A R C T I C C I R C U L A R

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THE ARCTIC CIRCULAR

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The following meetings of the Arctic Circle have been held:

Sixty-fourth Meeting, 10 January 1956. The Annual General Meeting. The films "Wind from the West" and "The New Greenland" were shown.

Sixty-fifth Meeting, 14 February 1956. "Operation Franklin", by Dr. Y.O. Fortier.

Sixty-sixth Meeting, 13 March 1956. "Norwegian, British, Swedish Antarctic Expedition, 1949-52" by Dr. E.F. Roots.

Sixty-seventh Meeting, 10 April 1956. "Fisheries of the Great Slave Lake" by Dr. W.M. Sprules.

Sixty-eighth Meeting, 8 May 1956. "A medical officer looks at the public health problem in the Eastern Arctic", by Dr. J.S. Willis.

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Visit of Greenlanders to Baffin Island. By M.L. Manning.

On 16 August 1956 the M.V. H.J. Rink, accompanied by the Royal Danish Naval Gunboat Skarven arrived at Cape Dyer, Baffin Island, from Godthaab, bringing the first party of Greenlanders to visit Canada. The purpose of the expedition was to give the Greenlanders an opportunity to study the life of the Eskimo in a small part of the Canadian Arctic in order to see how Eskimo lived traditionally and how this life changes when the people are in constant touch with southern civilization.

On August 17 the party was joined by Angnakadlak, a Canadian Eskimo who was to act as pilot of the expedition on the coast of Baffin Island, and by Mr. M.L. Manning, an officer of the Department of Northern Affairs. After refuelling and taking on fresh water and supplies the vessels left Cape Dyer later that day bound for Pangnirtung, approximately 300 miles away. Some ice was encountered but it did not hinder the vessels and Pangnirtung was reached on the night of August 18. The party was welcomed by the Rev. B. Smith, the Anglican missionary, and Mrs. Smith, Corporal H.A. Johnson, R.C.M.P., and Mr. and Mrs. R. Tingling of the Hudson's Bay Company.

The following day being Sunday, the party attended service at the Anglican Mission church. In the afternoon a brief ceremony was held out-of-doors during which Pangnirtung was made a friendship village of the town of Godthaab and gifts of a sealskin mat and two Eskimo dolls were presented to the visitors. During their stay at Pangnirtung the Greenlanders were entertained by the Eskimo and white people and they were able to record folklore and take photographs.

On August 24 the vessels left Pangnirtung for Frobisher Bay, 360 miles away. The original plan was to visit native camps in Cumberland Sound on the way, but it had been learned at Pangnirtung that practically all the camp Eskimo had gone inland to hunt caribou, so the party decided to go direct to Frobisher. The weather was good in Cumberland Sound, but there was a very heavy swell running in Davis Strait and a strong wind came up which gave the little vessel Rink rather a pounding.

Frobisher Bay was reached on Sunday August 26. The Greenlanders spent one week at the new Eskimo townsite and lived in one of the Eskimo houses, eating their meals in the carpenter's mess hall. Unfortunately, one of the party, Knud Hertling, developed a bad cold after leaving Pangnirtung and on arrival at Frobisher had to remain in bed at the nursing station for five days. As at Pangnirtung, the visitors spent the time talking with the local Eskimo, gathering folklore, taking pictures, and fishing. They also visited the nursing station, school, and some old Eskimo ruins. On the Sunday previous to their departure the Greenlanders attended a church service held by the local Eskimo. Later in the day they were presented with caribou antlers carved with scenes of Eskimo life by Angnakadlak on behalf of the Eskimo, and Mr. R. Griffiths gave them a square flipper mat from the Hudson's Bay Company. Mr. D. Wilkinson, Northern Service Officer, spoke briefly, and Peter Nielsen replied saying how much they had enjoyed their visit and expressing a hope that some day not too far distant some Canadian Eskimo might visit Greenland.

The party left for Godthaab on September 3 and arrived safely on the 6th. The members of the Rink party were:

Niels Ilsoe	Captain
Jasper Tausen	Mate
Svend Olsen	Engineer
Johan Jensen	Cook
Nathan Heinrich	Deck hand
Peter Nielsen	Member of "Landsraad" (Greenland Council)
Frederick Nielsen	Teacher and specialist in language
Robert Petersen	Teacher and specialist in Eskimology
Knud Hertling	Graduate lawyer and Danish-Greenlandic-English interpreter
Uvdlorianguak Kristiansen	Reporter with Greenland radio

An airborne magnetometer survey of the arctic islands, 1955

During the past eight years the Geological Survey of Canada has been engaged in airborne geophysical work. In the 1955 field season an airborne magnetometer and scintillation counter survey was made in the arctic islands. The object of this work was to test airborne methods in the area and to compare the results with those of Operation Franklin, the large helicopter-supported Geological Survey field party working on the ground.

Advance geological information was meagre, but from what was known and what was surmised by geologists of the Survey from a detailed study of air photographs, about 12,000 miles of flight lines were picked.

Briefly stated, the airborne magnetometer analyses the fluctuations in the earth's magnetic field which are directly related to the amount of magnetic material in the rock formations below, and the different structural formations can be delineated because of their varied magnetic content. The airborne magnetometer can therefore detect major geological features and give the approximate thickness of sedimentary rocks overlying the basement complex. A continuous record of the magnetic intensities is taken during flight.

The scintillation counter determines the amount of structural radioactivity and this is also continuously recorded.

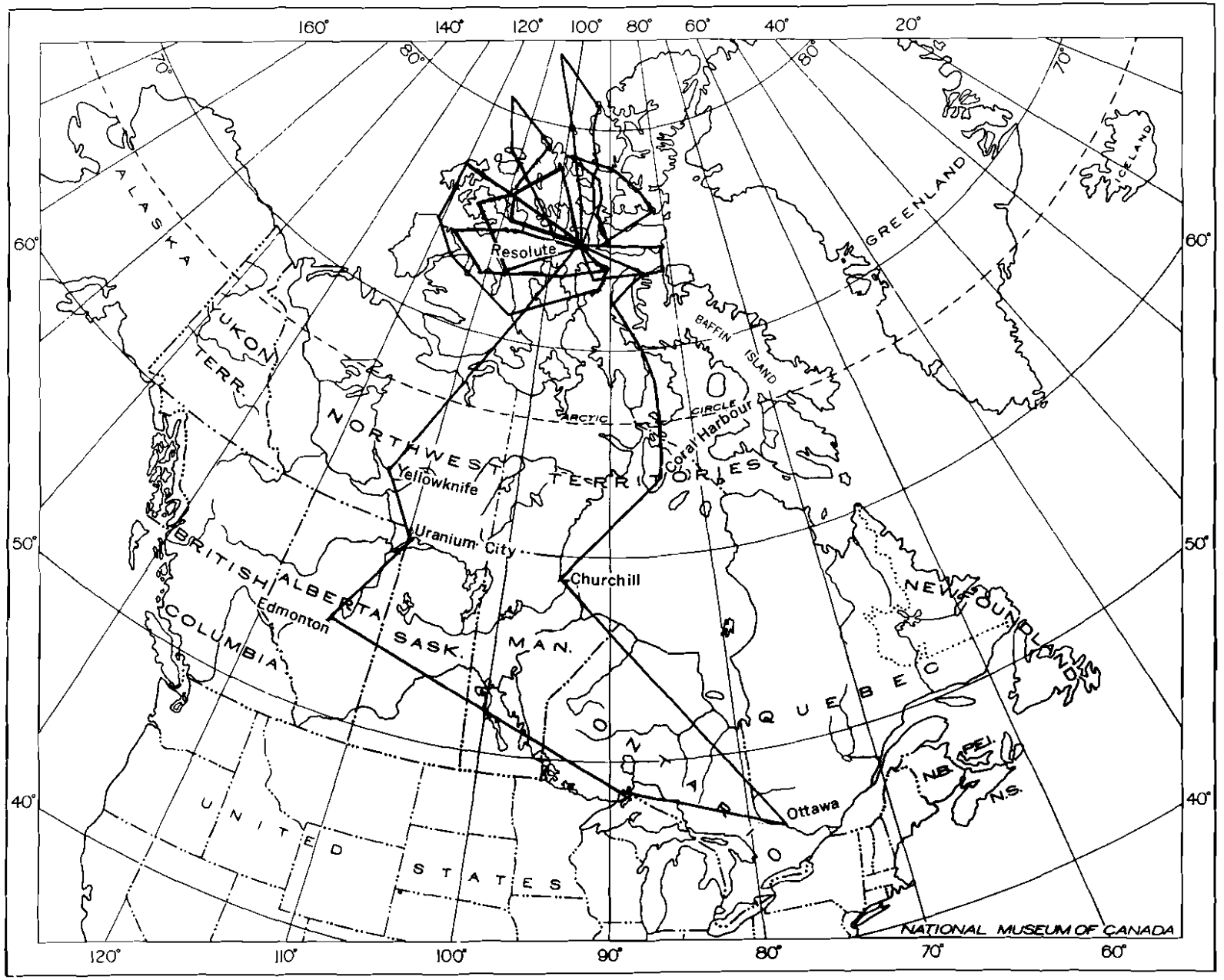
It was decided to leave Ottawa between June 7 and June 15 in order to reach the Arctic at a time when the land was nearly free from snow, thus aiding ground-controlled navigation, and before the sea ice broke up when the open water would give rise to frequent fogs. All flights were planned to be flown at an elevation of 500 feet. Over areas of high relief and rugged topography, flying at this height presents problems relative to aircraft capability but certainly does not tend to become monotonous.

Twenty-eight map sheets at a scale of 8 miles to 1 inch were required to cover the area over which the lines were to be flown. These were supplied by the Surveys and Mapping Branch of the Department of Mines and Technical Surveys; the latest editions were found to be satisfactory for the work, both as to scale and detail.

The R.C.A.F. station at Resolute, Cornwallis Island, was used as the home base and the operation received wholehearted cooperation from all station personnel. In addition, the Air Services Branch of the Department of Transport provided weather information and radio contact while the survey aircraft was airborne. About 6,000 gallons of aviation gasoline were shipped to Resolute in 1954 in anticipation of this geophysical survey.

A Canso aircraft has proved to be the most suitable for the work, having the load capacity and range to cover wide areas without landing. The Geological Survey's aircraft, which is operated by Spartan Air Services, has been equipped with the necessary electronic installations for this specialized work, and a precise directional gyroscope. It is, of course, an amphibious aircraft, a most comforting feature when flying in the Northwest Territories, or in fact anywhere where the lakes or seas are not frozen. Normal planning calls for ten-hour flights with thirteen hours fuel carried. This is well within the safety limits for this type of aircraft.

The Canso left Ottawa for Churchill on June 10 carrying 2 pilots, 2 navigators, 2 flight engineers, and 2 magnetometer operators. After a three-day delay at Churchill owing to poor weather at Resolute, conditions improved somewhat and on June 14 the aircraft left for Coral Harbour, about 500 miles to the north. Despite a 200-foot ceiling at Coral Harbour, a landing was made without trouble and the aircraft was refuelled. Plans had been made to fly part of a survey line over northwestern Brodeur Peninsula, Baffin Island, and thence to Resolute. As this area was approached the Canso let down to 500 feet and the scientific equipment was put in operation. Then the weather started to deteriorate and became steadily worse. Crossing the Gulf of Boothia the ceiling was down to 300 feet with visibility about one quarter mile. To avoid flying into the hills on the west side of the gulf, the aircraft was headed northeast. On crossing the cliffs on the coastline it was found that the snow-covered rolling terrain blended in with the white clouds and the horizon could not be distinguished. Flying under these conditions was rather risky and therefore an ascent was made into the clouds in the hope that no icing conditions existed and that a break would soon develop. After flying for one hour the break developed near Admiralty Inlet. A sun shot showed that the gyroscope was 20 degrees in error at this place. A let-down was made over Admiralty Inlet and the rest of the flight up Lancaster Sound to Resolute was made at an altitude of 200 feet.


160°
140°
120°
100°
80°
60°
40°
20°
70°
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80°
70°
60°
60°
50°
50°
40°
40°
120°
110°
100°
90°
80°
70°
60°
ALASKA
YUKON TERR.
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
SASK.
MAN.
ONTARIO
QUEBEC
GREENLAND
ICELAND
BAFFIN ISLAND
NEWFOUNDLAND
N.B.
P.E.I.
N.S.
UNITED STATES
ARCTIC CIRCLE
Resolute
Coral Harbour
Yellowknife
Uranium City
Churchill
Edmonton
Ottawa
NATIONAL MUSEUM OF CANADA

Sleet, rain, icing conditions, low cloud, fog, and high winds, either singly or collectively, prevailed during most of the time the Canso was at Resolute. After two false starts, one trip of eight and one-half hours was made to Axel Heiberg Island, but fog curtailed even this trip. By taking advantage of breaks in the weather a modified programme was completed by July 1 and the flight lines are shown on the sketch-map. During all flights navigation over the islands was carried out by map reading only, whereas over the sea ice and above the overcast, sun shots and, when approaching Resolute, directional radio beams were used.

The Canso left Resolute early on the morning of July 2 despite a cracked cylinder on the starboard engine and landed at Yellowknife later the same morning. Following a delay for parts and a trip to Edmonton, the Canso proceeded to Uranium City, where work similar to that done in the Arctic was carried out for three months. When the season was finished the crew had flown about 65,000 miles, a normal season for the Geological Survey's geophysical division.

Legal concepts among the Caribou Eskimo. By G. van den Steenhoven

In the summer of 1955 I studied the legal concepts among Caribou Eskimo groups for the Northern Research Coordination Centre of the Department of Northern Affairs. Three months were spent in the field: five weeks with the Padlermiut in their summer camp at Eskimo Point on the west coast of Hudson Bay, and seven weeks with the little known Ahearmiut of the Interior at Ennadai Lake, 240 miles due west of Eskimo Point. A detailed report of my investigations is now available in the Northern Affairs library. It contains a description of the actual situation in both areas today, to supplement the very useful ethnographical accounts by Rasmussen, Birket-Smith, and Gabus, a full account of my own field data and methods, and a consideration of the nature of the social control among these Eskimo. There are also appendices on the new Criminal Code for Greenland, photographs, and a translation of eight songs and a transcription of the music of five songs by Dr. Z. Estreicher of Neuchâtel made from my tape-recordings.

Unfortunately I was hampered by the lack of a good translator. None of the Padlermiut or Ahearmiut I met spoke English and no full-time translator could be obtained. The great help of the Rev. L. Ducharme, O.M.I., in interpreting for me at Eskimo Point was therefore all the more appreciated. Near Ennadai Lake occasional use could be made of a young and

willing, but inexperienced, interpreter from Churchill who accompanied a Life magazine party with whom I spent part of the time in one of the Ahearmiut camps.

Outstanding among my adult informants were at Eskimo Point Akpa (E-1-175), who is one of the Padlermiut most respected among his people, and Aggark (E-1-251) and at Ennadai Lake, Owlyoot (E-1-440). Another good Ennadai Lake informant, who unfortunately I had no opportunity to interview, would appear to be Hallow (E-1-471). After returning south, I felt that my good relations with the adults had been due to their approval of my friendship with the children, who, in both areas, had been my constant visitors from the start and with whom it had been possible to spend the hours in a most entertaining manner, without knowing each other's language. At Ennadai Lake I was able to accompany many hunting parties, to share in the meals and dances, and generally to take part in the daily life of the Eskimo to a much greater extent than at the coast.

A qualitative research project cannot easily be described briefly. My enquiries into the nature and scope of the Caribou Eskimo's "law" entailed an examination of their feelings and practices in the following fields of their social life: catch and kill, food distribution inside the camp, "tribal" boundaries, hunting and camping rights for strangers, leadership, group or camp decisions and group or camp discipline, "ownership" of movables, disposal of property, intra-family authority, borrowing and lending, taking away someone else's property, inheritance, and marriage and children. The available data indicate that the social phenomenon of law does not exist – and has not existed in the past – among these Eskimo. Of course, this does not imply that their social life is "lawless"; social control among these groups works on other, informal and often not less effective, levels – troublemakers are faced with a variety of communal reactions ranging from mere social disapproval to being left behind by the camp, which moves away without warning the undesirable. The tendency to avoid open conflict is characteristic of these Caribou Eskimo. As a rule, their social existence is peaceful, owing to common sense and a strong feeling for fair and reasonable practices in routine daily actions. Their social control seems to fail, however, in the rare case when they have to deal with a habitually troublesome camp member or neighbour, who has a strong enough character to face the disapproval and contempt of the others. But, fortunately trouble is no favoured pastime among these people. A young hunter at Eskimo Point, when asked what he would do if they had to put up with an undesirable

camp-member, answered: "We won't care for such a man, but we won't let him starve". Then, as if to correct himself, he added: "An Eskimo, however, would always be likable!"

The Mace of the Council of the Northwest Territories

The Mace of the Council of the Northwest Territories, which was presented to the Council by the Governor-General in January 1956, is at present being shown in each of the provinces. The Mace was designed to be similar to the traditional emblems carried in the Parliaments of Canada and the United Kingdom, but embodying elements representing the history and life of the north.

The Mace stands 5 1/2 feet high and weighs 35 lbs. It was made from northern materials: native copper from the Central Arctic, whalebone and narwhal tusk from Foxe Peninsula, muskox horns from Ellesmere Island, gold from the District of Mackenzie, an Eskimo harpoon, porcupine quillwork from Yellowknife, and oak from Sir William Parry's ship Fury, which was abandoned in the north in 1825. The carving was done by Eskimo craftsmen at Cape Dorset, under the technical direction of Mr. J.A. Houston of the Department of Northern Affairs, and the quillwork was made by an Indian woman at Yellowknife.

The Mace had already been shown in Ottawa, Aklavik, Yellowknife and at the Royal Ontario Museum before the present tour. On the tour it has already been in Halifax, Charlottetown, and Fredericton. It will be on show in Montreal (by the Canadian Handicrafts Guild), November 28-December 1; St. John's, Newfoundland, December 14-16; Toronto, February 4-8; Winnipeg, February 18-21; Regina, February 26-March 1; Edmonton, March 6-11, and Victoria, March 19-22.

Anthropological studies among the Attawapiskat Indians

In 1947-8 Dr. J.J. Honigmann spent eleven months at Attawapiskat working with the local Cree Indians for the National Committee for Community Health Studies. During the summer of 1955 he returned there to make further anthropological studies under the sponsorship of the Wenner-Gren Foundation for Anthropological Research and the Institute for Research in Social Science of the University of North Carolina. He was accompanied by his wife and by Mr. and Mrs. Hans Hoffman. The party studied the personality characteristics of the Cree population, making two

sets of psychological tests - the Rorschach and the Thematic Apperception tests - and recorded life histories of certain informants.

Dr. Honigmann noted that since his previous visit, many of the Indians were much more familiar with the outside world, having spent some time at the Moose Factory hospital, and that a considerable number of families had gone south to obtain wage employment in the area from Moosonee to Cochrane. The rest of the population, rather surprisingly, appeared to be somewhat better off economically, despite the poor fur resources along the coast and the great reluctance of the Indians to move inland to better fur areas. A housing programme was begun during the summer of 1955 and plans are to resettle most of the families in new multi-room houses which the Indians will build themselves with some financial assistance from the Indian Affairs Branch of the Department of Citizenship and Immigration.

American Society of Polar Philatelists

The American Society of Polar Philatelists is a new organization which is affiliated with the American Polar Society. It publishes a mimeographed newsletter, the Ice Cap News, which is issued six times a year. The newsletter deals with all aspects of polar postal news, and the society ultimately hopes to produce a handbook of polar postal history based on the articles published.

The Editor of the new publication is Mr. George A. Hall and the Secretary of the Society, Dr. Neil Josephson. The annual subscription to the Society, which includes the newsletter, is $1.00. Mr. August Howard, 98-20 62nd Drive, Rego Park 74, N.Y., U.S.A., Secretary of the American Polar Society also handles the subscriptions for the American Society of Polar Philatelists.

Change of Address

Members are earnestly requested to advise the Treasurer, Mr. H.M. Cox, 196 Metcalfe Street, Ottawa, promptly of any change of address.

Editorial Note

The Editor would welcome contributions from those who are at present in the Arctic or have information about work in the Arctic. All material for the Circular should be sent to:

Mrs. Graham Rowley,
245 Sylvan Road,
Rockcliffe,
Ottawa 2, Ontario.

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The following meetings of the Arctic Circle have been held:

Sixty-ninth Meeting, 9 October 1956. "International Geophysical Year 1957-8" by Dr. D.C. Rose.

Seventieth Meeting, 13 November 1956. "New town of Frobisher Bay, the first year 1955-6" by Mr. D.E. Wilkinson.

Seventy-first Meeting, 11 December 1956. "A summer visit to Greenland" by Mr. B.G. Sivertz.

"Operation Franklin", 1955. By R.G. Blackadar[1]

The Geological Survey of Canada's programme of systematic exploration of the arctic islands, which was begun in 1949, was greatly extended in the 1955 season by an air-borne survey known as "Operation Franklin" which was planned and directed in the field by Dr. Y.O. Fortier.

Prior to 1955 members of the Geological Survey had mapped Cornwallis Island, parts of northern Baffin Island, parts of Prince Patrick and western Melville islands, parts of northwestern Ellef Ringnes Island, and the north coast and parts of the east coast of Ellesmere Island. From these studies, from the investigations of other geologists, and from sundry observations of explorers, it was clear that there was great diversity in the types and structure of the sedimentary rocks outcropping on the islands north of the Canadian Shield, and that this diversity was suitable for the occurrence of natural fuels.

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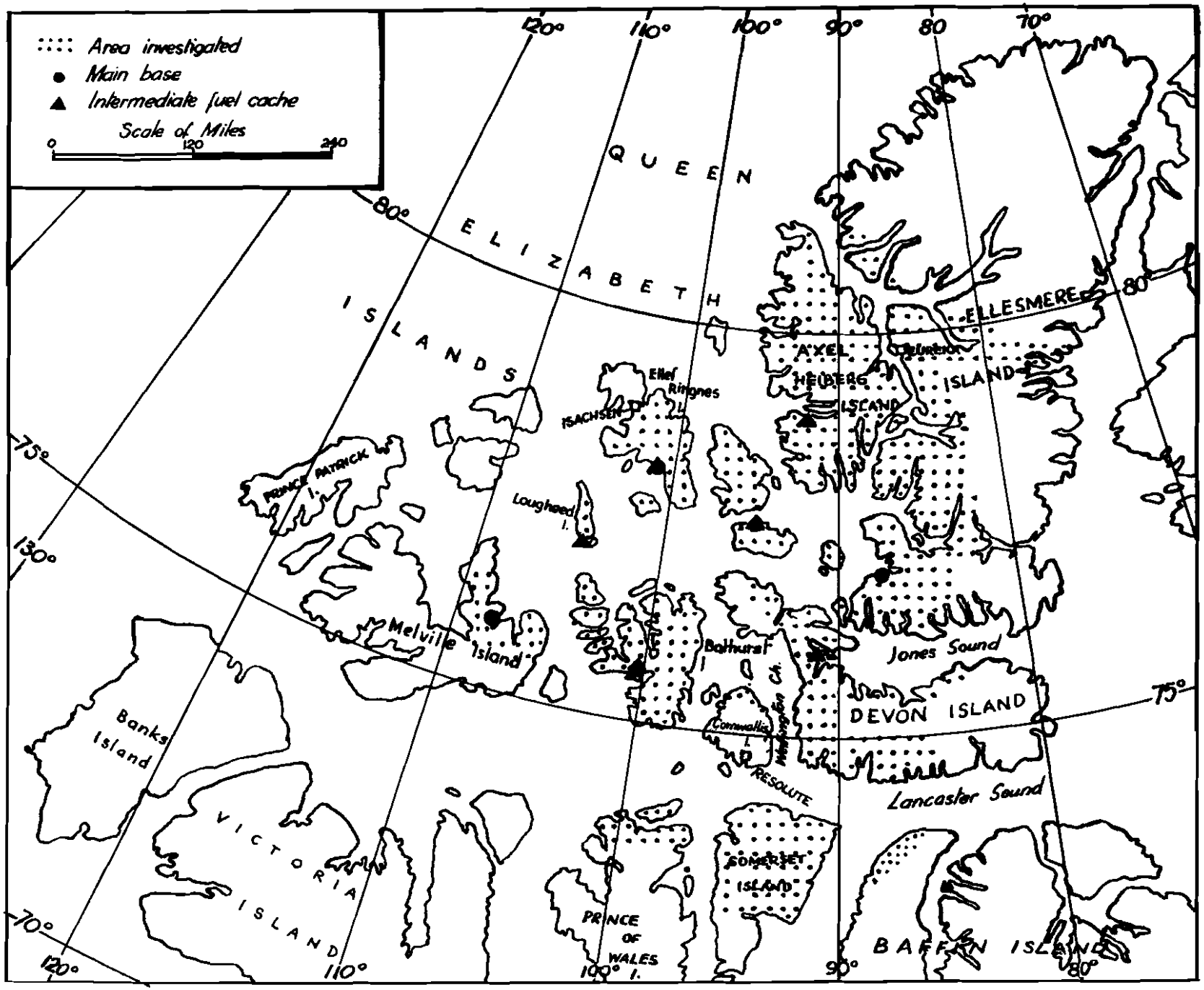
[1] Published with the permission of the Deputy Minister of Mines and Technical Surveys.


Area investigated
Main base
Intermediate fuel cache
Scale of Miles
0
120
240
120°
110°
100°
90°
80
70°
80°
75°
70°
QUEEN
ELIZABETH
ISLANDS
ELLESMERE
ISLAND
AXEL
HEIBERG
ISLAND
Elef Ringnes I.
ISACHSEN
PRINCE PATRICK I.
Loughead I.
Melville Island
Bathurst I.
Jones Sound
DEVON ISLAND
Banks Island
VICTORIA
ISLAND
Cornwallis I.
RESOLUTE
Lancaster Sound
SOMERSET
ISLAND
PRINCE OF WALES I.
BAFFIN ISLAND

Although the primary objective of the Survey is to map and study the geology of all parts of Canada, the 1955 project in the arctic islands was also oriented towards the assessment of the natural fuel potentialities of the islands. For this reason the area chosen included all the Queen Elizabeth Islands west of the Precambrian crystalline rocks of eastern Devon and Ellesmere islands, as well as parts of northwestern Baffin, Somerset, and Prince of Wales islands.

In the face of the difficulties, particularly of transportation, inherent in any work in the Arctic, it would not have been practicable to have undertaken an over-all detailed study of so large an area. Therefore the activities of "Operation Franklin" were directed towards determining the regional geology rather than the ramifications of any element. In more southern parts of Canada investigation of such an area would have depended on the use of fixed-wing aircraft or small helicopters supplemented by fixed-wing aircraft, but because of the scarcity of lakes, the unpredictability of break-up both on the lakes and on the sea, and the difficulties of finding suitable landing areas, it was necessary to use larger, long-range Sikorsky S-55 helicopters. It was considered that these machines retained, in spite of limitations of load, range, and travel over extensive open water, sufficient versatility for reaching and investigating any point within the territory to be surveyed.

"Operation Franklin" was a unique operation for the Geological Survey in several ways. It was certainly not the first helicopter operation carried out - "Operation Keewatin" had proved the technique and other similar projects had been made - but it was by far the largest and was to take place in a very much more inaccessible area. Therefore the whole project had to be planned, perhaps, more as a military operation than a normal field project. Planning started in the spring of 1954 when supplies for the project had to be estimated for sending to Resolute and Eureka on the 1954 summer sea supply mission. During the following winter about 16,000 air photographs were examined by members of the staff of the Survey and tentative photo-geological maps were prepared; key localities for detailed stratigraphic work were also selected. Operational provision was made to investigate the entire territory, but in the Arctic bad weather may prove such a serious and unpredictable handicap that the operation was so planned that even if the key localities only had been visited a valuable study would have been made of each of the major geological regions.

In fact, the weather was poor throughout most of the summer of 1955 in the southern part of the area covered by "Operation Franklin", and it was estimated that flying was prevented for 60 per cent of the time; the Survey was "lucky" only on Axel Heiberg Island. In spite of this, geological investigations were made of a land territory exceeding 100,000 square miles, or roughly 3 per cent of the land area of Canada. In addition to the substantial amount of information collected on general geology, detailed and specific studies were made of the stratigraphy at all the large number of key localities. Together, these localities form a network of reference standards on the stratigraphy of the entire region; separately, each provides local orientation for any future and more detailed surveys in their immediate area.

From the work of "Operation Franklin" the geology for about three-quarters of the 100,000 square miles investigated can now be adequately reproduced on reconnaissance maps at a scale of 1 inch to 8 miles. In compiling such maps, the geology from studied localities is extrapolated to intervening areas through re-examination of air photographs and through sundry observations made by airborne geologists who accompanied all flights and also aided in the visual navigation of the aircraft. The results of the project are now being prepared for publication by the Survey.

The operational aspects of the project illustrate a useful method of scientific exploration in the Arctic. Three sites for main base camps were chosen in the area and five other localities were picked for intermediate fuel caches. These are shown on the sketch-map. The distance between caches was about 110 miles, which allowed a payload of 1,400 pounds per helicopter trip when moving from one base camp to another. In addition to the field bases, Resolute and Eureka were available as operation centres.

Okanagan Helicopters Ltd. of Vancouver were the successful bidders for the helicopter phase of the operation. The following data on the helicopters used may be of interest. All take-offs from base were made with a maximum weight of 7,200 pounds. The empty weight of a helicopter was 5,000 pounds, leaving a useful load of 2,200 pounds. The standard load carried on all flights was 520 pounds, comprising the pilot, a geologist-navigator-observer, emergency gear, and oil. Besides the above load, 240 pounds of fuel (one hour reserve) was always carried. This left a disposable load of 1,440 pounds, the leeway wherein load had to be balanced versus distance.

The average cruising speed of the helicopters was 72 miles per hour, which required 240 pounds of fuel. This meant that about 1,080 pounds of cargo could be airlifted 110 miles or about 710 pounds 220 miles. Thus a two-man geological party weighing 650 pounds could be flown from base camp to a station 120 miles away still leaving fuel for the machine to return to base without dipping into the reserve. Again, the same helicopter, starting from base with 100 pounds of supplies and 1,470 pounds of fuel, some carried in drums, could re-supply the same party, airlift it 70 miles farther on, and return to base with at least 100 pounds of specimens, having made a circuit of 370 miles.

The operation was divided into two main parts: a cache phase and a survey phase. During the cache phase the food and fuel sent in in 1954 was sorted by members of the survey and was then flown by a DC-3 aircraft chartered from Arctic Wings Ltd. to each site from either Resolute or, to a lesser extent, from Eureka. Extensive use was made of the facilities of the R.C.A.F. base and joint United States-Canadian weather station at Resolute, and the joint weather stations at Eureka and Isachsen, and the Survey received helpful cooperation from the authorities concerned.

At each of the three main base camp sites, the aircraft left a geologist, an assistant, and an Eskimo and dog-team with the stores. This party first moved the food and fuel from the landing site to a place where a camp could be established in the summer, sometimes several miles away, and then began initial geological investigations at each locality. At the intermediate sites fuel was cached by the aircrew. By early June more than 100 tons of fuel and supplies had been distributed and initial field work had been accomplished. The dog-teams and field parties were then withdrawn to Resolute and the DC-3 returned to Churchill. With the end of the cache phase the main survey phase began.

The S-55 helicopters were carried from Malton Airport to Resolute in two R.C.A.F. C-119 aircraft. By June 13 both helicopters had been reassembled and tested. From that date until mid-September the operation depended solely on these machines for transportation.

In all, 11 geologists from the Survey and 10 student assistants took part in the summer's work, and about nine field parties were maintained. Each party consisted of a geologist and an assistant who were landed at the key

localities chosen during the photo-geological investigation during the preceding winter, and remained for from three to ten days before being moved to a new station. When all the key localities within a radius of about 150 miles of a main base camp had been occupied, the base itself was moved by helicopter to the next site. Thus each party and the operation as a whole advanced by stages through the area to be surveyed. Each party was supplied with about 70 pounds of rations and also carried an emergency food pack. Where the geology warranted it long traverses were made on foot: two crossings were made of Axel Heiberg Island and one trip was made across a part of central Ellesmere Island.

The ice in Lancaster Sound breaks up in early June, that in Wellington Channel and Jones Sound in mid-July, but the ice surrounding the western islands seldom breaks up. Thus by completing the survey work in the vicinity of Resolute by early July and proceeding in a counter-clockwise direction north and west from Resolute, first occupying the base on southwestern Ellesmere Island, then that on Ellef Ringnes Island, and finally in mid-September returning to Resolute via Lougheed and Bathurst islands, it was possible to avoid flying over open water in the helicopters, a necessary safety precaution.

After August 20 it became apparent that the weather, which in 1955 was worse than usual, was deteriorating rapidly and the field parties were gradually brought in to the base camp on Ellef Ringnes Island. The assistants were moved to Isachsen together with the bulk of the equipment and specimens and were later brought out on the first aircraft of the fall weather station airlift. The geologists continued the original field programme on Lougheed and Bathurst islands on a reduced scale and returned to Resolute by helicopter in mid-September. In late September they were taken out by an R.C.A.F. Transport Command aircraft and the helicopters were dismantled and flown south in C-119's early in October. Throughout the operation there had been no accident and the helicopters had shown that the only real limiting factor to what was otherwise physically possible for them, was unfavourable weather.

The geologists on "Operation Franklin" were:

Y.O. Fortier
R.G. Blackadar
B.F. Glenister
H.R. Greiner
D.J. McLaren
N.J. McMillan
A.W. Norris
E.F. Roots
J.G. Souther
R. Thorsteinsson
E.T. Tozer

Visit of the National Research Council to northwestern Canada and the scientific work of the Council in the area. By R.F. Legget

In 1956 the National Research Council of Canada held its summer meeting in Saskatoon instead of Ottawa to give the members of the Council an opportunity to see some of the current developments in the north. The Research Council, which was founded in 1917, is the national advisory body on scientific research and also channels federal funds into fellowships and grants-in-aid for the support of research work at the universities. It operates, in addition, nine research divisions with a total staff now approaching three thousand. Much of its correlative work is carried out through the medium of Associate Committees, one of which (on Soil and Snow Mechanics) has been active in northern research, particularly in connection with the study of muskeg. Other northern work is carried out by the Division of Building Research and cosmic ray experiments are being made at Resolute by the Division of Physics.

Following the meeting in Saskatoon, most of the members left for Uranium City on a Canadian Pacific Airlines chartered aircraft. The party of about thirty was led by the President of the Council, Dr. E.W.R. Steacie, F.R.S., and included the Directors of some of the National Research Council Divisions and Mr. Charles Herbert of the Department of Northern Affairs as well as the members of Council.

At Beaverlodge the party was received by Mr. W.F. Gilchrist, local manager of Eldorado Mining and Refining Company Limited, and was privileged to inspect the mill which refines the uranium ore. All members visited the new townsite and saw how the Saskatchewan Department of Natural Resources is developing a well laid-out town even in so isolated a location. The new 25-bed hospital was visited by a few; others inspected the road to Bushell and saw transshipment operations at this

busy little port. Here, the party was first introduced to permafrost; at this location it has been under careful study by the Council's Division of Building Research, assisted by the local Saskatchewan government officials.

After a splendid view of part of the Pelican Rapids on the Mackenzie River, dramatized by an approaching storm, the party flew on to Yellowknife. Here all were impressed by the activity of the town, seen under the guidance of Mayor F.W. Henne, and by the busy traffic at the local airport. In the inspection of the town something was seen of the unusual local water supply system, in which N.R.C. research had played a part. The Council gave a dinner to leading residents at which an address was given by Dr. David Thomson, Vice-Principal and Dean of the School of Graduate Studies of McGill University.

The party then proceeded to Norman Wells which was its centre for a long weekend. The Council were here the guests of Imperial Oil Limited, and were privileged to see something of the oil refinery operations. They inspected also the exposure site operated near the airport by the Division of Building Research. This is one of twenty-one such sites, located all over North America, at which materials can be exposed to normal atmospheric conditions which are carefully measured and recorded. Seven are in Canada, operated by the Council; fourteen are in the United States operated by the American Society for Testing Materials. The purity of the atmosphere at Norman Wells, together with its northern location, has led to its being adopted as the norm for all twenty-one exposure sites. The Council also inspected what is probably the most northerly experiment anywhere into evapo-transpiration from experimentally prepared grass plots, which is carried out for the Ontario Research Foundation.

The Chief event of the visit to Norman Wells was the opening of the new buildings for the Northern Research Station of the Division of Building Research. This ceremony was performed by Dr. Steacie, late one evening so that it could almost be said that the station was opened by the light of the midnight sun. Permafrost research was started at Norman Wells in cooperation with Imperial Oil Limited in 1953, using temporary quarters in two of the old prefabricated Canol buildings (see Circular, Vol. 6, No. 5, pp. 55-6). These are now replaced by the new buildings which consist of two

well-built prefabricated structures. One, measuring 20 x 48 feet, serves as a residence for up to six research officers. The other, measuring 20 x 72 feet, is a fully equipped soil mechanics laboratory, with an associated workshop and garage for the special truck and drilling equipment used by the station for investigation of permafrost in the field.

The party was divided into two groups for visits to the arctic coast. One of these was to Tuktoyaktuk and for this the chartered C.P.A. DC-3 aircraft was used. Although snow had left the ground there was still ice on the ocean, and the visitors were able to see an Eskimo village in a typical environment. In great contrast was the D E W. Line installation inspected.

The second excursion from Norman Wells was made to Aklavik in two C.P.A. Otters. The perfect weather on the second day gave an unsurpassed view of the wide expanse of the Mackenzie delta and showed the old town of Aklavik at its best. Each of the parties was kindly entertained to lunch by the R.C.M.P. and were treated to reindeer meat from the adjacent reserve. After examining some of the buildings of the existing town, including the hospitals and the beautiful little Anglican cathedral, each party then flew across the delta to "E-3", the site selected for the new location of Aklavik. Here the resident project manager for the Department of Northern Affairs, Mr. Curt Merrill, gave an explanation for the move of Aklavik and explained how the survey for the new site had been carried out. The detailed investigations included careful exploration of the sub-surface using the special permafrost drill of the Division of Building Research. Soil samples thus obtained were flown to Norman Wells for laboratory study. Public health matters, transport facilities, and supplies of building materials were other factors studied for each potential site. Only on the basis of such exhaustive studies was the decision finally made to select "E-3".

From Norman Wells the whole party proceeded in two DC-3 aircraft up the Mackenzie River to Fort Simpson. Here they were "ferried" to the town in chartered Otters owing to the high water in the river which cut off normal road access from the airport. They were received at the Experimental Farm of the federal Department of Agriculture by its Superintendent, Mr. John Gilbey, and were surprised to find fifty acres of obviously excellent soil under active cultivation. The application of scientific agricultural techniques in this far northern location has clearly confirmed that the agricultural potential of the

Mackenzie valley is valid but restricted to the narrow strip of good soil adjacent to some sections of the river.

The flight from Fort Simpson was the only one on this scientific odyssey in which the weather did not cooperate, and was wholly in clouds. At Whitehorse the party was greeted by the Commissioner of the Yukon and by a senior representative of the Northwest Highway Command of the Canadian Army, both of whom assisted greatly in the short but crowded visit to the Whitehorse area. Miles Canyon was naturally visited; even rain could not hide its superb beauty. Added, but somewhat poignant, interest was given by the fact that test drilling was in progress at the canyon for the projected great dam which may one day form a part of the hydro-electric project now being planned for this area. The Whitehorse Rapids were also viewed and further test drilling for yet another proposed power scheme was seen in progress. The two existing power plants which serve Whitehorse and its area were inspected and a tour was made of the newly developed townsite on the east bank of the river, with its wonderful hospital site and unusual water supply intake. Here, as in Yellowknife, the Council entertained leading local citizens and representatives of all major local agencies to a dinner at which an address was given by Dr. G.E. Hall, President of the University of Western Ontario.

From Whitehorse the party returned directly to Edmonton. Again, the journey was favoured by perfect weather and the C.P.A. pilot, Captain Doug Gaul, was able to take advantage of this while flying the regular route to let all members of the party have a view of the mountains and glaciers of the northwest. Although visions of such natural beauty, and the fascinations of primitive Eskimo life on the arctic coast, were vivid in the minds of all who took part in this unusual journey, its scientific implications will surely be their dominant impression.

Northern activities of the Geodetic Survey, 1955 and 1956

During the past two years, the Geodetic Survey has extended its network of basic horizontal and vertical control farther into Canada's northland, by means of shoran, triangulation, astronomic observations, and precise levelling. Aircraft have provided the principal means of transportation, though water transport has also been used, and in one case a railway was available.

In 1955 a Geodetic Survey officer was attached to H.M.C.S. Labrador on her trip to the Eastern Arctic. The voyage started from Halifax, and included a stop at Greenland, a trip through Hudson Strait and into Foxe Basin to prepare hydrographic charts, and a later trip escorting a convoy of merchant ships into Foxe Basin. As control for the hydrographic work two temporary Electronic Position Indicator stations were set up on shore, on Foxe Peninsula and Cape Fisher, and their positions were determined by means of astronomic observations. Astronomic observations for latitude and longitude were also made at 5 other stations in the Foxe Basin area, thus adding to the network of astronomic control in the area.

With the cooperation of the R.C.A.F., the shoran network was extended in 1955 and 1956 to cover the Yukon Territory and the southern part of the arctic Islands. The northern limit of the Canadian shoran network now coincides approximately with the 75th parallel of latitude. In the past two years, positions were determined of 26 stations, involving the measurement of about 130 lines.

Most of the work north of the mainland was carried out in the spring and early summer of 1956, using ski-equipped aircraft. Line crossing operations were completed before the end of July, but this proved to be too late for the removal of all personnel from ground stations by ski-equipped machines. In one or two cases, parties were marooned for a month or so, awaiting sufficient open water for a Canso to laid.

As mentioned in previous reports in the Circular (Vol. 5, No. 4, pp. 44-6, and Vol. 7, No. 4, pp. 50-1), a triangulation network has been extended northerly through Quebec and Labrador from Seven Islands, Gulf of St. Lawrence, to Chimo, Ungava Bay, with a branch network easterly following the valley of the Hamilton River. In 1955 the network along the Hamilton River was extended to the Atlantic coast, where connection was made with previous work by the U.S. Navy Hydrographic Service. At the same time a first-order arc of triangulation was started near Oskelaneo, in the Gouin Reservoir area south of Chibougamau, and projected northeastward, to pass eventually through Knob Lake and on to the Atlantic coast at Nain. In 1956 observation of angles on this arc was extended past Lake Mistassini, while reconnaissance was also being carried out at the other end of the arc, between Knob Lake and Nain.

As control for the triangulation, astronomic observations were made at three triangulation stations, one near Chibougamau and two near the Papaskwasati River, which drains into the northwest end of Lake Mistassini, and the length of the line between the last two stations was measured directly with invar tapes. A line measured in this way is known as a base line, and at this base line the length was measured by geodimeter as well as by tape. The geodimeter is a recently designed instrument which makes use of a modulated beam of light emitted by the instrument at one end of the line, and received back after reflection from a mirror or prismatic reflector at the other end. In our tests, the discrepancy between geodimeter and tape lengths was about one part in 300,000, which is about the same as the uncertainty of the tape measurement itself. The geodimeter should greatly facilitate distance measurements in the far north, since a line may be measured much more rapidly than by tapes, and the line requires no preparation provided the end points are intervisible.

A precise level line, which was started in 1955 and completed in 1956, has been run along the Q.N.S. and L. Railway from Seven Islands to Schefferville, in the Knob Lake mining area. The levels are based on a tidal bench mark at Seven Islands, the elevation of which was determined from tidal observations by the Canadian Hydrographic Service. We thus have elevations to a high order of accuracy established in the heart of the Knob Lake mining area, and these will undoubtedly prove very useful for many purposes.

Members of the Geodetic Survey staff taking part in these northern operations were as follows: Astronomy, W.D. Forrester; Shoran, A.C. Hamilton, S.A. Yaskowich, C.D. McLellan, and K. Seitz; Triangulation, J.V. Thompson, S.A. McNeily, A.D. Selley, M. Duval, K. Seitz, D. St. Helene, A. Drolet, R. Healey, and F. Hawkins; Base line, H.E. Jones; and Levelling, N.H. Frost and G. Laflamme.

Agreement between Canada and the United States on the establishment of a Distant Early Warning System in Canadian territory

On 16 November 1955 the Canadian government concurred in a United States proposal that the construction of a Distant Early Warning Line (DEW Line) in the far north to aid in the air defence should be the responsibility of the

United States government. The DEW Line would be one element of the over-all joint Canada/United States warning system. The conditions governing the establishment of the DEW System were agreed between the two governments in an exchange of notes dated 5 May 1955. At this time the Canadian government stated its intention to participate in the operation and maintenance phase of the project. The conditions are given below:

1. Sites

The location and size of all airstrips and the location of all sites, roads, wharves and jetties, required for the DEW System in Canada shall be a matter of mutual agreement by the appropriate agencies of the two Governments. Canada will acquire and retain title to all lands required for the system. Canada grants and assures the United States, without charge, such rights as access, use, and occupancy as may be required for the construction, equipment and operation of the system.

2. Liaison Arrangements

It is anticipated that the United States will carry out the construction of the DEW System through a management contractor appointed by the United States. It is understood that the United States and the management contractor will establish a DEW Project Office, and that the participation of interested Canadian Government agencies in the Project Office is desired to the extent necessary for consultation on matters covered in this statement of conditions. In addition, the Canadian Government may decide to appoint a Special Commissioner for the Project, and to assign liaison officers to the construction operations in Northern Canada.

3. Plans

Plans of the buildings, airstrips, roads (including access roads) and similar facilities, information concerning use of local materials, such as rock fill, sand and gravel, and information concerning other arrangements related to construction and major items of equipment, shall, if requested, be supplied to the appropriate Canadian authorities in sufficient detail to give an adequate idea of the scope of the proposed construction. Canadian officials shall have the right of inspection during construction. Proposals for subsequent construction, or major alterations, shall be discussed with the appropriate Canadian authorities.

4. Provision of Electronic Equipment

The Canadian Government reaffirms the principle that electronic equipment at installations on Canadian territory should, as far as practicable, be manufactured in Canada. The question of practicability must, in each case, be a matter for consultation between the appropriate Canadian and United States agencies to determine the application of the principle. The factors to be taken into account shall include availability at the time period required, cost and performance. For the purpose of applying these principles to the DEW line, the DEW Project Office shall be used as far as possible as the instrument for effective consultation between the Canadian and United States agencies concerned.

5. Construction and Procurement (other than Electronic Equipment)

(a) Canadian contractors will be extended equal consideration with United States contractors in the awarding of construction contracts, and Canadian and United States contractors shall have equal consideration in the procurement of materials, equipment and supplies in either Canada or the United States;

(b) Contractors awarded a contract for construction in Canada will be required to give preference to qualified Canadian labour for such construction. The rates of pay and working conditions for this labour will be set after consultation with the Canadian Department of Labour in accordance with the Canadian Fair Wages and Hours of Labour Act.

6. Canadian Law

Nothing in this Agreement shall derogate from the application of Canadian law in Canada, provided that, if in unusual circumstances its application may lead to unreasonable delay or difficulty in construction or operation, the United States authorities concerned may request the assistance of Canadian authorities in seeking appropriate alleviation. In order to facilitate the rapid and efficient construction of the DEW System, Canadian authorities will give sympathetic consideration to any such request submitted by United States Government authorities.

Particular attention is directed to the ordinances of the Northwest Territories and Yukon Territory, including those relating to the following:

(a) No game or wildlife shall be taken or molested in the Northwest Territories. Licences to hunt in Yukon Territory may be purchased from representatives of the Yukon Territorial Government.

(b) No objects of archaeological interest or historic significance in the Northwest Territories or Yukon Territory will be disturbed or removed therefrom without first obtaining the approval of the Canadian Department of Northern Affairs and National Resources.

7. Operation and Manning

(a) The extent of Canadian participation in the initial operation and manning of the DEW System shall be a matter for later decision by Canada after full consultation with the United States. It is understood that, in any event, Canada reserves the right, on reasonable notice, to take over the operation and manning of any or all of the installations. Canada will ensure the effective operation, in association with the United States, of any installations it takes over.

(b) Subject to the foregoing, the United States is authorized to station personnel at the sites, and to operate the DEW System, in accordance with the principles of command in effect from time to time between the military authorities of the two countries. The overall manning policy as between the employment of military and civilian personnel shall be the subject of consultation and agreement between the two Governments.

8. Financing

Unless otherwise provided by Canada, the costs of construction and operation of the DEW System shall be the responsibility of the United States, with the exception of Canadian military personnel costs if Canada should man any of the installations.

9. Period of Operation of the System

Canada and the United States agree that, subject to the availability of funds, the DEW System shall be maintained in operation for a period of ten years or such shorter period as shall be agreed by both countries in the light of their mutual defence interests. Thereafter, in the event that either Government concludes that any or all of the installations are no longer required, and the other Government does not agree, the question of continuing need will be referred to the Permanent Joint Board on Defence. In considering the question of need, the Permanent Joint Board on Defence will take into account the relationship of the DEW System to other radar installations established in the mutual defence interest of the two countries. Following consideration by the Permanent Joint Board on Defence, as provided above, either Government may decide that the installations in question shall be closed, in which case the arrangements shown in paragraph 10 below regarding ownership and disposition of the installations will apply.

10. Ownership of Removable Property

Ownership of all removable property brought into Canada or purchased in Canada and placed on the sites, including readily demountable structures, shall remain in the United States. The United States shall have the unrestricted right of removing or disposing of all such property, PROVIDED that the removal or disposition shall not impair the operation of any installation whose discontinuance had not been determined in accordance with the provisions of paragraph 9 above, and PROVIDED further that removal or disposition takes place within a reasonable time after the date on which the operation of the installation has been discontinued. The disposal of United States excess property in Canada shall be carried out in accordance with the provisions of the Exchange of Notes of April 11 and 18, 1951, between the Secretary of State for External Affairs and the United States Ambassador in Ottawa, concerning the disposal of excess property.

11. Telecommunications

The United States military authorities shall obtain the approval of the Canadian Department of Transport, through the Royal Canadian Air Force, for the establishment and operation (including the assignment of frequencies) of radio stations in Canadian territory. The provision of telecommunications

circuits (both radio and land-line) required during the construction period and thereafter will be the subject of consultation between the appropriate authorities of the two governments, having regard to the desirability of using existing military circuits and existing Canadian public carriers where this may be feasible.

12. Scientific Information

Any geological, topographical, hydrographical, geophysical, or other scientific data obtained in the course of the construction or operation of the DEW System shall be transmitted to the Canadian Government.

13. Matters Affecting Canadian Eskimos

The Eskimos of Canada are in a primitive state of social development. It is important that these people be not subjected unduly to disruption of their hunting economy, exposure to diseases against which their immunity is often low, or other effects of the presence of white men which might be injurious to them. It is therefore necessary to have certain regulations to govern contact with and matters affecting Canadian Eskimos. The following conditions are set forth for this purpose:

(a) Any matters affecting the Eskimos, including the possibility of their employment in any area and the terms and arrangements for their employment, if approved, will be subject to the concurrence of the Department of Northern Affairs and National Resources.

(b) All contact with Eskimos, other than those whose employment on any aspect of the project is approved, is to be avoided except in cases of emergency. If, in the opinion of the Department of Northern Affairs and National Resources, more specific provision in this connection is necessary in any particular area, the Department may, after consultation with the United States, prescribe geographical limits surrounding a station beyond which personnel associated with the project other than those locally engaged, may not go or may prohibit the entry of such personnel into any defined area.

(c) Persons other than those locally engaged shall not be given leave or facilities for travel in the Canadian Arctic (other than in the course of their duties in operation of the project) without the approval of the Department of Northern Affairs and National Resources, or the Royal Canadian Mounted Police acting on its behalf.

(d) There shall be no local disposal in the north of supplies or materials of any kind except with the concurrence of the Department of Northern Affairs and National Resources, or the Royal Canadian Mounted Police acting on its behalf.

(e) Local disposal of waste shall be carried out in a manner acceptable to the Department of Northern Affairs and National Resources, or the Royal Canadian Mounted Police acting on its behalf.

(f) In the event that any facilities required for the system have to encroach on or disturb past or present Eskimo settlements, burial places, hunting grounds, etc., the United States shall be responsible for the removal of the settlement, burial ground, etc., to a location acceptable to the Department of Northern Affairs and National Resources.

14. Canadian Immigration and Customs Regulations

(a) Except as otherwise agreed, the direct entry of United States personnel into the Northwest Territories or Yukon Territory from outside Canada shall be in accordance with Canadian customs and immigration procedures which will be administered by local Canadian officials designated by Canada.

(b) Canada will take the necessary steps to facilitate the admission into the territory of Canada of such United States citizens as may be employed on the construction of the DEW System, it being understood that the United States will undertake to repatriate at its expense any such persons if the contractors fail to do so.

15. Use of Airstrips

Airstrips at installations in the DEW System shall be used by the United States solely for the support of the System. If it should be desired at any time by the United States to use an airstrip for other purposes, requests should be forwarded

through appropriate channels. The airstrip shall be available for use by the RCAF as required. The airstrip shall also be available for use by Canadian civil air carriers operating into or through the area, whenever such use would not conflict with military requirements, and SUBJECT to the understanding that the United States Air Force will not be responsible for the provision of accommodation, fuel, or servicing facilities of any kind. Proposals and arrangements for such use of USAF-operated airstrips by Canadian air carriers shall be submitted to the RCAF, which shall consult the USAF before granting any such permission.

16. Landing Facilities

Landing facilities at any of the stations on tidewater will be available for use by Canadian Government ships and ships employed on Canadian Government business.

17. Transportation

Canadian commercial carriers will to the fullest extent practicable be afforded the opportunity to participate in movements of project materials, equipment and personnel within Canada. The United States will select the means of transportation and specific carriers for the movement of material, equipment, and personnel from points of Canada to DEW System sites, provided that in the case of air carriers applicable civil air transport agreements and procedures shall be observed.

18. Re-supply Arrangements

Because of the special conditions in the Canadian Arctic, the Canadian Government has a particular interest in the arrangements for the re-supply of the DEW System. These arrangements shall therefore be a matter for later consultation and agreement between the two governments.

19. Taxes

The Canadian Government will grant remission of customs duties and excise taxes on goods imported and of federal sales and excise taxes on goods purchased in Canada which are or are to become the property of the United States Government and are to be used in the construction and/or operation of the DEW System, as well as refunds by way of drawback of the customs duty paid on goods imported by Canadian manufacturers and used in the

manufacture or production of goods purchased by or on behalf of the United States Government and to become the property of the United States Government for the construction of the system.

20. Status of Forces

The "Agreement between the Parties to the North Atlantic Treaty regarding the Status of their Forces", signed in London on June 19, 1951, shall apply.

21. Supplementary Arrangements and Administrative Agreements

Supplementary arrangements or administrative agreements between authorized agencies of the two Governments may be made from time to time for the purpose of carrying out the intent of this agreement.

Meeting of the Southern Ontario Division, Canadian Association of Geographers

The Annual General Meeting of the Southern Ontario Division of the Canadian Association of Geographers will be held in the Department of Geography, McMaster University, on Saturday 26 January 1957. Registration will start at 9.15 a.m. in Hamilton Hall.

The Divisional Chairman, Dr. Hugh Thompson, will introduce the symposium and make brief commentaries linking the papers, which will all deal with "Northern Canada today". The following is a provisional list of speakers and topics:

Dr. William Dean -- Terrain analysis from air photographs
Mr. Morley Thomas and Mr. Donald Boyd -- Distribution of wind chill
Dr. Donald MacClement -- Caribou, muskoxen, and reindeer herding
Dr. Marjorie Findlay -- Sheep raising in arctic Quebec
Mr. Angus Hills -- Forestry and agriculture in subarctic Ontario
Mr. Curtis Merrill -- The re-siting and future of Aklavik
Dr. Trevor Lloyd -- Modern developments and Eskimo policy
Dr. Geoffrey Hattersley-Smith -- Expeditions to northern Ellesmere Island and the arctic ice islands (Banquet Speech).

Change of Address

Members are earnestly requested to advise the Treasurer, Mr. H.M. Cox, 196 Metcalfe Street, Ottawa, promptly of any change of address.

Editorial Note

The Editor would welcome contributions from those who are at present in the Arctic or have information about work in the Arctic. All material for the Circular should be sent to:

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The International Geophysical Year 1957-8. By D.C. Rose

The International Geophysical Year 1957-8 is the third such event though the previous two were more limited in objective and called "International Polar Years". The first was in 1882-3 and the second fifty years later, in 1932-3. The third, twenty-five years later, comes at a time when there are unprecedented facilities for travel to remote parts of the earth. This, combined with considerable public support for research into the dynamic behaviour of the earth and its surroundings, is making possible the great cooperative effort about to be undertaken. Further, the year 1957-8 coincides approximately with a period of maximum solar activity, and the sun has an important bearing on the majority of the geophysical phenomena to be studied.

The dynamic forces which make weather, ionosphere disturbances, aurora, and most of the other phenomena of geophysics are not limited by national boundaries. The basic information required to solve many of the problems requires either synoptic or simultaneous measurements over the whole surface of the earth. For years international cooperation in many of the branches of geophysics to be mentioned here has been carried out on a large scale because knowledge could only be gained by such cooperation. The cooperation was made easy by a common objective more cultural than commercial and completely free from political ideology. The I.G.Y. is essentially a great enhancement of scientific effort for a particular period. The detailed data will be that of an epoch represented by the eighteen months from 1 July 1957 to 31 December 1958. Much of the data will be

immediately to create a better understanding of the physical behaviour of the earth and its atmosphere. Some of it will remain to be used with other epochs to study slow processes such as continental drifts or the secular change in the position of the earth's axis.

Canada took little part in the first International Polar Year. There were three expeditions into northern Canada, only one of which was partially financed by the Canadian government. These expeditions were -

(1) A British expedition to Fort Rae financed jointly by the United Kingdom and Canada.

(2) A German expedition to Kingua Fiord (at the head of Cumberland Sound).

(3) A. U.S. expedition at Fort Conger on Ellesmere Island. This expedition undertook considerable exploration of the Greenland coast and on Ellesmere Island to Lake Hazen and Greely Fiord.

Canadian science was able to take a much more active part in the Second International Polar Year. Six stations were organized in Canada - five of which were Canadian. These were at -

Cape Hopes Advance	Meanook
Chesterfield Inlet	Saskatoon
Coppermine	Fort Rae (British)

In the organization of the Canadian effort the name of John Patterson, then head of what is now the Meteorological Branch of the Department of Transport, appears prominently and the stations were mostly organized through his efforts. A number of Canadian scientists who took part in these expeditions are still active in geophysical work.

The major efforts in the period were in meteorology, geomagnetism, atmospheric electricity, earth currents, aurora, and the beginnings of work on the ionosphere. Essentially the work was concentrated on the lower atmosphere and phenomena measured on the surface of the earth. In contrast to this the coming I.G.Y. organization has expanded the efforts not only over the whole surface of the earth but from deep in its interior (represented by seismology) through the upper atmosphere to the cosmological environment in which we find ourselves (represented by studies of solar radiation and cosmic rays).

The final report on the Second International Polar Year was written in 1951 in the form of a bibliography of the reports of the work planned and accomplished. The work from the six Canadian stations is represented in the bibliography by thirty-seven published papers. Our current plans list about eighty Canadian stations where special measurements will be taken in connection with the 1957-8 I.G.Y. On a proportional basis about five hundred scientific reports may be expected. We hope it will not take eighteen years to complete the presentation of the data. In some fields, of course, analysis is never final because it represents an epoch to be compared with future epochs or future I.G.Y's. In 1932-3 Chesterfield Inlet, Cape Hopes Advance, and Coppermine were very far north. Compare these with the present stations at Alert, Resolute, and Thule. In the present case none of the stations are being established solely for the I.G.Y. The measurements will be taken at existing weather or ionosphere stations, or where military establishments already exist. Some new buildings are being built at Baker Lake, Resolute, and Alert and a new magnetic station is being established at Yellowknife but for the most part communication and transportation channels already exist at every station. By taking advantage of these the scientific objective can be met more efficiently and economically than could be done if there had not been an active development in the Canadian Arctic during the past ten years. None of the stations planned are connected with either the Mid-Canada or Distant Early Warning Line stations.

Since geophysics covers a wide range of scientific disciplines, most of which already have their own international organizations, the I.G.Y. follows this natural subdivision of effort. There are thirteen so-called disciplines. The first of these is not really a discipline but is listed as such since it required a parallel subcommittee in the international planning.

1. World Days. There are certain days or selected periods during which measurements will be taken that are too difficult or too expensive to be taken continuously. For instance, high altitude radiosonde balloons will be released several times a day at meteorological stations instead of the usual two. The firing of rockets may be concentrated on World Days. There are two types of World Days - those planned in advance and those called on short notice, the latter being based on occurrences of unusual activity on the sun.

2. Meteorology. In the meteorological programme the emphasis is mainly on two features - world-wide circulation of the atmosphere and the radiation budget between the sun, the earth, and the atmosphere.

3. Geomagnetism. Most of the earth's magnetism comes from inside the earth but the magnetic field at the surface of the earth which has been used for centuries for navigation is subject to magnetic storms caused by disturbances in the upper atmosphere resulting from bursts of energy from the sun. This energy is in the form of radiation or charged particles or both. The energy bursts combined with the effects of the earth's magnetism cause winds and the flow of enormous electric currents high up in the atmosphere. During the I.G.Y. the emphasis will be on detailed studies of these storm effects and their interpretation in relation to other upper atmosphere phenomena.

4. Aurora and Air Glow. Much of our knowledge of the chemical composition and state of ionization or dissociation of molecules in the upper atmosphere (above say about 50 km.) is derived either from spectroscopic measurements on the light emitted or from the behaviour of radio waves. The aurora is usually believed to result from ionized particles shot out from the sun while the air glow is the result of chemical reactions. The aurora particles are profoundly affected by the earth's magnetic field and in turn are probably at least partly responsible for magnetic fluctuations. Techniques such as the reflection of radio waves from the aurora have enhanced our ability to study these phenomena and a world-wide network of stations using equipment and techniques not previously used on a large scale is being undertaken.

5. Ionosphere. Since we depend on the reflection of radio waves from the ionosphere for most of our radio communication and the ionosphere is a dynamic and constantly changing medium there is no need to emphasize that everything possible should be learned about it. Its effect on radio waves occurs in specific layers in the far upper atmosphere (fifty to several hundred kilometres). These layers are greatly influenced by sunlight and by the variable bursts of radiation or clouds of particles shot off the sun which were mentioned in discussing the aurora.

6. Solar Activity. The sun has been mentioned in all the previous disciplines. Most phenomena like geomagnetism, the aurora and air glow, and the ionosphere are affected by bursts of radiation (ultra-violet, X-rays, etc.) or clouds of particles from the sun and when these bursts occur there are usually spots or eruptions on the sun that may be seen and photographed. It is

essential, therefore, that the sun be watched continuously and a photographic record kept of its surface throughout the I.G.Y. The sun is always visible from some observatories during the 24 hours of the day and usually they are not all clouded over at once. International cooperation and rapid communication are important here. By watching the sun forecasts can be made (not yet with much certainty) when magnetic storms, aurora, and ionospheric disturbances may be expected.

7. Cosmic Rays. These are very energetic particles coming approximately equally in all directions. The source of these energetic particles is not completely known, but more can be learned about them by studying the variations that do occur in relation to other geophysical phenomena and over the whole surface of the earth.

8. Latitudes and Longitudes. This is essentially a study of the earth and its rotation.

9. Glaciology. In proportion to the amount of glacier-covered areas in our country Canadian science has done relatively little in this field. This is being corrected as rapidly as possible by groups in the University of Toronto, McGill University, and the Geophysics Section of the Defence Research Board. In this field, in particular, 1957-8 will be a period during which as much data as possible will be accumulated to be compared with past information and stored for comparison with the future.

10. Oceanography. In the international plans in oceanography two features stand out as important: a comprehensive measure of the circulation of sea water at all depths in the great Atlantic and Pacific Oceans, and a precise measure of tides and mean sea level at as many stations as possible, particularly in the Arctic and Antarctic. Most countries with any appreciable maritime boundaries will undertake oceanographic measurement, and multiple ship surveys only possible by international cooperation appear prominently in I.G.Y. plans.

11. Rockets and Satellites. Rockets and satellites in themselves should hardly be called a discipline though highly specialized knowledge is required in getting them launched, following their trajectory, and getting information back from them. The objectives of the rocket and satellite programme are concentrated in studies on the nature of the upper atmosphere above about 50 kilometres and on the nature of the solar radiation which is completely absorbed long before it reaches even the greatest height reached by aircraft. Ultra violet light and X-rays from the sun can only be observed by experiments of this sort

and the temperature, density, chemical composition, and state of electrical conductivity can be measured directly. These things are very important because we live by radiation from the sun, yet the atmosphere acts as a blanket to protect us from radiations that are known to be present and quite variable and in which life would probably be impossible. The atmosphere at these interesting levels represents a very good vacuum, better than can be obtained readily in the laboratory yet there is sufficient matter there to cause the ionosphere and aurora.

12. Seismology and 13. Gravity. These two disciplines have long been organized on an international scale and were included in I.G.Y. planning largely because of the possibility of taking extensive measurement at arctic and antarctic stations. For instance, the seismological station at Resolute is one of the most important there is, because of its distance from the chain of stations around the earth in temperate and equatorial zones.

In addition to the above divisions a programme is being planned which can be listed as the fourteenth discipline, namely, the measurement of the Radioactivity of the Atmosphere, including that produced from radioactive minerals, that resulting from nuclear interactions produced by cosmic rays, and the radioactive debris which is left in the air after atomic explosions. The international organization of this was late in getting started and the details are not completely decided.

The geographical distribution of stations in all these disciplines has been studied carefully by international groups and efforts have been made to get as perfect a coverage as possible. Since fifty-five nations are contributing the number of expeditions from larger countries into lesser developed areas is very small except in Antarctica where there will be over twenty I.G.Y. stations, including expeditions from Russia, the United Kingdom, France, the United States, New Zealand, Australia, Norway, and Japan. A map showing the proposed position of these stations has been prepared by the U.S. Hydrographic Office. There is, of course, a great deal of international exchanging of instruments and techniques, and cooperative efforts are being carried out in specialized fields.

The Canadian Programme

The Canadian Programme is organized under two Associate Committees of the National Research Council - the Associate Committee on Geodesy and Geophysics and the Associate Committee on Radio

Science. The former is the Canadian National Committee of the I.U.G.G. (International Union of Geodesy and Geophysics) and the latter the Canadian National Committee of U.R.S.I. (Union Radio Scientifique International). The programme is carried out by various government and university laboratories; the government laboratories finance their part through their own normal budget channels and university activities are financed through National Research Council or Defence Research Board grants. The whole is tied together by a small coordinating committee consisting of F.T. Davies, Assistant Chief Scientist, D.R.B., C.S. Beals, Dominion Astronomer, D.W.R. McKinley, Assistant Director, Division of Radio and Electrical Engineering, N.R.C., and as Chairman and Coordinator - D.C. Rose of the Division of Pure Physics, N.R.C.

Our Canadian Programme lists eighty observing stations. All meteorological stations where upper atomosphere measurements are normally taken and where an enhanced programme is to be carried out are included. For aurora measurements there is a chain of stations from Alert in a more or less straight line down to Winnipeg. These were planned to make as detailed as possible a study of a cross-section of the belt of maximum auroral occurrence, which is roughly at the latitude of Churchill. Another irregular group of stations extends from the arctic area across western Canada to Victoria. Every aurora station will have recording magnetometers, in addition to the permanent magnetic observatories at Agincourt, Baker Lake, Resolute, Meanook, and Yellowknife (just being established). Ionosphere stations follow roughly the same chain as the aurora. There are four cosmic ray stations planned: Resolute, Churchill, Ottawa, and on top of Sulphur Mountain near Banff. The glaciological programme includes an expedition to Lake Hazen. There is a considerable concentration of measurements at certain stations, for instance, practically every discipline is represented at Resolute and nearly all at Churchill. A complete report on the Canadian programme as planned up to May 1956 was issued a few months ago and a limited number of copies are still available.[1] As would be expected some changes have been necessary in the location of some of the stations and details of measurements at others, but the over-all plan has not been altered appreciably.

1. A revised programme dated May 1957 is now available.

It may be of interest to note that the International Union of Geodesy and Geophysics, one of the parent organizations of the I.G.Y., is holding one of its meetings in Toronto in September. It meets every three years and a gathering of research workers in geophysics from all over the world is expected.

Geological investigations in the arctic islands, 1956[1]. By R.G. Blackadar.

The Geological Survey of Canada had two field parties in the Arctic during the summer of 1956.

The first of these was in northern Foxe Basin where Dr. R.G. Blackadar assisted by Mr. J. Firrit, a graduate of Glasgow University, carried out field work from May until September. The party travelled from Churchill to Hall Lake early in May by an aircraft chartered from Trans Air Limited and proceeded on to Igloolik on May 7 by dog team. Later in the month two caches of fuel and food were laid north of Steensby Inlet by a Norseman aircraft piloted by the late Gunnar Ingebrightson.

During the latter part of May and in June four dog teams and four men from the Igloolik region, Alianikaloo, Ekoma, Allarut, and Kolaut, were employed. Each geologist was accompanied by two natives and trips were made as far west as Agu Bay beyond the west entrance to Fury and Hecla Strait, part way up Gifford Fiord, and to Jens Munk Island.

In late June the geologists accompanied by three natives and their teams, one of which was used to transport a 17-foot canoe, travelled to the mouth of Ravn River at the head of Steensby Inlet whence the natives returned to Igloolik, reaching the settlement just before the sea ice became impassable. From July 4 to August 19 Blackadar and Firrit investigated the area lying north of Steensby Inlet using the 17-foot canoe with a 3-h.p. outboard motor. Ravn River was free of ice by July 8 but some ice was encountered in the large tidal lake northeast of Steensby Inlet as late as July 28. On August 19 Peewaktoo, accompanied by Koono, Kipseega, and Malliki met the party at tidewater some 15 miles east of the mouth of Ravn River. The natives had left Jens Munk Island in Peewaktoo's 30-foot trap boat some days before but had been delayed by shifting ice in

1. Published by permission of the Director, Geological Survey of Canada, Ottawa, Canada.

the lower reaches of Steensby Inlet. Igloolik was reached on August 24 and, following a brief visit with Mr. Bill Calder of the Hudson's Bay Company, a trip was made to the Bouverie Islands and Richards Bay area northwest of Igloolik. Peewaktoo's boat was used for this trip also. Field work was concluded on September 11 and the party returned south via M.V. Calanus of the Fisheries Research Board, and Foundation Company of Canada aircraft.

In the Foxe Basin region a very late and snowy spring was followed by exceptionally fine weather. Between June 15 and July 10 there were scarcely any cloudy days and temperatures of 70 degrees were recorded in the shade on several occasions in July. The remainder of the season was more typical but on very few days was it impossible to carry out geological field work.

The second Geological Survey party consisted of Dr. R. Thorsteinsson and Dr. E.T. Tozer who worked in northwestern Ellesmere Island and eastern Axel Heiberg Island. This party made their base at the Eureka weather station in Slidre Fiord and travelled from Churchill to Eureka by way of Resolute on the spring airlift of the R.C.A.F. At Resolute two natives, Amagualik and Jebbedi, and two dog teams were engaged and were taken to Eureka with the geologists.

Thorsteinsson and Tozer began sledging in late April when two overland journeys were made to the "Sawtooth Mountains" some 30 miles east of the Eureka weather station to lay food caches for use on foot traverses during the summer. Owing to poor snow cover both journeys were difficult.

On subsequent journeys the coasts of Axel Heiberg and Ellesmere islands were investigated while sledging along Eureka Sound, Nansen Sound, Greely Fiord, Otto Fiord, Borup Fiord, and Hare Fiord. Canyon Fiord was traversed as far as East Cape and the Buchanan Lake region of Axel Heiberg was also investigated.

On July 3 the party arrived at Eureka from their last sledge journey. By this time there were many cracks in the sea ice and shore leads made it practically impossible to land dogs on the coast from the ice. Snow conditions varied greatly over the region traversed by sledge. In May Borup Fiord was covered by a mantle of soft snow two or three feet deep, and in early June similar soft snow prevailed in Otto Fiord, whereas only two to three inches of snow were encountered throughout most of Hare Fiord.

The period July 4 to August 7 was spent studying the geology of Fosheim Peninsula travelling on foot. In mid-July Thorsteinsson and Tozer walked to the "Sawtooth Mountains" along the route of the caches laid by sledge. Unfortunately a week of unseasonably bad weather handicapped investigations of these interesting mountains.

The break-up of the ice in Eureka Sound was completed during the first week of August. On August 2 Thorsteinsson and Tozer left Eureka for Bay Fiord in a 22-foot freighter canoe powered by a 9.7-h.p. Evinrude and carrying a spare 5 1/2-h.p. Johnson. Considerable delay was experienced in Eureka Sound because of shifting pack ice, whereas Bay Fiord was virtually clear and only one day was required to sail down its 45-mile length. Late in the evening of August 13 the party camped about one mile from Thumb Mountain, a prominent land mark at the west end of Sverdrup Pass. On the return leg of the canoe trip no ice was encountered until near the entrance to Bay Fiord, but adverse ice conditions in Eureka Sound again made progress slow. With the onset of freezing temperatures in the last week of August snow covered the land. On September 3 Thorsteinsson and Tozer returned to the weather station. At this time new ice was forming in Eureka Sound and Slidre Fiord. Within two days new and old ice had closed Slidre Fiord to canoe travel.

During the remainder of September geological investigations were carried out from the station whenever weather conditions permitted. On September 29 the party was flown to Resolute by the R.C.A.F. on the first leg of their journey south.

Eastern Arctic Patrol, 1956

The 1956 Eastern Arctic Patrol, which as usual was carried by the Department of Transport's ship C.D. Howe, left Montreal on June 28, sailing having been delayed for four days owing to a fire which broke out in the cargo. Settlements in northern Quebec and Manitoba, Baffin Island, Cornwallis Island, and southern Ellesmere Island were visited, and a brief stay was made at Thule, in Greenland, to deliver R.C.A.F. supplies sent from Churchill. The Patrol ended with the arrival of the ship at Quebec City on September 20.

This year the medical survey made by officers of the

Department of National Health and Welfare was the most comprehensive so far carried out in the Eastern Arctic. In the course of this survey more than 2,000 Eskimo were examined for tuberculosis, given medical checks and dental work, and vaccinated and innoculated. Fifty-one natives were taken home after medical treatment and 79 were evacuated to hospitals in southern Canada.

At each port of call officers of the Department of Northern Affairs, as part of its welfare programme, showed a health film with commentary in Eskimo as well as films for entertainment,played tape-recorded messages, and distributed pictures from Eskimo relatives in hospital in southern Canada. In addition recordings were made of messages for relatives "outside" and pictures of family groups were taken for the same purpose.

An historic occasion on this year's Patrol was the moving of the R.C.M. Police detachment from Craig Harbour, where it had been since its establishment in 1923, to Grise Fiord, about 50 miles to the west. The move will bring the post closer to the better hunting grounds already being used by the Eskimo who were brought to Craig Harbour from Port Harrison in 1953. Superintendent Henry Larsen was in charge of the closing of the old post. The new post will keep the name Craig Harbour. Inspection work for the R.C.M. Police on the earlier part of the Patrol was carried out by S/Sgt. G. Abraham.

The Patrol also made the usual delivery and pick up of mail and hydrographic surveys, and a survey was taken of the educational facilities in the Eastern Arctic. Besides carrying cargo and the Patrol the C.D. Howe was used to provide accomodation for stevedores at Resolute who were engaged in unloading supplies for the joint arctic weather stations.

Following the closing of the Department of Transport's weather station at Padloping Island, the staff were taken south on the C.D. Howe.

During the first part of the Patrol, R.A.J. Phillips of the Department of Northern Affairs was Officer-in-Charge. At Churchill he was replaced by J.C. Jackson of the same department, which also had the following representatives on the Patrol: J. LaRiviere, assistant to the Officer-in-Charge until Churchill, and D. Snowden, who took over these duties for the remainder of the voyage; W.H. Van Sickle and M. Sutherland of the Educational Division, and A.E. Spalding, interpreter.

The chief of the medical party as far as Resolute was Dr. J.H. Wiebe of the Department of National Health and Welfare, and on the return trip, Dr. I.F. Kennedy. Other members of this party were Dr. H.B. Sabean, assistant to the chief; radiologists, Dr. C.J. Dougherty, Dr. H.P. Peart, and Dr. R.B. Lynn; X-ray technician, F. Woodhouse; nurse, Ann Webster; nurse's assistant, Annie Padlo; orderly, Peter Wilson; and interpreter, Elijah Menarik.

The Postmaster on board was D. Workentin. Among the passengers carried were the Rt. Rev. D.B. Marsh, Anglican Bishop of the Arctic, from Churchill to Resolute, and P.A.C. Nichols, Manager of the Arctic Division of the Hudson's Bay Company, from Montreal to Sugluk.

Meteorological station at Sachs Harbour, Banks Island

In the original plans for a network of joint Canadian/United States arctic meteorological stations, a station on the west coast of Banks Island was included, but had to be dropped for reasons of economy. As a station in this area would provide observations from the immediate vicinity of the polar ice pack in a sector of the Arctic from which there were no other reports, the Canadian government later decided to go ahead on its own, and chose a site at Sachs Harbour on the southwest coast of the island.

Prefabricated buildings, equipment, supplies, and some 62 tons of diesel oil were landed at the beach at Sachs Harbour in mid-August of 1955. Although the material was cached above normal high-water level, one of the worst storms experienced in the Western Arctic scattered it along the shore up to a distance of 75 miles. Most of the equipment and supplies were recovered, but the contractor was naturally much delayed in erecting the buildings. The weather station staff performed a herculean task of dismantling, cleaning, and reassembling all equipment which had been immersed in sea water, and weather observations were begun on 1 November 1955. The buildings were carefully planned for both fire prevention and economy of operation, and the arrangement has resulted in a marked economy of fuel consumption compared with similar arctic stations.

Experience has shown that an airstrip is very desirable at the station. At present transportation is by Hudson's Bay Company ship once a year in late August. This means that no

overlap of incoming and departing staff is practicable as the ship must leave immediately after unloading supplies because of the short navigation season. Airdrops of fresh meat, needed spare parts, and mail are normally arranged at the time of the spring and fall airlifts to the joint Canadian/United States stations and at Christmas.

The staff is four meteorological assistants, two radio operators, one diesel power plant operator, and one cook. The meteorological programme consists of two rawinsondes giving pressure, temperature, humidity, and wind direction and speeds at very high levels; eight surface observations per day, including measurements of temperature, dewpoint, cloud, wind direction and speed, barometric pressure and pressure tendency, and cloud types and amounts; and two pilot balloon ascents for wind aloft. The thickness of the sea ice is measured monthly using special ice augers.

Scandinavian archaeological expedition to Svalbard, 1955. By George Nellemann

In July and August of 1955 a group of Scandinavian archaeologists visited Svalbard to search for cultural remains antedating the discovery of the islands by Willem Barents in 1596. The expedition was supported by private gifts and a grant from a Norwegian public foundation. The Norsk Polarinstitutt and the Danish Arktisk Institut loaned equipment and gave other assistance. Norwegian authorities and the crew of the Isfjord Radio also gave much help and practical advice. The members of the expedition were: Hans Christiansson, Sweden; Povl Simonsen, Norway; Helmer Tegengren, Finland; and Oluf Olsen and George Nellemann, Denmark. Thorleif Markussen, Norway, who had already visited these islands, also joined the expedition.

Unfortunately bad weather prevented the party from making extensive journeys in their small open boat, and work was confined to the areas between Grønfjorden and Kapp Linné and around the Lake Linnévatnet on the west coast of Vest Spitsbergen. An early Russian hunting settlement consisting of seven dwellings with heavy timber walls was excavated and a large number of well preserved artifacts were found, including wooden objects with inscriptions in Russian characters dating from the eighteenth century. These artifacts gave a good idea of some aspects of the life of the inhabitants, for instance their hunting habits, indoor life, and

gambling. Other ruins dating from the period of English and Dutch whaling, which began about 1610, were partly excavated.

No remains which could certainly be dated to a period prior to Barents' discovery were found, but artifacts of a different style and obviously belonging to an older tradition were discovered under the floor in the Russian huts, which suggests that later expeditions may perhaps find traces of an older occupation.

Waterproof material for maps

The Daly and Morin Company of Montreal have recently produced a waterproof material for printing maps, which appears to stand up well to wear and to be reasonable in cost. Their D.B. Litho Cloth is a vinyl-coated muslin, heavily calendered, so that the vinyl is completely impregnated into the cloth. This renders the cloth waterproof and the printed map is washable; written notes, with the exception of those made by ballpoint pen or indelible lipstick, can be removed with soft soap and water.

The prices of D.B. Litho Cloth range from $0.61 a yard for 36-inch width to $1.14 for 52-inch width. The printing process is not complicated and further information can be obtained from the Chief Cartographer, Department of Mines and Technical Surveys, Ottawa.

Editorial Note

The Editor would welcome contributions from those who are at present in the Arctic or have information about work in the Arctic, All material for the Circular should be sent to:

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