to dig passageways through the snow drifts that blocked the doors from ground to roof. There was always something to do.

We took our turn at cooking, and three or four of us cooked for everyone for one week at a time. The food was not appetizing, consisting largely of dehydrated vegetables and tinned meat, but there was plenty of flour, and by adding raisins and ingenuity we were able to produce some varied dishes. When we were learning to cook with the cookery book in one hand and a spoon in the other we all tried to make the food as interesting as possible for our clients, who inevitably scoffed with a few disapproving grunts. By the second winter the aim of the cooks was to produce a meal with as little effort and as little washing up as could be managed. Whenever a new group of cooks took over the kitchen they automatically withdrew from the rest of the expedition, who became “they,” and this detached status compensated in part for the tedious and menial tasks involved in feeding a large, hungry and rather ungrateful community.

Relaxation during the winters was varied. We had a wide selection of long-playing records catering to most tastes, and these were played and played and played. At first it was quite pleasant to be wakened in the morning by the “Emperor,” but it soon became rather exasperating to be wakened at all, and worse to be wakened by a piece of music that we had heard half a dozen times the previous day! There was a library with a good collection of Polar and mountaineering literature that we read, and also a collection of the World's Classics that we rarely read. “Their title and authors still mock us for we did not read them at school and this was a second opportunity not to read them.” A University of Queen Louise Land was formed and a series of lectures was delivered on “Science Simplified for the Serviceman.” In addition, guest speakers from among the servicemen gave us lectures such as “Radio Communications,” “The Cure and Prevention of Frostbite,” etc. The doctor who delivered this last lecture returned from his first sledging trip with a black toe, which gave us all a good laugh.

Even there in the Arctic night, where mornings were distinguished only by the noise of the cooks preparing breakfast, we made Saturdays our festive days. Ballroom dancing was not popular, but we got a great kick out of highland dancing in mountaineering boots. Those men dancing the ladies' parts would wear a sash. Sometimes makeshift skirts were worn in an attempt to produce an air of reality, particularly during the second winter when nostalgia was taking a firmer grip on us. We had a supply of spirits that we drank on party nights, and for Christmas and Hogmanay we had a ration of arctic ale as well. Christmas was our most important festival, but we found plenty of other occasions on which to celebrate. Burns' Night was observed, and a carefully preserved haggis was ceremoniously piped in. Later in the evening, the Sassenachs soundly thrashed the Scottish contingent at a game of indoor cricket. This was followed by a game of indoor rugby played with the plum duff that the cooks had made for the next day's lunch. There were no sides in this game – it was every man for himself.

The first winter passed quite rapidly. Everything was new to us and we did our work and our

cooking and had our little parties every Saturday. In the second winter we knew what lay before us. The novelty of the life had worn off and we were rather more conscious of the lack of feminine influence in our lives. On party nights there was a decided preference for soft sentimental music. The wall of our hut, which was graced by a couple of Constables, began to accumulate a gallery of pin-ups so that we were able to admire the features of Marilyn Monroe as we ate our lunch. One member of our party seemed to miss civilization more than the rest of us and he would sometimes leap to his feet during dinner and cry “Just one weekend! That’s all I ask, just one weekend!” before subsiding with a groan over his plate of dehydrated cabbage. Despite this we survived the second winter and after a few days out on the trail in the spring we continued our work with never a thought that we had not seen a female for more than 18 months – correction, hardly a thought.

2.3. The Final Field Season, 1954

Our second field season spanned the spring, summer and autumn of 1953. I drove the dog team and learned geology from my senior companion, Douglas Peacock. For a brief interval in the summer, the Sunderland aircraft flew in to Britannia Lake with supplies, mail, and new members to replace those who had signed on for only the first year. Douglas returned to Newcastle to write up the year’s geological results, and I became the only geologist. We all converged again to the base hut for the 1953-54 winter darkness. After another three months confinement it was great to get out into the field again in the spring of 1954.

My companion for the second year was Lieutenant Angus Erskine – an early member of Commander Simpson’s team. He was the expedition’s husky-dog expert who had spent a winter on the west coast of Greenland learning to mush, and purchasing three dog teams for the expedition. We had two sledges, each with our own husky team of nine dogs. With the help of some depots we were able to leave base and operate as an independent unit for two months at a time. We sledged first across the rugged 20-mile wide Storstrømmen Glacier and east along Seal Lake to Danmarkshavn, the Danish Sledge Patrol station on the coast where we were welcomed for a few days as we did local mapping and rock collection. Then, as the weather improved, we returned to the ice sheet and traveled down the broad glacier highways that flowed eastwards through Queen Louise Land. The high, near vertical cliffs that bordered the glaciers offered us magnificent geological exposures.

The huskies pulling our sledges became our friends. You can imagine that when two people leave base for weeks on end with no prospect of seeing any living thing other than each other and their dogs, this had to be so. They shared all our joys and all our hardships. Their capacity for work is astounding and their endurance unsurpassed. Each team has a King Dog who establishes his position by beating the other dogs in single combat. Once established, a King keeps his position by an occasional fight and a large element of bluff. The second in command can thump all the other dogs except the King, and in this manner a fairly rigid caste system is developed. The weakest dog in the team rolls over on his back as soon as another dog looks in his direction.

Conditions in the early spring were pretty grim. There were many occasions when I said to myself, “No, never again;” occasions when the snow was beating my face and the wind was tearing at my wind-proofs; when my nose was being frostbitten faster than I could thaw it with my hand, and when snow bridges over deep crevasses subsided a few inches as we crossed them. But the delights of sledging under the midnight sun in late spring and summer made up for all the early blizzards and frostbite, and I am already looking forward to the next time. The final field season passed very quickly, and with experience gained and the techniques developed in the first year we were able to accomplish

much useful fieldwork.

During the final month as we packed our equipment and specimens we became demob-happy, and it was not uncommon for everyone sitting down to a meal to make a noise like a squadron of aircraft flying in from the south. I feel sure that if an impartial observer had seen us during that month he would have concluded that we were at least halfway round the bend. In August 1954 the Sunderlands arrived at their base in Young Sound. After flying us out of Queen Louise Land with a minimum amount of equipment and a maximum amount of specimens and results, they bid a hasty farewell to Young Sound. The combination of mist and pack-ice drifting into the fjord made conditions dangerous for the aircraft at the moorings. We flew to Pembroke Dock (a South Wales base) in two days, including an overnight stop at Reykjavik (Iceland), and soon we were home.

The initial reaction to civilization was not at all violent. We carried on almost as if we had never been away – quite an anticlimax! A delayed action pitch of excitement built up quite rapidly, however, and this lasted for some time. Throughout the calm acceptance of civilization, the mad weeks getting over it and the gentle process of slipping back into gear, we all noticed a tendency to feel that we were detached from the traffic and people around us and unconsciously took the role of observers. The process of readjustment was, however, completed and we became once again normal citizens. There remains the memory, the yearning, that writers have named “The Call of the Far North.” I know now that this is a very real thing.

3. Epilogue: 1956 and 2006

After returning to the University of St. Andrews, completing my Honors B.Sc. in Geology, and wishing that I could join the Commonwealth Trans-Antarctic Expedition crossing (1956-1958), my polar mentor, Harald Drever, advised me to continue first with a Ph.D. program. So I did, and Drever then diverted me to another field, arranging with the help of BWGE colleague William S. Mackenzie (by then at the Geophysical Laboratory in Washington DC) for me to join Professor Frank Tuttle at the Pennsylvania State University as Research Assistant. There I was to learn the new techniques in experimental petrology, and with laboratory experiments to explore and perhaps explain the origin of those olivine-rich lavas that Drever had studied from West Greenland. The experimental approach was to subject minerals and rocks to the conditions of high pressure and temperature existing deep within the Earth, and to determine what happened to the materials, thus calibrating geological processes such as the formation and eruption of lavas. I emigrated in 1956, two weeks after getting married, and I've been an experimental petrologist ever since.

In this way I was seduced from the freedom of polar exploration and field geology into the tyranny of the laboratory to conduct phase equilibrium studies, the physical chemistry of mineral assemblages. I found enough experimental challenges to keep my laboratory busy through more than 40 years. Charting a new path through a multicomponent system in search of a process, or testing the viability of a process, includes a sense of exploration that is just as exciting as trekking into an uncharted field area. The final test of an experimental process must be “Can it satisfy the field observations?” But there have been many occasions when I have missed my dog team, and the ice-carved rocks.

Now, in retirement, writing a textbook for non-science majors, I find myself back in Greenland as I write about discovering paleoclimatology through ice core drilling. I was fascinated by the discovery in 1993 of a fast ice stream flowing about 450 miles northeast from near the center of the Greenland ice sheet, passing by our base area of Queen Louise Land and exiting through three outflow

glaciers including our fearsome Storstrømmen.

The nasty band of crevasses in the ice just west of Queen Louise Land that gave the mechanical Weasels of our ice sheet teams much trouble has now been identified from aircraft and satellite remote sensing as a sheared margin to this monster ice stream. One of our Weasels fell into one of those crevasses, and the two occupants were lucky to survive.

Especially exciting was the 2001 interpretation of radar data that the bottom of the ice sheet associated with this ice stream was melting, which lubricated its base and facilitated the flow. Until that time, it was generally agreed that the northern half of the Greenland ice sheet was frozen to its rock bed, despite the fact that one of our BNGE members, Professor Colin Bull, puzzled by the results from their seismic studies used to measure the thickness of the ice sheet, had concluded in 1956: “tentatively that the principal difference between the conditions in southern and northern Greenland is that under the central part of the northern area the bottom of the ice is melting while in the south it is not.” This result and interpretation appears to have been missed or forgotten by subsequent investigators, because in the 1990s when new drilling sites were being sought in north Greenland, it was “given that basal temperatures are generally well below the melting point throughout northern and central Greenland.”

Recent analyses of aircraft and satellite remote sensing published in 2005 and 2006 have demonstrated that the rate of melting and dynamic glacier discharge in the southern half of Greenland has been increasing through about 10 years, and even faster through the last five years, with enhanced ice loss migrating northwards. This dramatic result attracted the attention of the news media - big time.

□*Time*□ magazine, for example, devoted two pages to the topic □Has the Meltdown Begun?□ (February 27, 2006) stating that this □study sent tremors through the scientific community last week□.

My personal tremors were due to resuscitated memories that before I became an experimentalist, I had experience with three of these fast-moving glaciers more than half a century ago. In 1950, I man-hauled sledges over an ice cap to the Rink Glacier, and I walked toward the snout of the Jacobshavn Glacier (did not reach it, but saw loads of icebergs and heard loud calving). Between 1952 and 1954 I drove my dog team across the Storstrømmen four times.

Geology is a great subject. It's right with you wherever you are, and the impact of the geological images persists for a lifetime.

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