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ARCTIC EXPERIENCES
or
LIFE BEGINS AT FORTY BELOW
by
R. W. Rae

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ARCTIC EXPERIENCES †

or

Life Begins at Forty Below

by
R. W. Rae

Most of you are no doubt acquainted with the manner in which the weather station at Resolute was established. In July 1947, a cargo vessel accompanied by an ice-breaker left Boston to establish a weather station at Winter Harbour on Melville Island in the Canadian Arctic. However, ice conditions in the western Arctic were so severe that year, that the ships were unable to reach Winter Harbour. The only alternatives were to return home and try again another year, or to choose an alternate site. Resolute Bay on Cornwallis Island seemed like a promising spot and both Canadian and United States representatives agreed that it would be preferable to establish the weather station there rather than to return with the mission not completed. Once the decision had been made, no time was lost in moving the supplies ashore for it was the first of September and winter was beginning to set in. The ships pulled out on September 12th and we were on our own, eight Canadians, eight Americans and one RCMP Constable.

Our first glimpse of the island was not very reassuring, for a more bleak, barren and desolate place would be hard to find. There was nothing to be seen except clay, rock and coarse gravel which blended into a drab pattern of grey and brown. Such complete barrenness is unusual even in the Arctic. A considerable amount of vegetation may be found on islands several hundred miles farther north than we were. One of the best descriptions of Resolute Bay was given by a private in the United States Army who was with an engineer detachment that rebuilt our runway during the summer of 1948. He was a southerner from Miami, Florida, and when I asked how he liked Resolute, he sighed and said, "Man when you is heah, you ain't no place!".

The first year that the station was in operation was a trial and tribulation to all concerned. There were a number of reasons for this such as unsuitable personnel, crowded living quarters and shortages of critical items like radio parts and electrical wiring. The compatibility of the personnel involved is a major factor in the successful operation of an isolated station. To give you some idea of the sort of crew we had, one had been discharged from the United States submarine service as a neurotic,

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a second had been thrown out of the weather station at Thule, Greenland, at the request of the Danish official-in-charge, a third had a persecution complex, a fourth was highly nervous and emotional and two others were belligerent and quarrelsome. To make matters worse, one of the few stable individuals was clawed by a polar bear and had to be evacuated, and another was accidentally electrocuted.

But all this is just by way of introduction, for the bulk of my talk will be about our second year, or what I might call "The Happy Time". The replacement personnel were of exceptionally high calibre. Besides additional buildings were constructed and each man could be allotted an individual room. The routine of station maintenance and operation had also been simplified so that the heavy manual labour of the first year was reduced considerably.

One of the most difficult things to appreciate about life at an isolated station is your utter dependence on the supplies that you started out with. If you lack a certain type of bolt, screw or hinge, you have to either improvise or do without. There are also such problems as disposal of refuse, supply of water and so on. There are no public utilities to serve you and any work that is to be done must be attended to by the men themselves.

This dependence on your own resources has one advantage for it develops your ingenuity. The first year we followed our book of instructions fairly closely for we weren't familiar enough with Arctic conditions to start experimenting. However, the following summer we decided to look into the various tedious chores that had to be done to see if the work involved could be cut down.

One of our most noteworthy achievements was the revamping of our water supply system. The normal winter procedure in the Arctic is to utilize melted snow or ice. This is satisfactory for a small group but when there are two dozen or more to be looked after, this method becomes excessively laborious. A huge stockpile of ice must be cut in the fall. Furthermore, a considerable amount of time and heat are required to melt the ice. The original system consisted of an ice melter holding about 50 gallons connected with a hot water tank. Cold water was dipped directly out of the ice melter. If you wanted hot water, a tap at the bottom of the boiler was opened and it was necessary to pump furiously for five minutes to draw off one pailful. A bath, if it could be called such, was taken in a small laundry tub.

Our first step was to increase the amount of water storage. A tank holding 1000 gallons was welded from sheet metal and mounted in an insulated box on a tractor-drawn trailer. The tank was filled at the lake with a motor driven pump and then parked by the kitchen window where a hose

outlet was used to fill the ice melter. When temperatures began to remain below freezing in September, the tankful of water could not be left outdoors and, consequently, the indoor storage had to be increased. This was done by replacing the ice melter with two large cylindrical tanks, each holding 300 gallons. At first this posed another problem for the tanks were too large to fit through the door. The final solution was to cut the bottoms off with an acetylene torch and push in the sides enough that the tanks would squeeze through the door. Once inside, the tanks were pummeled back into shape and the bottoms rewelded on.

A third tank was built and mounted on a specially constructed platform just below the ceiling. This upper tank was our water supply outlet. Taps were installed in the kitchen, the laundry and in a shower stall that we built. The taps were connected directly to our outlet tank except that the hot water boiler was connected in series in the hot water line. In order to fill the upper tank from the lower ones, we borrowed a small high-speed pump that had been left behind by a rock-drilling crew. The only motor that was available to drive the pump was a slow-speed meat grinder which we fitted with an oversize drive wheel made out of plywood. It was a Rube Goldberg contraption but it served the purpose until a proper motor and pump were received eight months later.

There was still the problem of melting enough ice or else hauling water that the supply would meet the demand. The tank could be filled at the lake even in the coldest weather if a hole was chopped through the ice but the lake ice builds up to a thickness of eight feet or more by May, and you can't chop through eight feet of ice in a matter of minutes. The only solution was to keep a water hole open all winter in some way. A round table discussion was held on the matter and the various suggestions were incorporated into a workable idea. In the fall when the ice was about a foot thick, a 9-foot length of 3-inch pipe was frozen into the ice with its top end just above the surface. Then a 3-foot extension was screwed to the top. This 3-foot length provided sufficient pressure head that when aviation gasoline was pumped in through the top, the gasoline forced the water completely out of the pipe. Instead of a pipe full of water, there was now a pipe full of gasoline embedded in the ice. When it was necessary to haul water, the extension was unscrewed and the water pressure from below forced the gasoline out of the pipe. This gasoline was then burned off so that it would not contaminate the water. A hose was inserted into the pipe and the tank pumped full. After this was done, the extension was replaced and the pipe refilled with gasoline. In below-zero weather, the pump and intake hose were kept from freezing by means of a Herman-Nelson aircraft heater.

These Herman-Nelson heaters were about the most indispensable winter equipment on the station. It was found that no matter how cold it

was, the tractors and other vehicles would operate if they could only be started. That's where the Herman-Nelson came in. These heaters could always be started by playing a blowtorch over their oil chamber for half an hour. Then if the tractor was well covered with blankets and the two hot air ducts of the heater placed under them, the tractor was warm enough to start in about four hours. Of course by that time most of the day was gone, but at least the tractor was started. This problem will probably no longer exist for a large heated garage was constructed last fall which should provide indoor storage for all the vehicles.

Another use was found for these aircraft heaters last winter when the furnace motor burned out in our barracks building. The indoor temperature dropped from 72 to 26 degrees in three hours even though the building is well insulated. Until an improvised heating system could be installed, a hall window was removed and hot air ducts from a Herman-Nelson heater were inserted. This raised the temperature back to over 70 degrees in a matter of minutes.

Our winter temperatures were not nearly as cold as one would expect. The coldest temperature recorded in two years was 55 below zero, which is comparable to the coldest winter temperatures that may be expected in northern Ontario. What makes the winter seem so cold is the fact that temperatures remain consistently low. For six months of the year, average monthly temperatures were below zero. And even 40 below can feel quite uncomfortable if there is any breeze at all.

The most awkward part of your body to keep warm is your face. In extremely cold weather, I found that the best system was to use a soft woollen muffler to cover all the lower part of your face up to your eyes with the ends of the muffler tucked inside your parka hood. After awhile, condensation from your breath would freeze on the muffler, and when it became too icy, you hitched the muffler around a bit to bring a dry warm section in front of your face. The idea was to get indoors again before you ran out of muffler.

If there is no wind, the cold is scarcely noticeable. This was proved experimentally by one of the radio operators at Isaachsen last year. He had read accounts of former explorers which stated that they had often run out in their underwear in below zero weather to stop a dog fight, and decided to go them one better. One night when the mercury was rattling in the thermometer bulb, he jumped out of his sleeping bag and ran 100 yards through the snowdrifts to keep his radio schedule, clad only in a pair of slippers. He remarked later that he didn't feel the cold although his skin did tingle a little.

The amount and type of clothing worn in winter depended on the individual. Our staff could be divided into three groups; those whose work was primarily outdoors, those who worked mostly indoors but had to go out once in while and those who wouldn't go outdoors under any circumstances from September to May. Our cook fell into the latter category and consequently could get by with only a T-shirt and a pair of slacks all winter. The mechanics had a considerable amount of outdoor work even in winter. The amount of their clothing varied with the temperature, and in the coldest weather usually consisted of heavy woollen underwear, two or more pairs of woollen socks, felt boots, two pairs of trousers, a heavy shirt, sweater, jacket, wool tuque, two pairs of mitts and a parka. The remainder of the staff dressed much the same as they would here except that a parka was worn instead of an overcoat. Of course, since there was no feminine company, there was no incentive to dress up and clothes were purely functional instead of decorative.

This functional character of our clothes was quite noticeable in the outer protective clothing which was supplied from Washington the first year. The heavy trousers came in waist sizes from 40 to 48. This was just about the time that the New Look was being publicized and we began to suspect that perhaps this wrap-around effect was the last word in men's clothing. In a way, this was amusing because a chart with our individual clothing measurements had been sent to Washington before the expedition left. One of our radio operators was trying on a pair of these drape-shape trousers, and holding the slack out at arm's length, he mused, "I wonder why they asked for our measurements. All they needed to know was how many arms and legs we had".

Every once in awhile, someone asks me what we did for amusement. I suppose one reason for that is that in civilization there are so many diversions such as radio, movies, spectator sports, Royal Meteorological Society meetings, and so on, but it seems difficult to imagine what life would be like without them. The extent to which a person is bored in isolation depends largely on the extent of his dependence on the commercialized forms of entertainment. On the whole, I think most of us had a reasonably good time. During the first two years at least there was always so much work to do that there wasn't too much time left for worrying about what you were missing. However, aside from the work and the normal station routine, we did have a few diversions. One of the most important was reading. We were very fortunate to have a library containing all types of fiction and non-fiction so that no matter what your tastes were, you could be sure of finding something to your liking.

The next most popular pastime was playing cards. It is interesting to note that although we started out by playing bridge, this was soon discontinued when it led to too many arguments between partners.

Eventually, the only games played were ones where it was every man for himself, such as poker. The stakes were kept low enough that no one was hurt badly even if he lost.

On special days such as Canadian Thanksgiving, American Thanksgiving, Christmas, New Year's, Lincoln's birthday, the 24th of May and so on, we could usually round up enough interested people to have a bit of a party and a sing-song. Through the courtesy of the U.S. Air Force, who flew supplies and mail to us at intervals, we had a small stock of refreshments on hand reserved for such festive occasions.

For a few weeks in May, it was possible to do some skiing. Up to that time it was so cold that the snow was too hard for satisfactory skiing, and after that it began to thaw. In the summertime, that is July and the early part of August, we would often go on cross-country hikes. Since the sun was up for 24 hours a day then, it didn't matter what time of day you started out or when you returned.

The Mountie and I went on a hike during mid-July to explore the interior of the island. We knew it couldn't be any more barren than the region around the station and there was always the possibility that we might find a sheltered valley lush with vegetation and teeming with wild life. Native dancing girls, maybe. Our route brought us inland about 15 miles to a central plateau that seemed to be the highest spot on the island. The ground was clear of snow but quite wet. The soil was a soft gumbo clay through which we waded ankle-deep. We had hoped to cross this watershed and follow the streams which led to the other side of the island, but after wading through the mud for a mile or so we had had enough and turned back. The only living things which we saw during the round trip, which covered about 40 miles, were two birds and the only vegetation a few clumps of moss and coarse grass.

I made one other long trip with the Mountie to look over the south coast of the island. This was in May when the snow was still on the ground and we rode in style in a snowmobile instead of slogging along on foot. Near shore, the sea ice is piled up into high ridges of pressure ice, but beyond this pressure zone, the sea ice is relatively smooth as far as you can see. This smooth ice was our highway and we skimmed along at 30-40 miles per hour with no difficulty. Since this was towards the end of May, the ice was beginning to show signs of breaking up and numerous long cracks six inches to one foot wide were crossed.

The south coast of Cornwallis Island consists of numerous bays and several prominent hills such as Cape Martyr, Prospect Point, Dungeness and Cape Hotham. We went ashore and investigated each of the most prominent hills for cairns which may have been left by early explorers.

A number of expeditions wintered in this area, especially during the period that an intensive search was being carried out for Sir John Franklin about 100 years ago. Several cairns were found but no records.

We also visited Assistance Bay where a Franklin search expedition under Captain William Penny wintered in 1850. We found what may have been a camp site for one of Penny's shore parties. There was a large pile of ancient tin cans with the name of maker, D. Hogarth of Aberdeen, stamped into the metal. The cans were quite rusty but still intact. Their can openers must have been inefficient for the cans appeared to have been hacked open with a knife. There were a few other items nearby such as a broken bean pot and some harpoon heads that had been crudely chopped out of heavy metal plate.

Wild life that was seen near the station at one time or another included seals, walruses, polar bears, Arctic foxes, musk-oxen and many varieties of birds. When the station was first established, the polar bears and white foxes were not shy in the least and were often seen in the camp area. The white foxes were especially tame and it was possible to walk to within a few feet of them. After one of our radio operators had his much publicized and totally unrehearsed wrestling bout with a polar bear just outside our mess hall door, six sled dogs were flown in to us. The dogs killed several foxes and the rest promptly disappeared. The polar bears, too seemed to keep their distance a little better, although during two years, five polar bears were shot near the station and seven others were seen.

During the brief summer, there were families of geese, terns and ducks that built their nests near our small lakes. One tern's nest was found a few hundred yards from the station. These terns were about the size of sea-fulls and had a very piercing cry. They didn't take very kindly to an invasion of their privacy, and whenever anyone approached any closer to the nest than 100 yards, the male would take off screaming and hover above the offender's head. If you kept walking closer, the bird would swoop within a few inches of your scalp like a dive bomber. One day I was there with Wally Johnson, our observer. Wally walked ahead slowly while I stayed behind and shot movies of the straying. When Wally came back I said, "That tern certainly saw you coming", Wally replied. "Yes, he spotted me all right".

There were no human beings on the island other than our little group. Not even Eskimos live there for Eskimos have become so dependent upon the white man's supplies that they do not roam far from the trading posts. The only Eskimos we saw were the ones at Thule, Greenland, and at Dundas Harbour on Devon Island. There is a Royal Canadian Mounted Police detachment at Dundas Harbour and the two constables have two Eskimo

families based with them as general helpers. Several days were spent at Dundas Harbour, and everyone who could, went ashore to take the inevitable photographs. The Eskimos seemed to consider it an honour to have their picture taken and whenever anyone even pointed a camera in their direction, they would quickly line up in formation, women and children on one side and men on the other, all grinning broadly. They were very pleasant and friendly, but the women were by no means pretty, at least not according to our standards. Of course, it is said that if you're in isolation long enough your standards change, but we weren't there long enough.

Although there are no Eskimos on Cornwallis Island at present, there is evidence that at one time there was a good-sized settlement not far from the weather station. There are two main locations where there are ruins of what were probably sod huts or igloos. Some of the whale bones which were used as studding for the walls are still upright, embedded in the ground. Last summer, Dr. Collins of the Smithsonian Institute and Mr. Mischea of the Museum of Canada did some excavating at these ruins and found a large assortment of bone tools, utensils, weapons and so on. Dr. Collins estimated that the ruins were probably about 500 years old.

The general type of weather that was experienced deserves some mention since our main reason for being at Resolute was to observe the weather. The chief difference between the climate at Resolute and that of Toronto, for example, is the obvious one that it is much colder. To give you some idea of how much colder it is, the average annual temperature at Toronto is about 45 degrees. The corresponding average temperature at Resolute is near zero.

If we define winter as the period from the time that the snow first stays on the ground until the time that the ground is again snow-free, the Resolute winter lasts from the beginning of September to the end of June. This leaves only the months of July and August for spring, summer and fall. During July and August there are occasional periods of two to three days when the sky is clear, the wind is calm and that lucky old sun just rolls around heaven all day. At such times, the temperature rises to almost 60 above and it is a real pleasure to work outdoors. Unfortunately, these heat waves are the exception in summer, fog and low cloud are the rule. Fog, low cloud and drizzle persist as long as there is open water in the vicinity. When the straits are frozen over during the winter, skies are usually clear except for occasional high cloud.

Common phenomena during the winter are the storms of blowing snow which occur on the average about every two weeks. What little snow there is, is fine and granular, and as soon as the wind increases to more than 15 miles per hour these grains are blown about like dust or sand.

In some of the more severe storms when the wind is over 50 miles per hour, the air is almost solid with flying snow particles and visibility is cut down to about six feet. When you step outdoors, it feels as if you were standing in front of a sandblasting machine. The snow piles up into huge drifts around the buildings and are so hard that tractors may be driven over them.

There is one curious phenomenon that sometimes occurs in the early winter. The sun doesn't rise above the horizon after the first week in November, but for several weeks thereafter there are a few hours of twilight around mid-day. During these hours of twilight, when there is a low overcast, the horizon disappears and you lose all sense of perspective if you happen to be far enough away from the camp that you can't see the buildings. The ground, the sky and your surroundings all blend together with no pattern of light and shadow but only a uniform grey. As you walk along, you often stumble over hummocks of snow that appeared to be hills in the distance.

The Arctic dark period was described in a speech made by our Controller before the Royal Astronomical Society last month. The following excerpt is taken from the account of this speech which appeared in the Toronto Star:

"About that long winter night", he pointed out, "it is not nearly as dark and utter blackness as it has been reported. It is nothing like the deep velvety darkness of tropical nights". The immediately following sentence was probably inserted by the reporter for it read, "And there's plenty of moonlight to relieve the darkness for Eskimo lovers".

As a matter of fact, when the moon is full, it doesn't set for two or three days and it is almost as bright as day outdoors. The sky is a bluish purple, the moon a bright orange and the barren landscape has a weird phosphorescent glow that gives it a fascinating, unreal sort of beauty. You feel as if you were on another planet altogether.

The cold and drifting snow increase the difficulty of maintenance of outdoor instruments. This is especially true for instruments that have moving parts. In the case of an instrument such as a thermograph, which contains a drum driven by a clock, all the oil must be thoroughly cleaned from the clockwork or else the extremely low temperatures would cause the oil to congeal slightly and stop the clock. The ink in the instrument pens freezes also but this is not a serious matter as long as the pen doesn't freeze to the chart. It just means that the pen becomes a pencil for there is generally enough coloured ice adhering to the nib of the pen to make a faint but legible trace.

Extremely cold weather also complicated the taking of pilot balloon observations. The balloons were made of synthetic rubber which lost its elasticity at low temperatures. When the inflated balloon was taken outdoors to be released, the rubber would freeze almost instantaneously and the balloon rattled in the breeze like a piece of parchment. This loss of elasticity undoubtedly caused the balloons to burst at lower altitudes than they did during the summer. After the balloon was released, it was necessary for someone to stand outdoors and follow it visually with a theodolite. This required some ingenuity for if your eye was too close to the eyepiece, the lens frosted over. The best technique was to lean forward for a quick look as you were inhaling, then step back and turn your head to one side to exhale.

Another limiting factor in the length of a pilot balloon flight in cold weather was the ability or willingness of the observer to put up with the discomfort of standing outdoors for half an hour or more. A long flight often meant frost-bitten fingers and cheeks for the observer. Most of the personnel who did this work were conscientious but a few would invariably find some excuse to terminate the flight after ten thousand feet or less had been reached. One of them never seemed to be able to follow a pilot balloon for any longer than three minutes because his glasses frosted over. I found out later that when he had followed the balloon for a few minutes he would take off his glasses, breathe lightly on each lens, and after that he couldn't see a thing. Fortunately, this type of malingering was not common, but even so, I think the winter flights would tend to be longer if the observer could be more comfortable. For example, it should be possible to equip the Arctic stations with electrically heated gloves similar to those used by aircrews during the war.

There was one amusing incident that occurred in connection with the operation of our sunshine recorder. One morning as I went to change the chart, I noticed that the large crystal ball which focusses the sun's rays on the chart was missing. I made enquiries but no one had seen it. I thought that perhaps it had been dislodged in some way and had rolled from the roof into a snowbank and spent several fruitless hours digging in the snow around the building. Two days later one of the mechanics brought it to me and sheepishly admitted that he had thought it would make a very attractive souvenir.

This same mechanic had been born in the hill country in Arkansas, and according to some of his stories, his grandpappy had spent much of his time outwitting the revenuers. It seems he must have learned his grandfather's art because when I walked into the kitchen one night, he had the silex coffee-maker bubbling on the electric hot plate. A long coil of copper tubing extended from the top of the pot and a clear liquid was

was dripping from the end of the tube into a glass. "What the dickens are you doing?", I asked him. "Oh", he said, "I've just invented a Coca-Cola machine. Here, taste some". He handed me the glass and I took a small sip. For a moment it felt as if I had burned a hole in my tongue. I told him to dismantle his machine or else not only his brew, but he too, would end up in the jug.

Another interesting individual on our staff was the first year's cook, Fred Herring, or 8-to-5 Herring as he was more commonly known. The 8-to-5 didn't refer to his hours of work but to the fact that he would bet on anything. He would invariably offer odds of 8-to-5 that some event would or would not occur and let you choose which way you wanted to bet. Offhand, it would appear that he was bound to lose in the long run but he always managed to introduce enough qualifying clauses that he was hard to beat. During the first week in February, it became evident that the sun was approaching the horizon and there was some discussion as to the exact day it would first be seen. Fred Herring had approached me previously and we had determined from the Nautical Almanac that the sun was due to rise on February 7th. Armed with this knowledge, Fred bided his time until someone bet that the sun wouldn't be seen until February 10th, when he immediately jumped in and offered 8-to-5 that the sun would be seen by February 8th. As it happened, on the 7th, 8th and 9th of February there was a bank of low cloud to the south which was just high enough: that although it was apparent that the sun was above the horizon, it couldn't be seen. For once Fred lost because he had forgotten that the sun could be above the horizon and still not be visible.

We were more fortunate than most isolated stations in that we had regular air mail service. The U.S. Air Force were committed to complete one flight per month to Resolute, and on the average they followed this schedule reasonably well. During the winter months flights were more irregular chiefly on account of maintenance problems. All in all, the pilots who flew our mail run did a wonderful job under difficult conditions. They were all young, eager and happy-go-lucky. As they took off they would usually climb to about two thousand feet and then buzz the station in a screaming power dive. One of the pilots flew so low that he passed between two buildings in the camp area below roof-top level.

Operational difficulties were increased each spring during the period that an airlift was carried out from Resolute to supply the satellite stations at Isachsen, Mould Bay and Eureka. The runways at those stations are short, rough and covered with snowdrifts. In effect, each landing and take-off is an emergency one. The hazards involved in the accomplishment of this airlift were pointed up last spring by the fact that the number of aircraft which were seriously damaged or completely washed out

included a C-54, two C-82's, one B-17 and one C-47. If one were to replace these aircraft there wouldn't be much change left from a million dollars.

In view of the expense and difficulty of operating these remote stations, the question naturally arises as to whether the results obtained are sufficient to justify the cost. I think the answer is an unqualified yes. The chief function of these stations is to provide basic data from a hitherto unknown region. This information will permit research to be carried out on the large scale motions of the earth's atmosphere as a whole. This is the only way to improve our understanding of atmospheric processes, which in turn is the only way to improve our forecasting and to extend the forecast periods. The research cannot be done without the observational data and the data cannot be obtained without the stations.