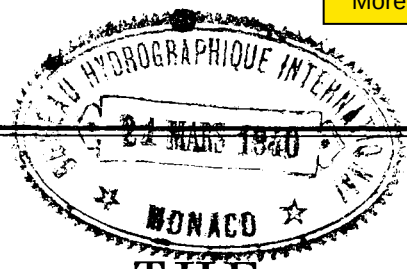

THE POLAR RECORD

Edited by F. DEBENHAM

Volume 3
NUMBER 19:
JANUARY 1940

PRINTED IN GREAT BRITAIN FOR
THE SCOTT POLAR RESEARCH INSTITUTE
CAMBRIDGE: AT THE
UNIVERSITY
PRESS

1940

Price Two Shillings

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D'URVILLE

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THE POLAR RECORD

Vol. 3 *January* 1940 No. 19

FOREWORD

Our frontispiece marks the centenary of two large and important expeditions to the Antarctic, by reproducing the portraits of their leaders, Captain Dumont D'Urville of the French Navy, and Lieutenant Charles Wilkes of the United States Navy. Both discovered land in the Australian sector in January 1840, the Adélie Land of the French being straddled by the Wilkes Land of the Americans. The expeditions were alike in that both the ships were not specially equipped for Antarctic service, and that in both cases the final reports appeared in great detail with excellent illustrations. It is most fitting that honour should now be accorded to these leaders of a century ago, and no doubt they will be commemorated in other ways in the course of the year. The reproductions have been made from portraits in the possession of the Royal Geographical Society, with its kind permission.

It is a pleasure to record the award of the David Livingstone medal by the American Geographical Society to John Rymill in recognition of his work as leader of the British Graham Land Expedition of 1934–37. The members of the expedition have also been honoured by the award, by His Majesty the King, of the Polar Medal in silver.

Readers will remember that it has been our intention to include articles of some length in each number of *The Polar Record*, but the unusual length of the article in this issue calls for remark. This review of polar footgear has been planned for some time, and, thanks to the help of many correspondents, it may be regarded as fairly comprehensive. A second part, concerned mainly with accessories such as crampons, skis and snowshoes, will appear in our next issue.

The outbreak of war has naturally had its repercussions on polar work. All European nations have had to cancel plans for polar exploration and probably the leader most seriously affected is Dr G. C. L. Bertram, whose organisation for a British expedition to Graham Land was well advanced.

The United States, more happily situated, has sent off its Antarctic expedition, the third to be commanded by Admiral Byrd. Nevertheless, there will continue a certain amount of work by neutral nations, and the function of the Scott Polar Research Institute in filing and recording such work must be carried on.

It has been found necessary to close the Museum to the public, since much of the valuable material in the show cases has had to be removed. In other respects the usual activities of the Institute will be carried on as well as circumstances and funds permit. The Assistant to the Director, Mrs J. W. Wright, formerly Miss Fetherstonhaugh, is fortunately able to continue at her post, but the greater part of the voluntary help on which the Institute has flourished is being dispersed to national service.

In September there arrived at the Institute a gift notable both for its size and interest, when Mrs Jackson, widow of Major F. G. Jackson, gave practically the whole of her husband's collections from Waigatz Island in 1893–94 and from the Jackson-Harmsworth Expedition to Franz Josef Land in 1894–97. Owing to the circumstance of the war these have had to be stored for the time being, but in due course the greater part will be exhibited. The thanks of all students of polar work are due to Mrs Jackson for her generosity.

OBITUARY

We regret to announce the death of Commander Frank Wild, C.B.E., R.N.V.R. (rtd.), on August 20, 1939. An appreciation will be found on pp. 282–85.

By the death of Major Gunnar Isachsen at the age of seventy-one, at Oslo, Norway has lost one of her leading polar figures. He was a man of wide experience and interests and always ready to help those from other countries who shared his love for the polar regions. His best-known work was as cartographer on the Second *Fram* Expedition, 1898–1902, but his share in the exploration of Spitsbergen in the years before the war of 1914–18 was an equally notable achievement (*Expédition Isachsen au Spitsberg*, 1909–10. *Résultats Scientifiques*, 3 vols, Oslo, 1916–27). In 1923 he was in charge of the Norwegian expedition in the *Conrad Holmboe* to East Geenland, when the ship was beset and drifted down the east coast. Finally in 1930–31 he was in command of the *Norvegia* Expedition to the Antarctic. This last he has described in his book, *Norvegia Rundt Sydpollandet*, published in 1934. Throughout most of his life he was a

ERRATUM

p. 208, 3rd line of OBITUARY

For pp. 282–83 *read* 280–81.

leading figure in Norwegian shipping circles, and in that capacity gave helpful advice to both Scott and Shackleton in their search for suitable expedition ships. In recent years Gunnar Isachsen was director of, and devoted much of his energies to, the development of the Norwegian ship museum (Norsk Sjøfartsmuseum) on Bygdö at Oslo. Here he gathered together an extraordinarily fine collection of polar equipment and maritime relics of historic interest, and he played a leading part in adding to the museum its crowning exhibit, Nansen's *Fram*, hauled ashore and preserved for all time.

W. G. Burn Murdoch died on July 19, 1939. It will be remembered that he accompanied W. S. Bruce as artist on the Dundee Whaling Expedition to the Antarctic in 1892–93, and his book *From Edinburgh to the Antarctic* is one of the most racy and original in polar literature. So also is his *Modern Whaling and Bear Hunting*, in which he describes life in the East Greenland pack-ice.

Engineer Lieut.-Comdr. W. A. Horton died in Durban in November 1939. He was a member of Scott's last expedition in 1910–12, and in 1925 became chief engineer on R.R.S. *Discovery*, and on R.R.S. *Discovery II* from 1929 to 1937.

On June 10, 1939, Karl Bengtsen, the Norwegian trapper, died at the age of fifty-three. He was one of the best known of the Spitsbergen trappers, and was the first to winter successfully in North East Land. He subsequently accompanied the Oxford University Arctic Expedition, 1935–36, and though most of his time was occupied in trapping, his general handiness and long experience with boats were of great value to the expedition.

On September 7, 1939, George A. Thorne, Jr., of Chicago, a member of Admiral Byrd's first expedition to the Antarctic, was killed in an aeroplane crash. He went with Byrd as surveyor and dog driver, and made a sledge journey of 1500 miles to establish an emergency base for Admiral Byrd's flight over the Pole.

Captain Felix Riesenberg died on November 19, 1939. From 1901 to 1902 he was an officer of the United States Coast and Geodetic Survey. In 1906–7 he was a member of the Wellman Polar Expedition, which wintered at Dane's Island, Spitsbergen, and he was the navigator of the dirigible airship *America* in the attempt to reach the North Pole in September 1907.

ARCTIC REGIONS

SVALBARD

Completed Expeditions

***Swedish-Norwegian-British Palaeontological Expedition to Spitsbergen*, 1939.**

[The following is from an account sent by Errol I. White and W. N. Croft.]

This expedition was arranged on the initiative of Professor Erik Stensiö of Stockholm to collect fossil specimens for the British Museum (Natural History), the Palaeontologisk Museum, Oslo, and the Riksmuseum, Stockholm. The chief object was to explore the Old Red Sandstone deposits in the geologically little known Wood Bay area and also in the neighbouring fjords on the north coast.

The plans were given in *The Polar Record*, No. 18, and the final party, which was led by Professor E. A. Stensiö with the support of A. Heintz of Oslo, consisted of E. Jarvik (Stockholm), G. Wängsjö (Uppsala), Sven Føyn and K. Aarhus (Oslo), N. Delle (Riga), E. I. White and W. N. Croft (London), J. A. Moy-Thomas (Oxford) and J. Brough (Manchester). C. Andreasen, a sealer from Tromsø, brought the collecting party up to twelve.

The tinned food taken on the expedition was supplemented by bacon, eggs and fruit, of which fresh supplies were brought from time to time on the regular mail-boat. This was necessary owing to the principal food animals—reindeer, geese and ptarmigan—being now strictly preserved, and seals being almost the only natural source of food. Except for the more personal belongings of the British party, all the equipment and most of the supplies were purchased in Scandinavia. The organisation which, down to the smallest detail, proved highly satisfactory, was due to Professor Stensiö, assisted by E. Jarvik. They had the invaluable help and advice of Docent Adolf Hoel, who was instrumental in chartering the *Heimen* (Capt. Jakobsen), a ship of 130 tons and one of the most serviceable and comfortable of the Norwegian sealing fleet. The party assembled at Tromsø on June 29, and about half the members left at once in the *Heimen* for Longyear City in Icefjord, the remainder following on the regular mail-steamer *Lyngen* three days later.

The first collecting was done in Dickson Bay on the north side of Icefjord. The expedition divided into two parties, one camping at Cap Wijk, where collections from the Trias were made; the second and larger party at the base of Mt Lyktan, whence the neighbouring ranges, all in the Lower Old Red Sandstone, were visited. At first the weather was wet, but later it was extremely favourable, and temperatures up to 62° F. were recorded.

On July 15 the *Heimen* left Icefjord and made for Wood Bay, reaching Lat. 78° N. From here onwards, with one exception, camping was abandoned and work was done by parties of four dropped at appropriate intervals by motor-boat. By this means much time was saved and large areas of coast bordering the fjords were quickly covered and a number of inland traverses were made. One of the chief objects was to collect material from the Lower Old Red Sandstone and to find the relationship of the beds to the overlying Grey Hoek and Wijde Bay Series. Large numbers of fossils were collected, and surveys were also made of the neighbouring coast in Bock Bay, Liefde Bay, Jakobsen Bay, Svendsen Bay and Wijde Bay as far as West Bay, and finally in Red Bay. The last named was already known as a rich collecting area in the Lower Old Red Sandstone, and fine collections were made therein especially from the Fraenkel Ridge and Mt Ben Nevis. On August 13 the *Heimen* left again for Icefjord, which, after a brief visit to King's Bay, was reached two days later. Here collecting was done in the Lower Old Red Sandstone of Ekman Bay, and the Trias of South Dickson Land, the Carboniferous on the north-west side of Klaas Billen Bay and from the Tertiary plant-bearing moraines of Advent Bay itself and the Tertiary of Coles Bay. Owing to the international situation, the British members of the expedition left Advent Bay on the *Lyngen* on August 24 and arrived in England a week later. The Scandinavian party stayed a week longer on the *Heimen* to finish off the outstanding localities in the Trias of Sassen Valley.

The expedition was highly successful and, although it will be some time before the value of the material can be properly assessed, it may be said that approximately 100 cases of fossils, weighing about seven tons, were brought back, almost all of which are new to the British Museum (Natural History).

Norwegian Expedition to Svalbard, 1939.

[The following account has been sent by Docent Adolf Hoel.]

In the summer of 1939 Norges Svalbard- og Ishavs-Undersøkelser organised an expedition to Svalbard consisting of three parties:

1. Hydrographic party in the fishery inspection vessel *Nordkapp*.
2. Surveying party to the north coast of Spitsbergen.
3. Surveying party to Hope Island.

The hydrographic party was led by Captain R. v. Krogh of the Norwegian Navy, and consisted of himself and Lieutenant R. Lyngaas as hydrographic surveyors, with three assistants. Work started in Magdalene Bay on July 12. Magdalene Bay, Sørgat (South Gat) and Smeerenburgfjord were sounded from motor-boats. The total charted area amounted to 850 sq. km., and beacons were also built. The work contined until August 23, and on August 30 the *Nordkapp* arrived back at Tromsø.

The Spitsbergen topographical party consisted of W. Solheim with three assistants, who were brought to and from their field of operation by the *Nordkapp*. Their work consisted of a remeasurement of the baseline which Isachsen measured in 1909 on Reinsdyrflya (Reindeer Peninsula), and an extension of the trigonometrical net eastwards to connect up with the Swedish arc-of-meridian net. Survey photographs were also taken and tide measurements carried out. The party used a motor-boat and had camps on Reinsdyrflya, and in Mossel Bay and Sorgfjorden, and was at work from July 10 to August 23.

The expedition to Hope Island consisted of the topographer, Th. Askheim, with three assistants. They were brought to the island in the *Maiblomsten*, chartered by the *Sysselmann* of Svalbard, and landed on June 30. The party was to have surveyed the island and to have built a concrete pillar for a transit instrument intended for an astronomical expedition planned for next summer, but weather conditions were extremely bad, with incessant fogs, and it was only possible to map one-fifth of the island. The expedition left on August 31.

Norwegian Fisheries Expedition to Svalbard, 1939.

[The following report has been sent by Captain Thor Iversen.]

As in previous years the Norwegian Board of Fisheries sent out a summer expedition under the leadership of Thor Iversen, with Birger Rasmussen as assistant biologist. The expedition used the fishing-boat

Solveig I, and left Bergen on May 6, returning on September 27. The investigations were mainly, as in previous years, in the waters along the west coast of Spitsbergen, and north of Bear Island. The expedition's base was at Ny-Ålesund (King's Bay).

The small vessel *Johan Hjort*, equipped with echo-sounding apparatus, was also used by the expedition for about three weeks, with the main object of sounding in detail some parts of the fishing banks off Spitsbergen. The skipper was Magne Christensen, and Odd Bostrøm went as hydrographer.

Palaeobotanical Expedition to Klaas Billen Bay, Spitsbergen, 1939.

[The following account has been sent by Ove Arbo Höeg, of Trondheim. See also *The Polar Record*, No. 18, under "Mr Höeg's Expedition to Svalbard, 1939".]

In order to continue the study of the fossil flora of Spitsbergen, an expedition was made to the Klaas Billen Bay district in the summer of 1939. A grant was obtained from the foundation "Statens Videnskapelige Forskningsfond". The party consisted of Ove Arbo Höeg, leader, Reidar Jörgensen, and Jakob Vaage, botanists, and one other member. They travelled to Advent Bay by means of the regular steamship service; from there on July 3 the motor-cutter of the *Sysselmann* transported the expedition to its base. Their main camp was on the south side of the Pyramiden Mountain, and excursions were made partly by boat along the western side of Klaas Billen Bay, partly inland up the Mimer Valley. The party left on July 30. At the time of arrival the snow had melted away from the lower altitudes, but the rivers were still large, and rubber knee-boots were very useful. Inflated rubber mattresses under the sleeping bags gave perfect insulation from the cold ground. The weather conditions were good and did not interrupt the work for a single day. A great number of specimens of Devonian plants were collected, chiefly from the beach profile north of Skans Bay and in the inner parts of Mimer Valley. Fossil plants were collected from the Lower Carboniferous of the Pyramiden Mountain; extensive collections of present-day plants were made, particularly of lichens and mosses; notes were made on flower biology, and root-tips were fixed for chromosome studies. For the latter purpose living plants were also brought back to the Botanical Garden, Oslo.

Ornithological Work in Spitsbergen, 1938.

In the summer of 1938 Capt. J. H. McNeile and Mr B. G. Harrison visited West Spitsbergen to make ornithological observations.

Soil Investigations in Spitsbergen, 1939.

It is reported in *Polar-årboken*, 1939, that the physicist N. V. Romanovsky from the Institut de Mécanique, Université de Paris, went to make soil investigations in the King's Bay and Cross Bay district in Spitsbergen, using the "North Polé" Hotel as his headquarters.

RUSSIAN ARCTIC

The Drift of the Sedov.

[See also *The Polar Record*, Nos. 15, 16, 17 and 18.]

In October 1937 the ice-breaker *Sedov* became ice-bound in approximately Lat. 75° N., Long. 132° E. In October 1939 the ship was reported to be north-east of Spitsbergen. The ice-breaker *Josef Stalin* is said to have gone to help the crew to release the ship from the ice.

Air Route in the Russian Arctic.

It was reported in *The Times* of August 4, 1939, that work had been started on the organisation of an Arctic air line extending along the whole of the northern coast of the U.S.S.R. from Archangel to Wellen, in the Chukotsk Peninsula. The line is to run parallel to the Northern Sea Route, and air bases are to be established to permit regular flights throughout the year. No further news of this proposed air route has been received.

The Finding of De Long's Diary on Henrietta Island.

A note was given in *The Polar Record*, No. 17, to say that a diary written by the American explorer Lieut.-Comdr. George W. De Long in 1881 during the drift of the *Jeanette* had been discovered on Henrietta Island. The diary was taken to the Arctic Institute at Leningrad, where it was hoped that it could be deciphered. It has since been found that the cylinder had not been properly sealed and that water had entered and reduced the diary to a pulp, making it completely indecipherable.

GREENLAND

Completed Expeditions

Danish North-East Greenland Expedition, 1938–39.

[The plans and personnel of the Danish North-East Greenland expedition sent out in memory of the *Danmark* expedition were given in *The Polar Record*, No. 16. No detailed account of the work of the expedition has been received, but the following notes have been compiled from a series of articles by the leader, Count Eigil Knuth, in *Politiken*, sent by Mrs Richard Hamilton.]

The expedition, consisting of eight men with fifty-four dogs, landed on August 24, 1938, from the *Gamma* at the mouth of Mørkefjord in Lat. 77° N. After three weeks the house was built and the meteorological and wireless instruments set up. Since snow fell after the first week, it was not possible to do any archaeological or botanical work the first autumn.

During the winter four depot-laying journeys were made. The first started out on October 16. One depot of 1600 kg. was laid 170 km. north of Mørkefjord, the route lying over a pass of 300 m. Bad weather and poor surfaces were experienced most of the time. On the second journey a visit was paid to the Norwegian-French expedition at Micardbu.

During the spring a second meteorological station was made on the 200 m. hill by the hut. Auroral photography was carried out simultaneously at three stations, and it was thus possible to determine the height and position of the aurora.

Norwegian-French Expedition to North-East Greenland, 1938–39.

[The following account has been compiled from *Polar-årboken* 1939, and from notes sent by Widerøe's Flyveselskap A/S. See also *The Polar Record*, Nos. 16 and 17.]

During the summer of 1938 the expedition ship *En Avant*, under the skipper Karl Nicolaysen, reached Lat. 77° 22′ N. where ice blocked any further advance. The main station was set up in Germanialand and named Micardbu after Count Gaston Micard, one of the leaders. Five sub-stations were established: two at Koldewey Island and three on Germanialand. The wintering party consisted of:

Count Gaston Micard, leader.
Willie Knutsen, leader.
Sigbjørn Aamodt, telegraphist.
Kristian Hatlevik, geophysicist.
Ingvald Ingebrigtsen, engineer.

WILLIAM JAKOBSEN.
KARL NICOLAYSEN, skipper.
KRISTIAN NIELSEN, telegraphist.
NILS NØIS.
LEIF OLSEN, hunter.
SIGMUND SNARBY.
JESS TILLIER.
—. WILHELMSEN.

During the winter weather reports were sent four times a day to the Meteorological Institute at Oslo. Hatlevik made investigations on cosmic rays, carried out tidal observations, and with Aamodt and Tillier photographed the Aurora Borealis. Radio communication was established between two of the Norwegian stations and the Danish station in Mørkefjord.

In the spring of 1939 Count Micard was taken seriously ill, and it was decided that he must be fetched by aeroplane and ship. The *Veslekari*, under Captain Johan Olsen, was hired and equipped by Docent Adolf Hoel, and Widerøe's Flyveselskap A/S, pioneer in winter mountain flying in Norway, provided an ambulance plane. Flight-Lieut. E. Engnaes was chief pilot and Flight-Lieut. Helge Björnebye second pilot and radio-operator. On May 13 the ship left Ålesund and on May 19 reached the edge of the pack-ice 100 km. off Shannon Island in Lat. 75° N. The aeroplane, equipped with Edo floats, was put on the water and took off on a 400 km. flight to Micardbu. Count Micard was brought by sledge to a lane of open water where the plane had landed; forty minutes later the plane took off and reached the *Veslekari* where medical attention awaited the count. A few hours later the open water at Micardbu was closed and the coast became enveloped in thick fog. The *Veslekari* reached the Norwegian coast on May 26, and Count Micard was flown to hospital at Oslo.

In the summer of 1939 the whole expedition left Greenland, but with the hope that it would be possible to return in 1940.

Norwegian Expeditions to East Greenland, 1939.

[The following account has been sent by Docent Adolf Hoel.]

During the summer of 1939 Norges Svalbard- og Ishavs-Undersøkelser sent two expedition ships to East Greenland.

The relief of the Norwegian meteorological station at Myggbukta, Mackenzie Bay, and of the Norwegian hunting stations in North-East Greenland, was carried out by the *Polarbjørn* of Ålesund, under Captain

K. Marø. The expedition was led by John Giæver, Secretary of Norges Svalbard- og Ishavs-Undersøkelser. The glaciological expedition to Clavering Island, led by the Swedish professor Hans W:son Ahlmann, was also on board. Brit Hofseth, geologist, together with some Swedish, Finnish and Norwegian tourists, and one Pole, also took part in the voyage.

Polarbjørn left Ålesund on July 15, at first bound for Bear Island and Svalbard. The ship tried without success to penetrate the ice in about Lat. 77° N. Farther south, in Lat. 74½° N. the ice was found to be quite open, and the ship arrived at Cape Herschel on July 27. It was found that the winter-ice was lying unbroken over the southern part of Foster Bay and at the mouth of Vega Sound and Davy Sound. The ship had to wait for fourteen days before getting into King Oscar's Fjord. In the meantime it had also been found that the winter-ice lay unbroken between Bass Rock and Shannon Island. During the last half of August the ship succeeded, however, in calling at all the Norwegian stations between Davy Sound and Ardencaple Inlet. In the summer of 1939 there was scarcely any drift-ice along the eastern coast of Greenland between Lat. 72° and 75½° N., but the winter-ice did not break up at all on the outer coast from Cape Simpson on Traill Island to Bontekoe Island, in the basin between Sabine Island, Pendulum Island and Kuhn Island, and in Shannon Strait. The *Polarbjørn* returned to Ålesund on August 31.

The *Grande* of Sandshamn near Ålesund (Captain Hide) carried out the relief of the Norwegian meteorological station at Torgilsbu in South-East Greenland. The ship left Ålesund on July 20 and arrived at its destination on August 6. A great many icebergs were observed off the coast. The station building, which had been partly damaged during a storm in the winter, was repaired. The ship left Torgilsbu on August 14, and arrived at Ålesund on the 23rd.

Danish Archaeological Expedition to South-West Greenland, 1939.

[From an account sent by Cand. mag. C. L. Vebaek, leader of the expedition.]

An expedition, sent out by the Danish National Museum, Copenhagen, during the summer of 1939, continued work on the mediæval Norse community in South-West Greenland. The expedition consisted of the archaeologists Cand. mag. C. L. Vebaek (leader) and Stud. mag. H. Rasmussen (assistant), with nine or ten Greenlanders. They left Denmark at the end of May and returned at the end of October.

It was planned to excavate two remote farms, situated in a valley near the ice-cap in the Julianehaab district. Motor-boats, and later Iceland ponies, were used to carry the equipment. On arrival it was found impossible to cross a river running through the valley from the ice-cap. Plans for excavating one of the farms situated beyond it had therefore to be abandoned; but another, hitherto unknown, farm was excavated instead. This proved to be interesting, as it was completely covered with drifted sand, and in many places it was necessary to dig for about 4 m. before the remains of the buildings were reached. Only the vegetation indicated the position of the buried farm. The construction of the buildings indicates an early phase of the Norse culture in Greenland, while preliminary study of the objects found suggested that they are of rather later date. Among these may be mentioned vessels and spindle whorls of soapstone, knives and arrowheads of iron, gaming pieces, and spades and bodkins of bone.

The other farm appears to be the best preserved mediæval farm built of stone and turf which has yet been excavated. Some of the walls were standing to the original height of about 2 m., but unfortunately not many objects were found there.

At the end of the summer a third small farm was excavated. During the expedition reconnaissance trips were made by boat, on horseback, and on foot, and these resulted in the finding of several Norse farms of which nothing had previously been known.

Danish Geological Expedition to northern West Greenland, 1939.

[From an account sent by Docent A. Rosenkrantz, leader of the expedition.]

This expedition, the plans and personnel of which were given in *The Polar Record*, No. 18, left Copenhagen on May 27 and arrived at Umanak on June 18. Until October 3 the expedition continued, under the leadership of Docent A. Rosenkrantz, the work of the 1938 expedition. Apart from the main task of further geological mapping of the Nûgssuaq Peninsula, preliminary research work was carried out on the Svartenhuk Peninsula along the south and east shore, in the interior, and on the whole shore region of Disco Island. The motor-boat, placed at the disposal of the expedition by the Danish Geodetic Institute, was in the charge of Jens Olsen and travelled about 4000 nautical miles in connection with the expedition work. The geologists were working in four parties, and were assisted by twenty Greenlanders. Petrological studies of the igneous

rocks were carried out by Sole Munck, and Dr Noe-Nygaard, assisted by student V. Münther.

The whole area occupied by the Tertiary basalt formation, apart from Ubekendt Island, was visited. The basalt breccia, mentioned in last year's report, was studied in detail in a great many places; sections were made through the covering plateau basalts and several observations made concerning the dyke swarms. The submarine origin of the breccia postulated by S. Munck in 1938 was confirmed. Observations concerning the intrusive basic and ultrabasic rocks were also made. Only sporadic studies were made on the crystalline basement complex.

The sedimentary rocks were investigated from a petrological point of view by Dr Helge Gry, assisted by Bruno Thomsen. The Cretaceous and Tertiary sediments on the Nûgssuaq Peninsula were studied in detail. For purposes of comparison some sections on Svartenhuk and Disco were examined. Furthermore, samples of beach concentrates and river sand were taken from numerous localities for heavy mineral investigations.

The stratigraphy of the pre-Quaternary marine sediments was studied by the leader, assisted by student K. Eriksen, and for some time by Dan Laursen. On Svartenhuk a Coniacian Scaphites fauna was discovered. In Nûgssuaq a similar fauna is found. The marine complex comprises sediments not less than 1½ km. in thickness, bituminous shales predominating. Collections of fossils from several horizons were made, representing Coniacian, Senonian, Danian and Eocene. The Tertiary volcanic activity set in during the Eocene epoch.

Studies of raised beaches and deltas together with examinations of the shell-bearing Quaternary marine deposits were undertaken by Dan Laursen, assisted by student K. Dreyer Jørgensen.

The expedition, which was financed by the Danish Government and the Carlsberg Foundation, returned to Copenhagen on November 1.

St Andrew's University West Greenland Expedition, 1939.

[From an account sent by Dr H. I. Drever, leader of the expedition.]

The plans and personnel of this expedition were given in *The Polar Record*, No. 18. Drever left by the *Hans Egede* from Copenhagen on June 9; George, Swales and Paterson by the *Martin Goldschmidt* with a cargo of salt from Barry in South Wales on June 12. After a short passage on the coastal schooner *Fylla*, the members of the expedition eventually

reached their base at Igdlorssuit on Ubekendt Island by motor-boat on July 17.

The geological work begun by the Cambridge West Greenland Expedition, 1938, was continued on the southern coastal section, with the aid of two Greenlanders. George made a detailed plane-table survey on a scale of 1 : 50,000 of the Sarqa cliffs and of the surrounding area which includes the most important geological features of the island. During the second week the other three members examined the Tertiary rocks of the south-west corner of Upernivik Island and employed three more Greenlanders. Paterson and Swales explored the glacier immediately north of Upernivik Naes. The geological work on Upernivik Island was completed, although the existing topographical map is not sufficiently accurate for plotting the geological data.

After the expedition had reassembled at Igdlorssuit, Paterson and Swales succeeded in climbing the peak of Upernivik Island which rises to a height of 6893 ft. This peak had been attempted unsuccessfully in 1938.

After George had left in order to catch the *Hans Egede*, Paterson and Swales joined a Greenlandic family on their annual reindeer hunt in Svartenhuk, while Drever continued his geological work.

The three remaining members of the expedition left Igdlorssuit on August 26 and eventually, by way of Umanak, caught the *Disko* at Marmorilik.

Other Expeditions to Greenland.

At the time of going to press no recent accounts have been received of the following expeditions.

French Expedition to West Greenland, 1938–39, under the leadership of Dr Hubert Garrigue (see *The Polar Record*, No. 17).

Professor Ahlmann's Expedition to East Greenland, 1939–40 (see *The Polar Record*, No. 18, and Norwegian expeditions to East Greenland, p. 217).

Danish Thule and Ellesmere Land Expedition, 1939–40, under the leadership of J. van Hauen (see *The Polar Record*, No. 18).

ICELAND

Completed Expeditions

Cambridge (Mývatn) Iceland Expedition, 1939.

An expedition from Cambridge University was at work in the vicinity of Mývatn from June 27 to September 7, 1939. The personnel was as follows:

F. L. M. Dawson, leader and zoologist.
A. J. Burton, photographer.
D. G. Glennie, mineralogist and meteorologist.
S. C. H. Hood, assistant ecologist.
J. A. Seldon, botanist.
M. M. Spencer, geomorphologist.
M. M. Swann, zoologist.

The expedition aimed at being entirely independent throughout, and seven ponies were purchased and used successfully without assistance from local guides. Although scientific activity was subsidiary to the training value to the personnel, a considerable amount of useful work was accomplished. The lake itself was the main field of study, and large biological collections were made. The members of the expedition studied the plant and animal ecology of the region and examined the problems connected with the origin of the lake and surrounding land forms. A rough chart of the lake bottom was produced.

A journey was made to Askja, via Suðarárbotnar and the Ódáðahraun, thence via the upper reaches of the Jökulsá near Vatnajökull to Herðubreiðalindir. Grafarlond and Eilifsvötn were also visited. The fauna and flora of these localities should make interesting comparison with those of Mývatn and of the oases farther south which had been studied by Anderson and Falk in 1932.

Cambridge North-West Iceland Expedition, 1939.

An expedition from Cambridge University, consisting of J. R. Langley (leader), E. L. Arnold, P. I. R. Maclaren and C. Mallabey, spent part of the summer of 1939 in North-West Iceland. Their main object was to study the nesting habits and distribution of the White-tailed Sea Eagle (*Haliæetus albicilla*), and to collect invertebrates. Sea eagles proved to be much less rare than had been supposed. Nine occupied nests were found, and thirty adults were seen in the north-west peninsula. Detailed observations were made at one nest between July 3 and 18 and a fine series of photographs was obtained.

Oxford University Faeroes and Iceland Biological Expedition, 1939.

An expedition, consisting of H. G. Vevers (leader), W. G. Alexander, F. C. Evans and L. S. V. Venables, visited Iceland in the summer of 1939 in order to make a census of breeding Gannets (*Sula bassana*).

They visited and counted the birds on the islands of Eldey, Sulnasker, Hellisey, Brandur, Geldunger, and Grímsey. Other ornithological work was also carried out, and collections were made of the vegetation of bird cliffs. They visited the Faeroe Islands on their way back to England.

ARCTIC CANADA AND LABRADOR

Completed Expeditions

The Eastern Arctic Patrol, 1939.

[The following account has been sent by D. H. Chitty.]

The *Nascopie* left Montreal on July 8 for her eighteenth annual cruise. She arrived at Churchill on August 6 and reached Halifax on the return on September 23, three days ahead of schedule, having covered a distance of 10,660 miles. Major D. L. McKeand was in charge of the Dominion Government party for the eighth consecutive time. On the trip west through Hudson Strait, ice and fog conditions were bad and there were delays through ice or storm near Craig Harbour, Fort Ross, Arctic Bay and Hebron.

Men of the Royal Canadian Mounted Police and of the Hudson's Bay Company were taken to or from their posts and there was a full passenger list of scientists, tourists and others. D. A. Nichols, of the Geological Survey, made his fifth trip. The University of Toronto was represented by C. H. M. Williams, conducting research into dental condition and its relation to diet among the Eskimos; and by J. G. Oughton, invertebrate zoologist from the Royal Ontario Museum. The latter worked in close collaboration with M. J. Dunbar of Oxford, who made extensive collections of plankton. These two spent a month at Lake Harbour, South Baffin Island, where the *Nascopie* made two calls. Also from Oxford was D. H. Chitty, who was supplementing the studies of the Bureau of Animal Population into wild-life fluctuations in the Arctic. He and L. L. Lyster of the Institute of Parasitology, McGill University, brought home a number of live lemmings. Lyster was also investigating disease in sledge dogs, and arranging for future collections of material on the subject. H. S. Peters, from the United States Bureau of Biological Survey, obtained information on the breeding and migration of waterfowl. Dr John Melling was ship's doctor as far as Chesterfield Inlet where he relieved his brother as resident doctor. From Pond Inlet the ship brought out P. D. Baird of the British Expedition to North Baffin Island.

A unique feature of the trip was the trial at Pangnirtung of an Eskimo murderer; counsel for the Crown and for the defence had joined the ship at Churchill.

The following places were visited: Hebron (twice), Port Burwell (twice—this post was then closed down), Lake Harbour (twice), Stupart Bay, Sugluk West, Cape Dorset, Wolstenholme (twice), Southampton Island, Cape Smith, Port Harrison, Churchill, Chesterfield Inlet, Craig Harbour, Fort Ross, Arctic Bay, Pond* Inlet, Clyde River, and Pangnirtung.

Notes on the Work of the Royal Canadian Mounted Police, 1939.

[The following notes have been supplied by the Commissioner of the Royal Canadian Mounted Police.]

A flight by aeroplane was made by Constable Shillingford of the R.C.M. Police, from Coppermine, during January 1939, to North Western Victoria Island, visiting native encampments en route. The R.C.M. Police now have a seaplane in the North-West Territories, based at Fort Smith. It has visited a number of points in the Western Arctic, and during the summer of 1939 went east from Fort Smith to the Thelon Game Sanctuary. The seaplane is also fitted for land and for skis.

The Royal Canadian Mounted Police Schooner *St Roch*, which wintered during 1938 at Cambridge Bay, Victoria Island, returned to the Pacific coast (Vancouver) during the late summer of 1939, after delivering police supplies to posts at Coppermine and Cambridge Bay.

A report of the Patrols made during the summer of 1939 will be given in the next number of *The Polar Record*.

British Expedition to North Baffin Island, 1938–39.

[Previous accounts of this expedition were given in *The Polar Record*, Nos. 16 and 17. The following is an account by P. D. Baird.]

In December, 1938, Baird went to Repulse Bay to send a message containing the news of Bray's accident by the Hudson's Bay Company radio station. He left again on January 2, on the return journey to Igloolik, and in two days caught up with G. W. Rowley who had been waiting at a large Eskimo camp in Lyon Inlet. They continued north with three dog-teams, sharing the feed which had been cached on the way south. Unfortunately one of the caches had been destroyed by foxes, and an expected Eskimo camp was deserted, so that for three days the dogs were very slow and hungry.

* The omission of the possessive after Pond, Stupart, etc., is in accordance with the ruling of the Geographic Board of Canada. The "s" is, however, used locally.

After a stay with Father Bazin, Baird left Igloolik on February 12 with the intention of making for Clyde Post, where he hoped to obtain supplies to equip a base inland for work in the spring and summer. He travelled with an Eskimo, Nutarareak, and his son, Ataruargutsierk, and their families, the party being nine, but increasing to ten with the birth of a baby during the journey. As it was impossible to take sufficient dog-food, the party had to rely on caribou, which were plentiful that season; but there was a shortage of seal-oil fuel. The first part of the journey to Piling had been done by Bray and Rowley in March 1937. Baird was able to verify Bray's map and to obtain a longitude at Piling itself. There he found a message from T. H. Manning, which showed that he and his wife, travelling alone, had been there two weeks before, so that the circuit of Foxe Basin had now been completed at various times by members of the British Canadian Arctic Expedition of 1936.

Baird then struck inland across the island, but got into bare, hilly country, with little snow. According to local reports a reasonable crossing exists, but the party was short of fat and fuel and so eventually turned back and took the well-known land crossing to Milne Inlet and Pond Inlet, arriving at the Hudson's Bay Company post there on April 15.

A 7 ft. iron-shod *komatik* was obtained, and, with five dogs, Baird spent the spring and summer of 1939 going around and across Bylot Island, surveying by plane table as he went. At the end of May he made a base at the R.C.M.P. hunting shack in the middle of the south coast, and made a three-weeks' trip into the interior. On the existing map this is shown as one large ice-cap; but this was found to be incorrect as, although the country is almost all ice-covered, it is very broken with mountain ridges and large valley glaciers. A journey was made 20 miles up one of these to the watershed at 5000 ft., and from this point a mountain (6100 ft.) was climbed. From the watershed a 2 mile wide and 40 mile long glacier led down towards Lancaster Sound. Half-way down this Baird was held up by soft snow and crevasses, so turned east and, by crossing an easy col, found another glacier leading down to within 5 miles of the east coast. From this point a day's journey was made with an unloaded sledge down the steep face to the sea-ice. This was in the latitude of the deep inlet which is marked on the charts of this coast, but Baird saw no sign of any inlet. On the return trip he descended another glacier, the Sermilik, which reaches the sea opposite Pond settlement.

The south-west corner of the island was later investigated and found

to be composed of Tertiary sediments, chiefly sands with occasional hard sandstone layers and very thin bands of coal, reaching in one place up to 2200 ft. The bird life proved to be rather disappointing; there were few geese, but one Blue Goose (*Chen caerulescens*) and a Brown Crane (*Grus canadensis*) were seen, neither of which has been recorded before from this district.

Baird then waited at the Hudson's Bay Company post, until on September 5 he left on board the *Nascopie*. There was a severe epidemic among the local dogs during the summer, many of the native teams being reduced from fifteen to one or two.

G. W. Rowley's Archaeological Work in Baffin Island, 1938–39.

As stated in *The Polar Record*, No. 17, G. W. Rowley, who had been archaeologist of the British Canadian Arctic Expedition, 1936–37, returned to the Canadian Arctic in 1938. After a satisfactory season's excavating at Igloolik, he returned with the Mission boat *Thérèse*, and is now working on his collection at the National Museum at Ottawa. Further details are not yet obtainable.

Commander D. B. MacMillan's Arctic Cruise, 1939.

Commander Donald B. MacMillan made his eighteenth voyage to the Arctic during the summer of 1939. The expedition set off in June for the Canadian Arctic and West Greenland and returned in September. The Commander was accompanied by Mrs MacMillan and nine college students. Various collections were made, and measurements were taken of the Umanak Glacier.

Captain Robert Bartlett's Arctic Cruise, 1939.

In September 1939 Captain Robert A. Bartlett returned from his annual Arctic cruise in the *Effie M. Morrisey*. As usual, the expedition was made up of young college students who paid their way, but signed on to do various tasks as members of the crew. Collections were made for the New England Museum of Natural History, the New York Zoological Park, and the Smithsonian Institution. Reports on ice and weather conditions were sent to the Hydrographic Office in Washington.

Finnish Expedition to Labrador, 1939.

[See *The Polar Record*, No. 18.]

No complete account of the Finnish expedition to Labrador has been received at the time of going to press; but it is learnt that Dr Alexander

Forbes, flying his own seaplane, intended to join Professor Tanner on his expedition in Northern Labrador, and to assist by taking aerial photographs.

Vicomte G. de Ponsins' Work in the Canadian Arctic, 1938–

A note in *La Géographie*, LXXII, No. 1, gives news of M. de Ponsins, who left in May 1938 in order to carry out ethnographical work in the Canadian Arctic. His work is sponsored by the *Société de Géographie* of Paris. He was landed by the Mackenzie Air Service at the post at Coppermine River, and then went by boat to King William Island. In November 1938 he made a journey to the Magnetic Pole. He then returned to Gjöahavn, where Amundsen had his winter quarters in 1903–5. In January 1939 M. de Ponsins set out for Pelly Bay and reached it after fourteen days' travelling. A number of Eskimo camps in the neighbourhood were visited. He planned to return to King William Island and thence along the coast to Coppermine.

Wood Yukon Expedition, 1939.

[From a note in the *Geographical Review*, XXX, No. 1, pp. 142–3.]

In 1931 the American Geographical Society entered on an ambitious programme of research in the use of oblique aerial photographs for topographical mapping. As a result of the experience gained during the Forbes-Grenfell expedition to Northern Labrador, it was felt that in a region of extreme relief, where the transport of instruments and the recording of observations are difficult problems, a great saving of time would result through the establishment of ground photographic stations. At such stations the camera would take the place of the theodolite, for the reason that angles can be measured on the photographs and used in the building up of a network of control points from which the location and orientation of the air photographs can be determined.

It was the purpose of the Wood Yukon expeditions to put into practice the improvements in theory and technique developed as a result of the Labrador surveys.

The activities of the Wood Yukon Expedition in 1935 were described in the *Geographical Review* (XXVI, 1936, pp. 228–46). The chief result was a general reconnaissance of a highly complicated region. In 1936 a network of fixed points was built up and flights over the area resulted in a large number of photographs, which, through the inability of the expedition's

plane to reach desired altitudes, were excellent in detail but not comprehensive enough in scope.

In the summer of 1939 the Third Wood Yukon Expedition entered the same field, with the purpose of obtaining air photographs supplementary to those of 1935 and 1936 from an altitude high enough to ensure extension of the original network of ground control points to the limit of the area to be surveyed. In addition it was desired to link the uncoordinated observations of 1935 to the control network of 1936, and to carry on further experiments in the use of ground photography to supplement instrumental observations.

All these objectives were achieved. The expedition entered the area that embraces the mountainous terrain between Kluane Lake and the international boundary, and spent two months in the mountains of the St Elias Range. The party was led by Walter A. Wood, head of the Society's Department of Exploration and Field Research. Anderson Bakewell, of the Society's staff, made a representative collection of the flora of this previously unstudied region; and Roger W. Drury continued a study, begun in 1936, of the meteorological conditions peculiar to the area.

After establishing their base camp on the Wolf Creek Glacier, the party back-packed more than a ton of supplies and equipment across the glacier to the foot of Mt Wood. Three camps were set up on this peak for the purpose of attempting its ascent and establishing an important survey station on its summit. Unfavourable weather prevented this, but during an attempt on the summit on August 25, a photographic station was established at 14,000 ft. Had a theodolite been carried, it could not have been used. On the other hand, the exposure of seven photographic plates required only a few moments.

Despite the fact that the expedition enjoyed only four fine days in fifty-five, it was able to link the work of 1935 to that of 1936, and on its return to Kluane Lake was able to profit by moderately fine weather to obtain six hours' aerial photography carried out at altitudes ranging from 15,000 to 18,000 ft. The resulting photographs will form the basis of a topographic map to be prepared by the use of the methods and techniques developed by O. M. Miller at the Society. It is planned to publish a full report of the three Yukon expeditions with the finished map.

Expeditions in the Field

British Canadian Arctic Expedition, 1936–40.

[See *The Polar Record*, Nos. 12–15 and 17. No news has been received direct from T. H. Manning, and the following notes have been compiled from letters to Mrs Reynold Bray.]

Manning and his wife spent the winter of 1938–39 at Hantzsch River. During the autumn of 1938 they went up the west coast of Baffin Island for deer hunting and, early in 1939, went up again to Piling, mapping the shore line and belt of islands off the coast, and only missing Baird by two weeks. They intended during April 1939 to cross to the east coast, and on their return to the west coast to move south to a goose colony for the summer. They plan to winter (1939–40) still farther south on the plains about Kukjuak, making another trip up the coast in the *Polecat* to obtain dog-feed. They hope to make a trip to Pangnirtung and one to Dorset, and plan to return from the Arctic during 1940.

NOTES ON MINING DEVELOPMENT, REINDEER HUSBANDRY, AND THE EIDER-DOWN INDUSTRY IN THE CANADIAN ARCTIC

[Compiled from the weekly bulletins issued by the Department of Mines and Resources, Ottawa.]

Mining Development

During the last year there has been steady progress in the development of mining in the North-West Territories. The first municipal government in the North-West Territories, as at present constituted, has just been established at Yellow-knife, and will start to operate on January 1, 1940.

Yukon, long-famed as a source of placer gold, now shows promise of becoming a producer of lode gold. During 1938 a brick of crude gold weighing 84 ounces was produced at the Laforma mine in the Freegold Mountain area in the Carmacks district. This was the first production of the area and the first gold produced in Yukon from a lode gold property for many years. During the first three months of 1939 approximately 250 ounces of fine gold including bullion and concentrates have been produced from the mill in the area, and the expectations are that the output will average from 300 to 400 ounces of gold per month. This development is one of the most interesting in Yukon mining for some time as it promises to make the Freegold Mountain area the third important producing region in the Yukon and to establish lode gold mining in the Territory.

Reindeer

Another annual round-up of the reindeer herd at the government reindeer station, near the Mackenzie Delta, N.W.T., has been completed. A total of 4126 reindeer, comprising 1184 fawns, 1969 yearling and adult females, 626 yearling and adult bulls, and 347 steers, were put through the corrals. The annual round-up is staged on Richard's Island, a short distance off the mainland.

This year's round-up was attended by Dr Seymour Hadwen, who is making a survey of the reindeer on behalf of the government. Dr Hadwen states that the Canadian herd is one of the best he has seen, and expressed satisfaction with the condition of the animals and the methods of handling them.

The smaller herd of reindeer established in the Anderson River area,

some 150 miles eastward from the Mackenzie Delta, is reported to be progressing favourably. This herd numbered about 900 head when separated from the main herd in December 1938 and has now increased to approximately 1200. The question of corralling and counting the deer in the native herd will depend largely on conditions which may be encountered in regard to a suitable location for a round-up and material available for corral fences.

Since its transfer to the Anderson River area, the native herd has been managed by Eskimo herders, under the supervision of the chief government herder. Establishment of this native herd is another step in Canada's plan to establish reindeer ranching among the Eskimos as a means of assisting the natives by providing a staple supply of food and clothing. The herd is reported to be in excellent condition, and the natives entrusted with its management are taking a keen interest in the enterprise. Thus Canada's experiment in converting the Eskimos from hunters to herders appears to be making favourable progress.

Eider-Down Industry

Permission to establish an eider-down industry in the Eastern Arctic has been granted to the Hudson's Bay Company by the Department of Mines and Resources, Ottawa. An area embracing the southern coastline of Baffin Island and all islands east from Cape Dorset to Pangnirtung has been leased to the company for the purpose of establishing sanctuaries for eider ducks, and a permit for the collection of down has been issued under the authority of the Migratory Birds Convention Act.

About 1500 Eskimos live in this area, and the development of the industry should contribute to the livelihood of many of them at a time when they have little else to do during the period between trapping and hunting seasons. Under the company's plan, Eskimo families participating in the industry will be allotted certain regions in which to collect eider down. The natives will be taught how to remove the down without causing the ducks to abandon their nests, as well as the proper methods of cleaning the down.

In addition to contributing to the support of the Eskimos, the new industry is expected to encourage conservation of the ducks by the natives. Heretofore the Eskimos had no idea of the value of eider down and did not use it for any commercial purpose. Periodic visits to the nesting grounds by the native collectors will tend to safeguard the ducks from foxes and other natural enemies.

Possibilities for the development of the eider-down industry in the Eastern Arctic were investigated last year by J. J. Bildfell, of Winnipeg, Manitoba, who accompanied the 1938 Eastern Arctic patrol. Mr Bildfell returned to Baffin Land with this year's patrol, where he is now endeavouring to establish the eider-down industry on behalf of the Hudson's Bay Company.

Eider down is much in demand in commerce, and the work of developing the eider-down industry in Canada was first begun in 1933 along the north shore of the Gulf of St Lawrence. It was started as a measure of protection for the ducks by impressing on the inhabitants the benefits to be gained by safeguarding the birds and adopting modern methods in the collection of the down.

ALASKA

Dr Victor E. Levine's Work in Alaska.

It is stated in *The Explorers Journal*, XVII, No. 2, that Dr Victor E. Levine would again be at work in the Arctic during the summer of 1939. From August 1937 to August 1938 Dr Levine stayed at Point Barrow in order to make medical and biological studies of the Eskimos. He also worked at Wainwright, and in regions along the coast from Barrow to Demarcation Point. A census was taken, and a statistical study made of births and deaths for the period 1914–38 inclusive. Medical histories of the 442 natives at Barrow and Point Barrow were obtained, and a medical examination of over 300 Eskimo adults and children made, as well as experiments on diet and nutrition.

NOTES ON THE SELECTION AND CARE OF POLAR FOOTWEAR

BY ANDREW CROFT AND BRIAN ROBERTS

PART I[1]

Introduction

The choice of footwear is still one of the most outstanding problems which confront a traveller in the polar regions. Differences of opinion have arisen for various reasons, but perhaps the most common one is lack of experience of the available types. Personal views are influenced by the nature of the journeys already undertaken, the climatic conditions and the types of country experienced, whether the individual has had to repair his own footwear or has had native help, whether he has good circulation, the question of whether his feet are subject to excessive perspiration, and whether he has any tendency to flat-footedness, etc. It must also be remembered that a man who has used a particular kind of footwear in unsuitable conditions or without proper care tends to condemn that kind as being useless in all circumstances.

In view of the great importance of the subject, we have attempted to collect together brief descriptions of the main types of footwear used in cold regions, and to discuss some of their advantages and disadvantages. It will be appreciated that many of these types are still evolving, and it is our hope that these notes will help not only in the selection of footwear for any proposed expedition, but that they will demonstrate the need for further adaptations of native footwear and the experimental development of new types.

In order to take advantage of the accumulated experience of as many people as possible, we circulated a letter asking for information from a large number of polar travellers in different countries. With a few exceptions, the replies to our enquiries were most helpful. We have thus been able to consider a very representative selection of opinions. Whilst fully acknowledging this assistance, we feel it necessary to accept responsibility for the views expressed below, because they represent our

[1] Notes on crampons, skis, ski-bindings, snowshoes and on special tanning methods will appear in Part II.

own interpretation of the conflicting comments which have been sent in. It may be added that one or other of us has had personal experience, in the Arctic or Antarctic, of about two-thirds of the items described.

We are greatly indebted to the following for their invaluable assistance: H. W. Ahlmann, Pat Baird, Robert Bentham, Colin Bertram, E. W. Bingham, Charles Bird, Donald Carmichael, August Courtauld, Alfred H. Edgerly, John Giæver, A. R. Glen, A. S. T. Godfrey, L. M. Gould, G. F. Gretton, Mūsse Hamilton, Adolf Hoel, Arne Høygaard, Lauge Koch, Robert Lawrie, Ethel John Lindgren, Martin Lindsay, J. H. Martin, Martin Mehren, N. E. Odell, Carl O. Petersen, Quintin Riley, Graham Rowley, I. Schlossbach, G. Seligman, V. Stefansson, Michael Spender, A. Stephenson, Mikel Utsi, Bradford Washburn and John Wright. We also wish to express our thanks to Mrs Robert Lawrie for the great care which she has taken in preparing the bulk of the illustrations, and to Jill Bray and Beryl Pickering, who were responsible for the remainder. With the exception of two Manchurian types lent to us by Dr Lindgren, the specimens of footwear shown in the illustrations are all in the museum of the Scott Polar Research Institute (S.P.R.I.) or the University Museum of Archaeology and Ethnology (U.M.A.E.), Cambridge. Their registered numbers are indicated in the text. Dr Lindgren also lent us a fine series of drawings, which greatly facilitated our consideration of northern Asiatic footwear; her help has been invaluable. Finally, we take this opportunity to acknowledge the assistance of Dorothy Wright in all stages of the preparation of this paper. All the correspondence upon which it is based has been filed at the Scott Polar Research Institute, where it is available for reference.

It is obvious that no single type of footwear is suitable for all conditions in the polar regions. It is only in very low temperatures that serious trouble is experienced with the freezing of perspiration from the feet. Further, it is only when travelling long distances, and sleeping in a tent or snow-house, that the accumulation of this frozen perspiration becomes really serious and the drying of footwear a definite problem. For those who are living in houses or travelling short distances from house to house, as in Alaska or the populated parts of Greenland, the problem is comparatively simple. At the end of the day the footwear may be saturated with moisture, but it can easily be dried in a warm house during the night.

The material available, and the widely contrasting surfaces which exist in the polar regions at different times of the year and in different localities, are responsible for the evolution of a large number of specialised

types of footwear. Many of these are suitable only in the conditions for which they were designed. The problem is to select those types which most nearly combine the characteristics required. It has sometimes proved advisable for the members of expeditions of long duration to be provided with twelve or more distinct types of footgear (e.g. moccasins, crampons, sea-boots, etc.) for use in different combinations as occasion arose.

The classification and names which we have adopted may be open to criticism; we have attempted to be practical rather than ethnographic. For each type of footwear it has been our object to describe the main features of construction, the circumstances under which it may profitably be used, methods of care, and the most suitable socks or other "inners" with which it may be worn. Some brief notes on special tanning methods have also been added, since the preparation of the leather is often of vital importance.

Where possible, we have included the specific names of the animals whose skins are used in the specimens described, but there is still confusion in the scientific nomenclature of mammals and these names may be open to correction. For all practical purposes concerning footwear it is probable that generic distinctions are adequate. The following remarks on deer may be helpful.

There are three forms of circumpolar deer, each of which consists of a number of closely related or identical species. Unfortunately, the English names overlap. (1) *Alces* is normally known as the "moose" in America and the "elk" in Eurasia. (2) *Cervus* is the "wapiti" of North America, where it is also commonly called "elk". This form also occurs in Eurasia under either of these names, and in the British Isles it is known as the "red deer." (3) *Rangifer* is called "reindeer" in Eurasia, but "caribou" in America. Introduced, semi-domesticated *Rangifer* in America are, however, called "reindeer".

It should be remembered that the skins used by natives for their footwear must come from those animals which can be obtained locally, and are not necessarily the most suitable for the purpose.

Leather Sea-Boots

In the case of ordinary sea-boots the main dispute is about the relative merits of leather and rubber. Most men working on British trawlers prefer leather, but few can afford it, though admitting that in the long run leather is more economical.

Leather boots are warmer than rubber ones, and cause much less perspiration. They are stronger and more durable and, if damaged, are more easily repaired. They do not slip so much on oily or blubbery decks, and the stiffer soles make them safer for work aloft. Their general stiffness also protects the feet from injury.

The uppers of leather sea-boots should be moderately stiff and may extend to either the knee or thigh. For most purposes the shorter length is preferable. The toe should be blocked, like a football boot, so that it does not crush easily, and provides adequate air-space round the toes (any form of pressure being uncomfortable and bad for the circulation). The instep should be high enough to enable the boot to be put on and taken off easily. In an emergency this may be very important. The heel should be well shaped and the seam up the back can, if necessary, be strengthened by an oversewn strip of leather. The soles should be exceptionally thick and as many as two clump soles should be put on after the boots have been bought. A good type is most easily obtained in northern Norway (fig. 1; S.P.R.I., 50).

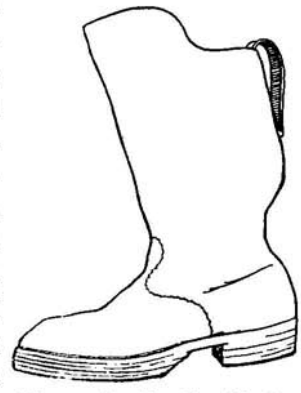

Fig. 1. Leather Sea-Boot.

The precaution of fastening clump soles to the boots prevents the inner and original outer sole, and in particular the stitching, from becoming worn through. By this procedure it is possible to use the same pair of boots almost continuously for three years or more. From time to time additional clump soles should be added, the original ones not always being removed. There is no harm in retaining five or six worn clump soles, as their removal may weaken the sole and cause leakage. The best method of fastening these soles is wooden pegging, but brass sprigs are more normally used.

If the boots leak they may best be rendered watertight by applying a preparation of bees-wax dissolved in chloroform.[1] They may be kept supple and in good condition with applications of neat's-foot oil, or a mixture of Stockholm tar and linseed oil. There are many preparations used for preserving boot leather, rendering it soft and flexible, and preventing the penetration of water. Those that are fluid and of an oily nature are simply rubbed in with the hand or a cloth, whilst the more solid ones must first be liquefied by heat. In all circumstances it is advisable

[1] This is worth taking on an expedition especially for this purpose.

to use these preparations, whether liquid or solid, slightly warm, since in this condition they penetrate much deeper into the leather than when cold. After the first application, it is best to put the boots in a warm place until the preparation has been fully absorbed. It is a widespread error to suppose that wet leather cannot be greased, but ought first to be thoroughly dried. In fact the leather becomes hard and brittle through drying, and then requires a long time to resoften by the aid of greases. Wet leather, on the other hand, is in a very suitable condition for greasing, all that is necessary being to wipe it with a dry cloth until the grease will adhere and then to rub the latter well in.

Brunner[1] gives the formulae for making a number of these dressings. In particular he recommends for leather sea-boots a grease made up in the following proportions: spermacetti (2), wax (4), pine resin (3), turpentine (5), linseed oil (40), and fish oil (20). The wax, spermacetti and pine resin are melted together, the turpentine then being added, followed by the linseed oil and fish oil, the whole being heated to the boiling point of water and stirred for half an hour.

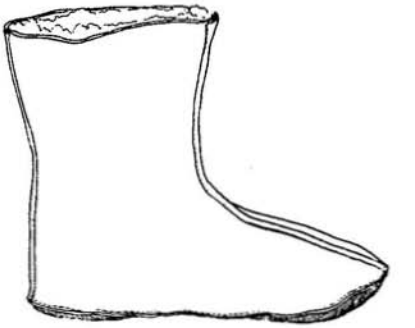

Fig. 2. Lamb-skin "Inner".

It sometimes happens that under expedition conditions leather boots not actually in use become covered with mildew. This does not harm the leather unless it is allowed to remain for several weeks, but it may change its colour. When first detected, mildew should be wiped off with a damp cloth, the leather well dried and put in a drier place. The application of poisons to prevent mildew is not to be recommended, but clove oil or saddle-soap may be used.

For repairs see the section on *Climbing Boots* (p. 244).

The boots should be large enough to permit the wearing of one pair of insoles and two pairs of moderately thick stockings. Lamb-skin inners, as supplied by Robert Lawrie, Ltd., London (fig. 2; S.P.R.I., 82), are good, but they are not easy to dry. They are to be recommended when two pairs can be worn on alternate days, and there are good facilities for drying. Kamiks (p. 250) also make satisfactory, warm inners for use in low temperatures.

[1] Richard Brunner. *The Manufacture of Lubricants, Shoe Polishes and Leather Dressings*, London, 1923, pp. 221–25.

Rubber Sea-Boots

Although leather boots are more efficient for general use, rubber thigh and knee boots both have their advantages. On the whole, a man is more nimble in rubber thigh boots and an oily frock (the normal apparel of British trawler men) than in leather knee boots with oilskin trousers and jacket. Rubber thigh boots are essential for deep wading, as is necessary when handling a sea-plane. They are too cold for most types of boat work in the Antarctic, but during an Arctic summer both thigh and knee boots are useful.

Quite apart from their use at sea, short rubber boots may be invaluable in the Arctic for use on land. The borders of most ice-caps become waterlogged during the summer months and people may suffer from cold-water frost-bite. It is essential to include rubber boots in the equipment for such districts as Vatnajökull in Iceland, where it may be necessary to travel long distances through slush and water, often knee deep. They are also invaluable in the marshy country which is found in many parts of the Arctic in summer.

Rubber boots require no treatment, but are highly perishable. Small repairs can be effected by the technique used for mending rubber tyres.

Owing to excessive perspiration, it is usually not practicable to wear more than one or two pairs of thick socks.

Climbing Boots

Climbing boots need not necessarily be used only for mountaineering, but are invaluable for summer work in the polar regions. Areas where they may be used in the Antarctic are perhaps rather limited, but they are recommended for almost any type of expedition in the Arctic. It must be clearly understood, however, that few climbing boots are warm enough for temperatures below about -10° C. In the Arctic such low temperatures are rare from May until September, except at high altitudes. Sheep-skin linings should not be used, since they take too long to dry. The drying of climbing boots requires time, and this is their main disadvantage. Expense is also a consideration, although first-class workmanship and special nailing are not always essential. Cheap, "Army" boots, with or without ordinary hob-nails, are adequate for general work such as tramping along rocky shores, unloading ships, etc. Ill-fitting boots chafe the feet, and it is always advisable to have climbing boots made to measure. If a personal fitting is impossible, the following notes for

measuring feet indicate the main details required by the manufacturer: an outline of the stockinged feet, taken while standing, with the weight evenly distributed between the two feet, and the all-round measurements at *A*, *B*, *C* and *D* (fig. 3), taken without any weight on the feet.

Fig. 3. Method of measuring foot.

In selecting boots the following points should be considered:

Length. The average human foot elongates one size (i.e. 8 mm.) when the normal weight is imposed upon it in standing. This elongation increases as the force increases; for instance, in running down a steep hillside, the average foot will elongate from two to two and a half sizes. The internal length of the boot should therefore exceed that of the foot, complete with socks, by 20 mm. Short boots will lead to considerable discomfort and trouble, and may easily result in frost-bite, loss of toe nails, etc.

Width. The forepart of the boot should be roomy enough to avoid constriction of the toe, yet at the same time should not be too big. An excessive amount of material on top of the foot may lead to the formation of a heavy crease which will cause friction at the roots of the toes. The back of the boot should be close fitting, and the lacing should firmly hold the foot in the back of the boot when descending a steep slope; otherwise it is possible to produce the effect of a short boot by allowing the foot to slide forward into the toe end. The facings should be set well apart, particularly in a new boot where the leather has not yet stretched.

Depth. It is important to see that the depth of the vamp is carried right through to the toe, and that it is not in any way bevelled off; a boot which is excessively deep at the toe is often inconvenient while rock climbing, however.

Pitch. The pitch, or longitudinal curve of the sole in the forepart of the boot, is worth examination. Some curvature is desirable, as this assists in giving a natural "roll" to the boot in walking; it also prevents the uppers forming an excessive crease.

Soles. These should be stout enough to provide adequate insulation, not only from cold and wet, but also from the nails used in the boots and

from rocky ground. Generally speaking, the soles should be from 13 to 15 mm. thick. This thickness should be carried through under the instep and heel.

General Design (see fig. 4; S.P.R.I., 34[1]). The upper material should be reasonably stout—about 2·5 to 3 mm. thick. The leg of the boot usually need not be lined. The tongue should be of thin pliable material and of

Fig. 4. Leather Climbing Boots.

bellows pattern, being sewn up the sides. If the forepart of the boot is lined, it should be with leather. A strip of leather sewn up the back of the boot, to join the two halves of the leg, tends to come unstitched near the bottom, on account of the wear that takes place in descending scree and boulder-strewn country. A seamless counter round the back of the boot is preferable. If there is a toe-cap, it should be superimposed

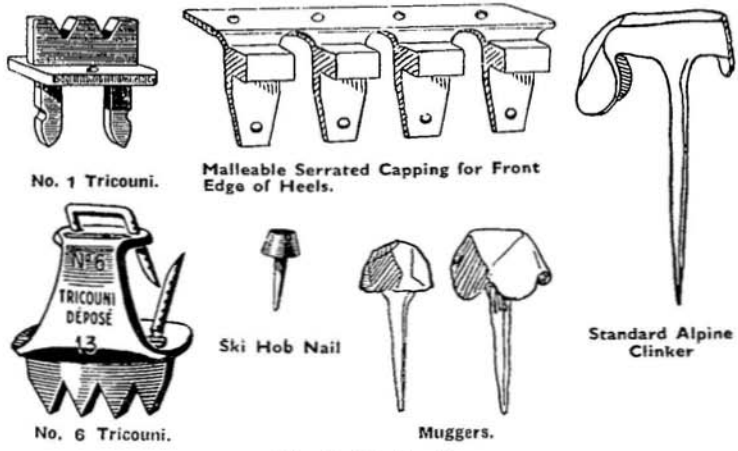

Fig. 5. Boot nails.

on a plain fronted boot, and not simply stitched on the edge of a short vamp. Heavy wax thread should be used for the stitching of the uppers.

Nailing (see fig. 5). Heavy clinkers probably have the longest life of any type of nail. They are best used with the shanks cut short, driven

[1] "Mark VI" type made by Robert Lawrie, Ltd., London. These have a three-ply fixed insole made of leather, asbestos and wool.

directly into the sole. Their wings should, however, be drilled and riveted to the side of the sole; this acts as an additional anchorage and helps to prevent the nails from twisting round. When clinkers are used with long shanks driven through the welts and turned over the edge of the sole, damage is likely to be caused by nails working loose and tearing through the welt, middle sole, and outer sole (see fig. 6). Very frequently this damage will necessitate the entire remaking of the boot.

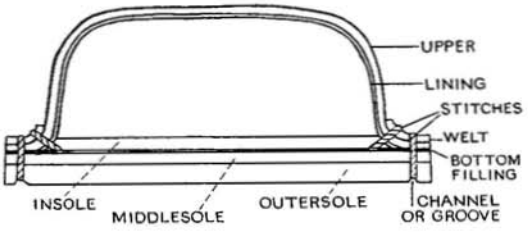

Fig. 6. Detail of Boot Construction.

Round the toe there should be about seven interlocking clinkers. This arrangement saves the boots from a considerable amount of wear when steps are kicked in hard snow. Along the sides of the sole, clinkers are best placed in closely-set pairs, about five pairs on each side being enough. Nails placed singly instead of in pairs are more inclined to be turned over or knocked out.

The heel should be nailed with slightly heavier clinkers than the sole. A great deal of wear is imposed on the back of the heel, so that at this point the clinkers should be overlapping, as at the toes. The front edge of the heel should have a fairly continuous line of protection. This may be either of clinkers or of metal capping. The latter material saves weight and is effective. The middle part of the sole is probably best nailed with hobs, which can be replaced on a journey as required. The hob should have a fairly large head, but the shank should not be so long as to produce an uncomfortable lump inside the boot. A long shank is also inclined to conduct the cold through to the foot. Where the boots are to be worn much in snow conditions, the middle part of the heel should be without nails, to reduce snow "balling". If this part is to be nailed, muggers should be used.

Tricouni do not wear so well as heavy clinkers, but are more readily replaced during an expedition. They are held in position on the soles and welts with staples. These staples can be cut and withdrawn, and the nail removed and replaced with a new one in exactly the same position.

The old staple holes should first be plugged with splinters of wood. In ordering supplies of these nails, the thickness of the sole should be measured to ensure that the correct size is taken. Tricouni are made for soles only. Clinkers are always best for the heels.

When not in use, boots should preferably be kept on trees. Otherwise they should be stuffed tightly with paper or dry grass, which moreover absorbs moisture from wet boots. Wet boots should not be dried on hot pipes or too near a fire; even a slight shinkage may ruin them.

Boots should not be over-oiled. Excessive oil causes leather to saponify and become very porous. Chrome tanned leathers require different treatment to vegetable tanned leathers. Generally speaking, it may be said that deer fat or neat's-foot oil are good for the latter, but that for the former a mineral oil such as vaseline is preferable. Tallow and bees-wax are good dressings for both, but have little or no softening effect. Whale oil is probably the best oil for softening leathers as it does not harden at low temperatures, but it cannot be regarded as a water-proofing agent. Oil is best applied with the fingers, when the leather is damp. The soles and heels should never be oiled as this loosens the nails.

During a long expedition it is often essential to carry out boot repairs. With suitable equipment and a book of instructions,[1] such work can be adequately carried out by a man with no previous experience of cobbling. For the essential details of boot construction, see fig. 6. The following is a list of equipment required:

Spare soles and heels in best oak-bark-tanned leather. (These should be ready cut to approximately the shape required, in advance, and preferably well-hammered; this process makes the leather hard-wearing and less porous.)

Wooden pegs for stopping old nail holes, etc.

"Wax ends" (i.e. threads ready made, complete with either bristles or needles. Those for stitching on soles should be fairly stout, of about 12 to 15 cord thickness and those for repairing seams in uppers, stitching patches, etc., of about 5 or 6 cord thickness).

Leather suitable for patching uppers.

Awls for stitching soles. (It will be found most convenient to use a special awl haft of a screw clip type so that broken awls can readily be replaced or exchanged.)

One fine hook awl for stitching uppers.

[1] We recommend *Boot and Shoe Repairing for Amateurs* by G. Norman (London: W. Foulsham & Co., no date).

Shoemaker's hammer, with one or two spare shafts (weight 2–3 lb.).
Wire cutters.
Two or three shoemaker's knives.
Pegging awl.
Sole prizer.
Leather rasp.
Iron repairing last. (The more robust the better, but weight may be a serious consideration. In an emergency, a conveniently shaped stone can be used to make the boot more solid to work on.)
Strong pliers for removing nails, stripping soles, etc.
Small brass rivets for uniting sole splice repairs, etc.
Channel groover for stitching soles, etc.
Spare climbing nails.

Ski Boots

Ski boots are specially constructed for use with the modern types of steel binding, but are normally too cold for temperatures below about −10° C. Additional warmth may be obtained with a sheep-skin lining, but, since this requires considerable time for drying, it is unsatisfactory. If three or more pairs of socks are worn, the boots will be too loose for proper control when ski-ing.

The best ski boots are handsewn and made of waterproof calf-skin. To prevent buckling, the waist is strengthened by a steel plate, and there is no insole. The toe should be fairly square and long enough to leave an empty space inside of at least 1 cm. between the end of the big toe and the tip of the boot. Ski boots should never be too wide at the ankle and should be fairly low in height, not rising more than two finger breadths above the centre of the ankle bone. Around the top it is advisable to have sorbo rubber padding, covered with leather, to keep the boot firmly on the foot. This is preferable to an instep strap which tends to restrict the muscles at this point. To prevent snow balling between the ski and the boot, and to avoid dangerous falls when walking, a non-skid rubber sole and heel are strongly to be recommended. Cord lacing does not rot easily nor does it vary so much in diameter and strength as leather lacing.

For repairs see under *Climbing Boots* (p. 244).

Two pairs of socks of medium thickness should be worn. One thick pair is not to be recommended, since it is infinitely better to avoid chafing the skin than to be too warm.

The Bass Boot

This is a very high quality, nail-less boot for combined ski-ing and mountaineering at low temperatures (S.P.R.I., 236). It was designed by G. H. Bass & Co., Wilton, Maine, U.S.A. for Bradford Washburn's Yukon Expedition of 1935, and proved most successful. The leather of the upper is of a very heavy chrome tan, moderately treated with oil. It provides only partial insulation against moisture, but in cold conditions it does not become stiff and its heat conductivity is very low. The forepart of the boot is made exceptionally large, whereas the heels are of standard measurement. There is thus ample space for extra socks, and the heel is sufficiently close-fitting for adequate control when ski-ing. The heel is strengthened around the counter with strong leather, similar to that used for the soles. There is a felt top band as well as a strap round the ankle, a waterproof tongue, and hooks and eyelets for the lacing. Between the outer and inner soles a layer of asbestos provides additional insulation, which is particularly valuable when using steel crampons.

For low temperatures the boot has proved most satisfactory, but it is unsuitable for warmer conditions. Messrs Bass & Co. are now making further experiments with the insulation of boots.

The Amundsen Boot

This boot was designed for Amundsen's Expedition to the South Pole. It represents the first attempt to adapt a ski boot for use with a steel binding in low temperatures. It has a thick leather sole, without nails, and a canvas upper of ordinary ankle height. A broad band of stiff leather runs round the boot above the welt and is fastened to the sole with a waterproof join. This leather reinforcement provides the necessary control when ski-ing,[1] while the loose-fitting canvas part of the upper enables the boot to be dried more easily and does not restrict freedom of movement or blood circulation. These boots must be made sufficiently large to permit the wearing of several pairs of thick socks. The members of Amundsen's party each used five or six pairs. For low temperatures at least three are advisable, with a thick felt insole which can be removed after use for drying

The above description is based on a specimen of Amundsen's in the Ski-museum at Oslo. We understand that the design has since been improved

[1] The amount of ski-control required when travelling alongside a dog-drawn sledge is far less than in mountain work.

and that the boots may be obtained from Holth, Rostedsgate 1, Oslo. No one appears to have tried both the Amundsen boot and the winter binding which is described in Part II. The former must give greater control when ski-ing, but the soft footwear used with the latter is much easier to dry.

The Solbakken Boot

This is a recent invention by a Norwegian hunter, and appears to be a remarkably good type of footwear for a wide variety of conditions. Unfortunately we have been unable to see a specimen, but we have received reports to the effect that these boots have proved extremely satisfactory for winter conditions in East Greenland. The shape resembles that of an ordinary climbing boot. The sole and heel are made of a single piece of hard "gummed Balata",[1] and the upper of stiff felt ("ungummed Balata"). There is a tongue, and the lacing is similar to that of an ordinary boot. Solbakken boots are worn with two pairs of thick woollen socks and a felt insole. They can be used with ordinary steel bindings on skis, and are not too warm for this purpose. At the same time they have been found comfortable for riding on a sledge all day in temperatures down to about $-45°$ C. In warm conditions they absorb moisture, and for long journeys it has been found advisable to carry two pairs, which can be worn on alternate days. These boots seem to solve the problem of low-temperature footwear suitable for use with steel ski bindings, and we hope that further details will be published later.

The Barker Boot

This is one of the best types of American specialised footwear, and a really excellent, all-round boot for summer work (fig. 7; S.P.R.I., 228). It is waterproof, light in weight, and warm enough for temperatures down to about $-10°$ C. The rubber sole tends to slip on ice or hard snow surfaces, but otherwise the boot is most satisfactory and, owing to the wide ankle room, it can be dried easily. The foot, which is of canvas-lined rubber, resembles that of an ordinary rubber sea-boot, except that the heel is almost flush with the sole. The upper is of leather, and is attached to the rubber by

Fig. 7. American Barker Boot.

[1] English "Balata" is a fabric made of layers of canvas impregnated with rubber. This description comes from a Norwegian correspondent.

four lines of parallel stitching. The boot has a waterproof tongue, and is fastened by ordinary woven thread lacing. An oversewn strap of leather strengthens the seam up the back.

These boots should never be used without insoles. One felt insole, about 8 mm. thick, and a thin "loofah" one have proved satisfactory. The "loofah" insole should be placed on top of the felt insole. Two pairs of heavy socks should be worn.

After use the boots are generally filled with oats or crumpled newspaper, in order to absorb moisture and keep them in shape overnight. Several travellers advocate the use of oats even during short sledging expeditions. The insoles should be removed and dried separately.

"*Moccasin*" *Boots*

This boot (fig. 8; S.P.R.I., 237) was used on Byrd's first two expeditions to the Antarctic, and is an adaptation of the Canadian "Shoepack" (see below). It is waterproof and strongly built, and should wear well except in boulder-strewn or scree country. It cannot, however, be turned inside out, and is therefore difficult to dry. The foot is protected from becoming bruised on hard sea-ice or rocks by three layers of soft leather, one of which is a thick insole. This insole is a disadvantage in some ways, since the toes cannot obtain a firm grip, but the boot is otherwise quite satisfactory for wear near camp, or for short journeys without skis. A spiked heel makes it impossible to use the boot with either skis or snowshoes, inside a house or tent, or on the deck of a ship. These disadvantages would seem to outweigh any benefits which the spikes may provide on a slippery surface, and indeed the spikes may be omitted without affecting the construction. The boot is made, at a high price, by G. H. Bass & Co., Wilton, Maine, U.S.A.

Fig. 8. American "Moccasin" Boot.

The boot is made of soft, oil-treated leather. As in the Indian moccasin, there is no seam beneath or at the sides of the foot, and the whole sole piece is stretched into shape and sewn to the uppers by a double line of stitching. The leather at the seam has a double overlap, which forms a bulge round the toe and sides of the boot. The leather at the heel is not overlapped, but an oversewn strip of leather is attached up the back of

the boot by two triple lines of minute stitching. An additional outer sole is shaped round the original sole, and attached by a double line of stitching below the bulge. The other main features of the boot may be seen in the illustration.

When in use, the boot is lightly padded with "sennegrass" (see p. 265), and two or three pairs of socks are worn.

The Canadian "Shoepack"

This is a simpler and cheaper form of the "Moccasin" Boot described above. Shoepacks (S.P.R.I., 231) are very widely used in Canada and Alaska, and are an excellent type of footwear for use in soft snow, slush, etc., in wooded country. The construction is essentially as shown in fig. 8, but there is no spiked heel.

Dog-Skin Boots

This is a winter boot used by many of the Baffin Land Eskimo (fig. 9; S.P.R.I., 49). It extends to just below the knee, where it is fastened with a draw-string, and is worn with fur clothing. Inner breeches of caribou-(*Rangifer*) skin, with the hair facing inwards, are tucked into the top of the boot, and outer breeches, also of caribou-skin but with the hair facing outwards, are made sufficiently long and loose-fitting to hang just over the boot top.

Fig. 9. Dog-skin Boot.

Our information about this boot is based chiefly on a pair at the Scott Polar Research Institute. It is shaped like a "mukluk" (p. 260), the foot being of caribou-skin and the leg of dog-skin. The leg is very loose-fitting, and is made of four horizontal strips of dog-skin, black and white alternating as a decorative device.

This type of boot appears to be extremely warm and comfortable, but must be difficult to dry. An overshoe can be worn, as with caribou-skin boots.

The Eskimo wear an inner stocking of caribou-skin with the hair facing inwards. Since the hair at the feet of these stockings is liable to

wear out quickly, the most satisfactory inners appear to be woollen socks and duffles (p. 266). The inner duffle should be of the short variety, the outer one long enough to extend to just below, or just above, the knee. "Sennegrass" padding under the foot provides additional insulation and protection, if required.

Caribou-Skin Boots

The caribou-skin boot, also used by the Baffin Land Eskimo, is similar in design to the dog-skin boot, but is made entirely of caribou- (*Rangifer*) skin, with the hair facing outwards. From the ankle downwards the hair is clipped short so that an overshoe may be worn. This overshoe is either made of seal-skin with the hair removed, or, for really cold conditions, of caribou-skin with the hair facing outwards. It is secured by a thong, which is threaded through two loops, one on each side of the instep, and tied round the ankle.

This form of footwear combines comfort with warmth and freedom of movement. It should not require so much drying as the dog-skin boot, for, since hoar frost accumulates inside the overshoe, the foot of the boot does not become particularly damp. The disadvantage of this footwear is that it may be too warm.

After use, the overshoe should be turned inside out, and any hoar frost scraped off before drying.

Probably the most suitable inners are those advised for dog-skin boots. The Eskimo, however, use an inner stocking of caribou-skin, extending to just below the knee and with the hair facing inwards.

"*Kamiks*"[1]

Provided it is well made, this hairless (i.e. shaved) seal-skin Eskimo footwear is probably the best all-round type for polar travel (fig. 10; S.P.R.I., 9).[2] With suitable inner, it should be warm enough for temperatures above about $-20°$ C., and for colder conditions it can be worn with an outer boot or shoe made of seal- or caribou-skin. The hair of these outers provides additional insulation, but they are not easily dried except during hut-to-hut travel.

Kamiks are waterproof and light in weight, provide an excellent grip on dry rock and ice, and are much less tiring than ordinary boots. They are

[1] Sing. *kamik*, plur. *kangmit* in W. Greenland and *kamiker* in E. Greenland. Commonly called "kamiks" in English.

[2] Hudson's Bay Company type, made in Labrador with hem and draw-string added at top.

too soft for wear in rough, boulder-strewn or scree country. They are essential for kayaking, and are ideal for most boat work. They do not slip on a wet or oily deck, nor do they deteriorate from contact with oil.

Kamiks are often criticised by those who do not know how to select good ones and look after them. The types used in Greenland and other parts of the Arctic are inferior to those from Labrador. The sole of a Greenland kamik is usually too small and does not provide a sufficiently definite heel, nor does it extend high enough round the sides and toe. Consequently the Greenland type does not retain its shape, and is often ill-fitting; moreover, the stitching soon wears through. It is advisable to have kamiks specially made to measure. If a visit to Labrador is impossible, a competent agent there should be appointed to choose the boots from a large stock, or have them made. The sizes required can be indicated by sending duffle inners, or by forwarding measurements or drawings of the foot with the sock on. In the latter case, the duffle inners should be ordered in addition to the kamiks. Kamiks may be purchased through the Hudson's Bay Company store at St John's, Newfoundland.

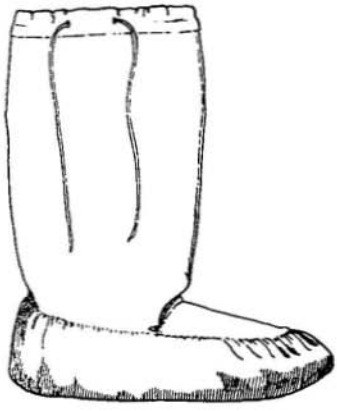

Fig. 10. Labrador Kamik.

Kamiks from Labrador do not require the thong ankle fastening of the Greenland and Alaskan types, since the heel is much more shaped and is reinforced by several lines of stitching. However, they are frequently made too big round the calf, thereby allowing snow to enter at the top. For this reason, it is advisable to substitute for the ornamental top a light cloth or canvas hem. A draw-string may then be threaded through the hem and should emerge from two holes about 3 in. apart, the ends passing each other before emerging. By this method a straight pull on both strings closes the boot without any strain on the hem.

Kamiks, similar in general design but usually inferior to the Labrador type, are used by the Eskimo of Alaska, the Canadian Arctic, and Greenland (S.P.R.I., 92, 112, 118, etc.). Some of the main Alaskan types are described by Nelson.[1] These all appear to have seal-skin soles (mainly *Phoca foetida*), but the uppers are of caribou- (*Rangifer*) skin, either intact

[1] E. W. Nelson. The Eskimo about Bering Strait. *Eighteenth Annual Rept. Bureau American Ethnology, Smithsonian Institution*, 1896–97, Part I, 1899, pp. 40–43.

or with the hair removed. In the latter case, the hair can be either inside or outside.

Shaved seal-skin is rather smooth in texture, and kamiks are apt to slip about on snowshoes or inside the modern type of winter ski-binding. But they are easy to put on quickly, and, for this reason alone, are excellent on any sledge journey.

There are numerous types. The large majority are of knee height, but some extend to the thighs. The best skin for the soles is from the Bearded Seal (*Erignathus barbatus*), on account of its thickness and wearing qualities. The uppers are usually made from the thinner skin of the Fjord Seal (*Phoca foetida*) or Harp Seal (*Phoca groenlandica*).

The removal of the hair and the preparation of the skin is a process which requires considerable skill. The skin is scraped and then soaked in urine for two or three days to extract the fat.[1] The thicker sole-skin is finally softened by chewing. The method of construction of the boot, as used in Labrador, has been well described by Hawkes.[2] In order that the boots should be thoroughly waterproof, each seam must be double sewn, inside and out, with very close stitching. If obtainable, caribou tendon is used as thread, since it is stronger than any sinew from a seal or narwhal.

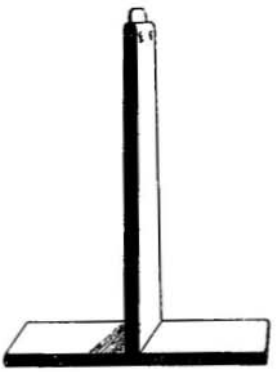

Fig. 11. Kamio.

In order to keep kamiks pliable and water-tight, they should be regularly treated with seal or whale oil. Neat's-foot oil is also very satisfactory for this purpose. Seal oil is easy to prepare by melting down lumps of blubber in a container, or the blubber itself may be rubbed on in the raw state or when partly melted.

For the proper care of kamiks it is essential to use a *kamio* (fig. 11; S.P.R.I., 80). The base of this wooden gadget can be held secure by standing with one foot on either side of the upright, which is about 50 cm. in length. The top of the upright is fitted with a rounded piece of smooth metal, across which the boot can be rubbed backwards and forwards. The height of the upright also makes it possible to rub the sole of the boot from the inside without turning the boot inside out. New boots,

[1] Urine tanning is characteristic of Eskimo culture.

[2] E. W. Hawkes. The Labrador Eskimo. *Canada Dept. of Mines Geological Survey.* Memoir 91, No. 14, Anthropological Series, Ottawa, 1916.

should be worked on a *kamio* before wearing. After use, they should always be turned inside out, and dried, and then worked on the *kamio* before being used again. This stretches the skin, keeps it soft and pliable, removes wrinkles caused by drying, and prevents the soles from shrinking. With practice the treatment is quickly carried out, and it is essential for this type of footwear. On a sledge journey, when weight is of paramount importance, a *kamio* may be dispensed with. The boots should then be placed across the knee and rubbed with the handle of a sheath-knife. If practicable, two pairs of boots should be used on alternate days, to ensure adequate and slow drying. Care should be taken lest kamiks become too dry and hard, as this causes the stitching to tear.

For sledge journeys, the most satisfactory inners for kamiks are woollen socks and one pair of short duffles (p. 266). For colder conditions, a long duffle can also be worn, but one of medium length is impracticable owing to the lack of ankle space in a correctly fitted kamik.

The Eskimo inner boot, or stocking (*alerse*, *alerseq*, *alertik*, etc.), made of the skin of seal, caribou, dog, fox or hare, is unsatisfactory for long sledge journeys. Fox- and hare-skin are very fragile, while caribou- and dog-skin are difficult to dry. Seal is the best of the Arctic skins for this type of stocking, with, for extra warmth, the foot of the stocking made of reindeer- or dog-skin (preferably puppy). The most practicable type, however, is made of lamb-skin, which is now being used by the Cape York Eskimo. An edging of bear-skin round the top of the stocking prevents this from tearing. Between the foot of a skin stocking and the sole of a kamik, it is advisable to have a layer of "sennegrass" (p. 265). This absorbs moisture, can be dried easily, and provides greater protection for the feet. Insoles of caribou- or sheep-skin are also used, but are apt to ruck up inside the boot and wear out too easily. For summer wear, a skin stocking is warm and comfortable without ordinary woollen socks.

The McClintock Boot

We have been unable to obtain much information about this boot, which was evidently designed some ninety years ago by Leopold McClintock. It has a loose-fitting canvas upper extending to just below the knee, and the sole is of seal-skin. In the Arctic, Stefansson has found it a most suitable footwear for long journeys, being easily repairable and extremely warm if adequate inners are worn. As inners he wore a sock of caribou-skin, with the hair facing inwards, and several layers of duffle inners.

"*Finnesko*"[1]

This is the winter boot used by Lapps and Scandinavians living in the far north (fig. 12; S.P.R.I., 32). It is made of reindeer- (*Rangifer tarandus*) skin, with the hair intact. A Lapp tucks the lower part of his cloth trousers inside the top of the finnesko, round which he binds tightly a narrow length of woven braid in order to prevent snow penetrating inside the boot. In really cold conditions, or when tending reindeer, he wears over his trousers a pair of leggings made of skins from reindeer legs, and these extend to just below the knee. These leggings are very similar to the fur leggings used by the Reindeer Tungus (see fig. 22).

Fig. 12. Lapp Finnesko.

If well lined with "sennegrass", finnesko are warm and extremely comfortable. Snow tends to clog in the hair, and they should therefore not be used in temperatures much above $-20°$ C. Except in Lapland itself, it is almost impossible to obtain finnesko made to measure. Those obtained through agents are often ill-fitting and made from the wrong parts of the reindeer skin. A strap, bound round the ankle and below the instep, is then necessary to keep the boot securely on the foot. On hard, wind-driven snow, finnesko slip easily, and the danger of falling is increased by ill-fitting boots. On the whole, finnesko are not to be recommended for expeditions, unless the members are able to have pairs specially made for them in Lapland. They have often been of great value to expeditions in the past, but several other good types of footwear are now available.

The upturned toe prevents the finnesko slipping backwards out of the toe-strap which the Lapps, and many Finns, find sufficient as a ski-binding (see Part II). Finnesko can also be used with the "winter ski-binding" (see Part II).

A finnesko is usually made with three pieces of reindeer-skin sewn together with dried leg sinew. The sole is cut in such a way that there is no seam beneath, or at the sides of, the foot. The seams connecting the

[1] *Finnesko* or *finsko* means simply "Lapp shoe" in Norwegian (*Finne* previously denoting both Lapps and Finns). The term has come into English polar literature through the Norwegian explorers.

sole with the two pieces of skin which constitute the upper can best be seen in the illustration of a "komag" on p. 256. The upper is made of skin from the fore or hind legs of a reindeer. The sole should be made from the forehead skin, which is even stronger, and has shorter hair, than the skin of the legs. Forehead skin is essential for the sole, since finnesko are otherwise too slippery on hard snow surfaces.

Finnesko are rather more than ankle high. Those supplied by most Scandinavian shops have coloured draw-strings threaded through a leather hem round the top of the boot, as shown in the accompanying illustration. This type of finnesko is not to be recommended. A finnesko should, as in the true Lapp model, have wide ankle room like a "komag", thus enabling the "sennegrass" to be spread out evenly inside the boot. For fastening there should be two leather loops above the instep. A short leather thong is attached to one of these loops and threaded through the other. When the boot is put on, this thong is pulled tight and a length of woven braid or thin lamp wick, to which the thong is attached, is wound several times round the ankle.

Before entering a tent or hut, the finnesko should be beaten to dislodge any snow. They should then be removed, and the damp "sennegrass" taken out and dried; a muslin bag is convenient for this purpose. The drying of finnesko should be done carefully and slowly, as with all skin boots. Moisture in the fur can be absorbed by placing dry "sennegrass" in the finnesko after they have been turned inside out.

Finnesko are designed for use with socks and "sennegrass". "Sennegrass" (p. 265) provides excellent insulation, absorbs moisture, and keeps the foot securely in position inside the boot, but it must be properly packed in the boot before the stockinged foot is placed inside. Additional "sennegrass" is stuffed round the ankle and instep before the top of the finnesko is finally fastened. Duffles are not to be recommended with finnesko.

"*Komager*"[1]

This is the Norwegian name for the summer boots used by the Lapps in northern Scandinavia. It is made of reindeer- (*Rangifer tarandus*) skin, with the hair removed (fig. 13; S.P.R.I., 87).

Both in summer and in winter, fishermen and sealers, and many other local people, use komager with an additional sole sewn underneath (S.P.R.I., 52). A further piece of leather or hide is generally sewn on to

[1] Sing. *komag*. N. Lappish *gāmâ*.

the heel. The sole greatly increases the stiffness of the boot and prevents the foot becoming bruised on hard sea-ice or rocks. On the other hand, komager without soles, being softer, enable the toes to obtain a firmer grip.

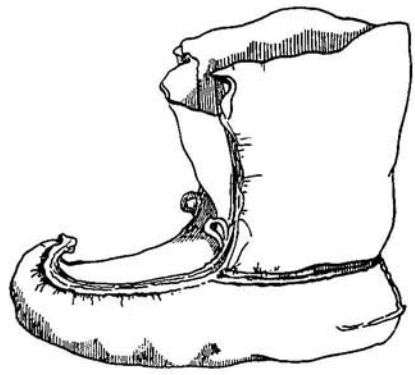

Fig. 13. Lapp Komag.

This boot is waterproof and light in weight, and is essentially a summer one, but the "sennegrass" padding enables it to be used in temperatures down to about −25° C. The leather, being smooth in texture, is apt to slip about with snowshoes, or the modern type of winter ski-binding. In the latter case, however, komager are better than kamiks, since they are stiffer and take up more space within the binding. Elgström[1] gives a good illustrated description of the methods of making, wearing and repairing these boots.

Although it is advisable to purchase komager in Lapland, good pairs can also be obtained through agents.

Except for the absence of hair, the design, choice of skin, and stitching of komager are similar to that of finnesko. The method of fastening is also similar. There should be wide ankle room, as shown in the accompanying illustration.

After purchasing komager, they should be treated with a mixture of one part Stockholm tar to two parts seal oil.[2] This mixture should be boiled, then cooled, rubbed well into the leather, inside and outside, and allowed to dry slowly. A second and third coat should be put on. This treatment of komager should be repeated two or three times during the summer months. It is inadvisable to oil komager during the colder part of the winter, since oiled boots are not so warm and allow more hoar frost to form inside. In northern Sweden, the Lapps usually treat komager with fish-oil during the summer months.

After entering a tent or hut, komager should be removed, and the damp "sennegrass" dried. It is not always easy to turn komager inside out for drying purposes, and quite impossible if an outer sole has been at-

[1] Ossian Elgström. *Karesuando-Lapparna. Etnografiska skisser från Köngämä och Lainiovuoma*, 1916–19. Stockholm, 1922, pp. 298–313. (A translation of the relevant sections is filed at the S.P.R.I.)

[2] This mixture is also excellent for waterproofing leather gloves for use at sea.

tached. In any case, whether the boots are turned inside out or not, moisture is absorbed by stuffing with dry "sennegrass". The leather may be stretched and softened by rubbing it with a stick (Karesuando Lappish; *tjieghasmuorra*) in somewhat the same way as that described for kamiks.

For inners, socks and "sennegrass" should be used, as in the case of finnesko. A felt insole may provide additional protection, if necessary, but duffles are not to be recommended. The Lapps always tuck the bottoms of their trousers inside their boots.

"*Pjäxor*"

This is the Swedish name[1] of an adaptation of the komager which is used in northern Scandinavia, particularly for salmon fishing and for hunting seals on the sea-ice. Pjäxor are very similar to komager, but the uppers are slightly stiffened and extend to just below the knee, where they are fastened with a strap. This is apparently a very good sea-boot, and also possesses the qualities required on snow and ice, being light, pliable, and waterproof. We have not seen a specimen, but have received very favourable reports from those who have used them.

Moccasins

The term "moccasin", derived from one of the eastern Algonkian dialects, has come to be used for all the different kinds of North American Indian shoes. It is convenient, however, to use the term only for forms of footwear closely allied to the soft-tanned leather moccasin of the Virginia Indians.

The most important feature of moccasins lies in the fact that the whole shoe is made of one or more pieces of the same quality of prepared skin. Methods of tanning in different regions are described by Schufeldt,[2] Turner,[3] Wissler,[4] and Hawkes.[5] White skins are "frost dried" and coloured ones smoked. The extremely pliable texture is usually obtained

[1] The term *pjäxa* (Sing.) is now loosely applied to several different forms of boots in northern Scandinavia.

[2] R. W. Schufeldt. The Navajo Tanner. *Proc. U.S. Nat. Mus.* Vol. II, 1888, pp. 59–66.

[3] Lucien M. Turner. Ethnology of the Ungava district, Hudson Bay Territory. *Eleventh Annual Rept. Bureau of Ethnology, Smithsonian Institution*, 1889–90, 1894, pp. 213–19, 292–98.

[4] Clark Wissler. Material Culture of the Blackfoot Indians. *Amer. Mus. Nat. Hist. Anthropological Papers*, Vol. V, Part I, 1910, pp. 63–65. (Section on moccasins by W. C. Orchard, pp. 139–51.)

[5] E. W. Hawkes (1916). *Loc. cit.*

by the application of deer's brains and bone marrow or other fatty substances. Skins used for footwear are nearly always tanned with smoke, a process which tends to render the skin less liable to injury from moisture. The sole piece is bent up round the sides and gathered at the heel by a vertical seam which may be simple, or, in some types, shaped as an inverted T or Y. The stitching is done with deer sinew, which will not rot like cotton thread. Different types of moccasins have been studied by Hatt,[1] who gives a valuable summary of their geographical distribution and main characteristics. A wide variety of moccasin-type boots combined with leggings is also found in northern Asia, but these do not seem to be so well developed as the North American patterns. The moccasin illustrated (fig. 14; S.P.R.I., 90) was made at Fort Rae, Canada.

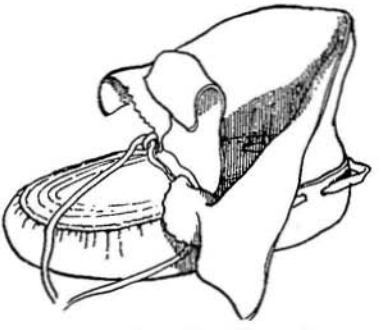

Fig. 14. Canadian Moccasin.

Worn with adequately warm inners, moccasins are an invaluable form of footwear for land travel in cold conditions ($-10°$ C. and below). In wet conditions, some of the North American Indians wear a rubber overshoe somewhat like the English "golosh". Moccasins are warm, soft, cheap, and exceedingly light in weight. They are probably the most comfortable of all polar footwear, and can be worn with ski, if special bindings are available, or with snowshoes. Owing, however, to their thinness, the feet are easily bruised by snowshoes, unless they are sufficiently hard to withstand long days of trekking. Moccasins are not very durable, wearing out quickly on rocks and sharp ice, and they should only be used on land in cold weather. If they become damp during the day, they and their inners may freeze together into a solid mass. Again, it is inadvisable to use them on sea-ice, as, even in the coldest weather, the feet are always liable to become wet. It is then not possible to dry the moccasins properly until the salt has been thoroughly washed out.

There are many distinct types of native-made moccasin, each differing in cut, skin-quality, method of stitching and ornamentation.

[1] Gudmund Hatt. Moccasins and their relation to Arctic Footwear. *Memoirs American Anthropological Association*, Vol. III, No. 3, 1916, pp. 149–250, and *Arktiske Skinddragter i Eurasien og Amerika* (Copenhagen, 1914).

A standard type of moccasin (S.P.R.I., 37) may be purchased from the Hudson's Bay Company. It usually takes four or five months from the date of ordering to the date of delivery in England. As far as the skin is concerned, there are three main types: (*a*) those made with the softer and thinner caribou- (*Rangifer*) skin, which is generally used for summer and indoor wear, (*b*) the much stronger type made with thick moose- (*Alces*) skin, and (*c*) an intermediate type made with elk- or wapiti- (*Cervus*) skin. It is essential that the ankle-flaps should be long enough to provide plenty of overlap, and that the tongue should be broad and long enough to prevent it working down from under the fastening thong; otherwise a ruck may form in front of the ankle and snow may collect inside the moccasin. The tongue and flaps should preferably be made of the thinner caribou-hide, since three layers of moose-hide in front of the ankle is cumbrous and often too warm. Moccasins with thick soles that are free from irregularities should be selected. In order to ensure a good fit, it is advisable to wear duffle inners and allow an Indian woman to make the necessary measurements. She will then make a really close-fitting moccasin, which will be devoid of loose folds even though it may stretch slightly with use. On the other hand, if moccasins have to be ordered from abroad, it is advisable to obtain them on a "sale or return" basis from the Hudson's Bay Company. Each member can then select his own.

If moccasins are kept dry and free from grease, two good pairs should be sufficient for four or five months' winter travel. Grease of any description is detrimental to the hide, and it is necessary to wear rubber overshoes when dealing with any form of blubber. On a sledge journey moccasins can easily be dried, provided sufficient care is taken. Before entering the tent, all loose snow should be brushed off them. They should then be removed immediately and turned inside out, and all the hoar frost scraped off with a spoon or the back of a knife before they are hung up to dry. Final drying, if necessary, can take place inside the sleeping bag. Moccasins are easily repaired. In the North West Territories (Canada) they are often strengthened under the toes and heels with patches. These patches can be removed when worn through, thus delaying wear on the original sole. For sewing, the Indians use dried sinew called *babiche*, and, although this is the best material, ordinary cotton thread is adequate for patching. To make the soles last longer, it is advisable to use moccasins on both feet alternately, but whether such alternation is possible depends on the shape of the individual's feet.

In the North West Territories, two pairs of duffles, with one or two pairs of socks, are worn during the winter. In the late spring one pair of duffles is adequate, and a smaller size of moccasin is then necessary. Instead of duffles, "sennegrass" has been used with some success, for it helps to prevent the feet becoming bruised when snowshoes are worn.

If windproof trousers are tied loosely round the ankle, outside the moccasin, this will prevent snow collecting in the socks and duffles, but should not restrict the blood circulation. When windproof trousers are not worn, short canvas leggings may be used to keep the socks and duffles free from snow, but they restrict good ventilation and are not to be recommended unless very loose-fitting.

Mukluks

As far as the foot is concerned, mukluks (fig. 15; S.P.R.I., 89)[1] are essentially the same as moccasins and are used extensively in the North West Territories. The ankle-flap is replaced by a loose-fitting canvas upper, which is fastened by a woollen draw-string just below the knee. There is also a raw-hide ankle fastening as in moccasins. In many ways the mukluk is an even better type of footwear for cold conditions than the moccasin, since snow, twigs, etc., cannot penetrate any folds in the material. It is essential, however, that a mukluk should be properly fitted for each individual, and above all that there should be adequate ankle room. Otherwise, if in pulling it on the two duffle inners are drawn towards the heel of the mukluk, it is then difficult to readjust them. To ensure freedom and better ventilation, the trousers should hang loosely outside the mukluks. This is particularly important in the case of those who perspire freely. In Canada, mukluks are usually worn with ordinary trousers or breeches. Some trappers, however, only use them as a form of comfortable evening footwear after returning to their huts.

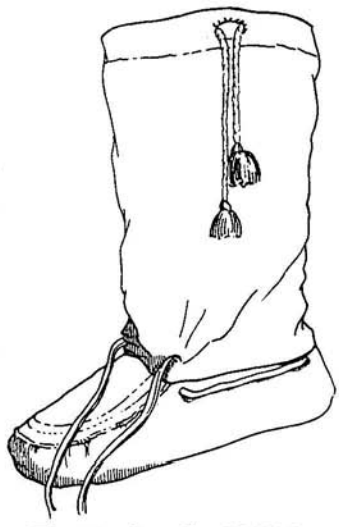

Fig. 15. Canadian Mukluk.

[1] Obtained through the Hudson's Bay Company. In Alaska this name is apparently used for reindeer-skin boots of a type quite different from that described here.

Mukluks should be treated in the same way as moccasins. Socks and duffles are the most satisfactory form of inners. "Sennegrass" is not to be recommended, owing to the difficulty of spreading it evenly in the foot of the mukluk. Sometimes a sock of thin fawn-skin is worn.

"*Válenki*"

Válenki are felt boots worn by many Russians in Siberia and elsewhere. Felt is a fabric produced by "matting" or "felting" together fibrous materials such as wools, hairs, furs, etc., and is probably one of the oldest types of recognised fabrics. Válenki are essentially a winter footwear for dry snow conditions, and are designed not for walking long distances but for sitting on a sleigh or cart, or for riding on a horse. For these purposes they are admirably adapted, and they may also be recommended in the immediate neighbourhood of hut or camp.

Fig. 16 shows the common, unadorned type, but they are sometimes decorated with embroidery. The material is a coarse wool felt, evidently made on a last and impregnated with some stiffening agent. The thickness increases from about 3 mm. at the top to 4 or 5 mm. at the foot. When válenki are first put on, the felt feels hard and uncomfortable, but it very soon takes the exact shape of the foot. Except in the coldest weather, when the full length is used, the top is turned down just below the knee. Many Russians do not normally wear stockings with válenki, but these may be added with advantage. While the felt is extremely warm, it does not cause perspiration. The boots must never be allowed to get wet, since they are extremely difficult to dry.

Fig. 16. Russian Válenok.

Válenki appear to be a good type of footwear for men riding long distances on a dog-sledge or horse-sleigh, and they might also prove very suitable for men driving snow-tractors. There is always the disadvantage that alternative footwear must be provided if there is a possibility that the wearer may have to walk any distance. They were used during the *Terra Nova* Expedition, with the addition of a leather sole, for walking about in the vicinity of the base.

[1] Sing. *válenok*. Sometimes called *katantsy* or *kátanki*.

Northern Asiatic Types of Native Footwear

Throughout the greater part of northern Asia there are two main series of footwear used by the natives.[1] These differ in material, which in one series is ordinary haired or de-haired soft-tanned skin from reindeer (*Rangifer*), elk (*Alces*) or roedeer (*Capreolus*), while in the other series the haired leg-skin of these animals is used. The de-haired soft leather[2] series, in particular, seems worthy of mention here. An example is shown in fig. 17. This is a long, soft leather boot extending to just above the knee. It was collected by Dr Lindgren at Dubova, in north-western Manchuria. These boots are used by the

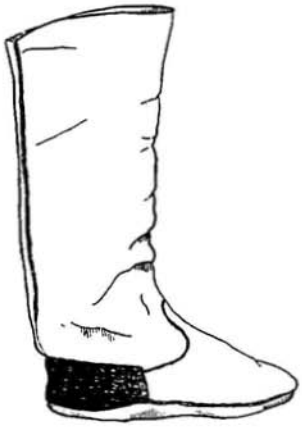

Fig. 17. Cossack Deer-skin Boot.

Fig. 18. Reindeer Tungus Hemchurel.

Russian Cossacks, who have adopted a type characteristic of the Reindeer Tungus, but have here added a strengthening piece of leather round the heel. The Cossacks use these boots in winter for hunting squirrels, an occupation which involves walking long distances in the snow. The boots are soft and comfortable and do not become stiff after getting wet. It is suggested that chamois-leather footwear of this type would be easy to make and might prove very satisfactory in cold dry conditions elsewhere in the polar regions.

For inners the Cossacks wear woollen socks. The Reindeer Tungus use a padding of elk-hair (p. 226), with or without socks.

[1] See Gudmund Hatt (1916). *Loc. cit.*

[2] Some notes on tanning will be given in Part II. This native-made chamois leather retains its softness in spite of repeated wetting and drying.

Boots made from the leg-skins of deer are used by nearly all the northern Asiatic tribes. There are local variations in the skin and the number of longitudinal strips forming the boot top, but almost everywhere there is a striking similarity in the construction of the foot. It would appear that none of these forms[1] are so well suited for the use of white men as the somewhat similar footwear which has evolved in North America. Two types, of which we have been able to examine specimens, seem to be worth describing here.

"*Hemchurel*" (fig. 18; U.M.A.E., 35.783). These are the winter boots of

Fig. 19. Khingan Tungus Chikhami.

Fig. 20. Khingan Tungus Dokten.

the Reindeer Tungus in northern Manchuria. The uppers are made from the leg-skins of elk (*Alces machlis*)[2] with the hair worn outside, and the soles are of soft-tanned hairless elk-skin.[3] *Hemchurel* are worn with fur leggings called *ollohit* (p. 264), or soft-tanned hairless skin leggings

[1] Speaking of the *summer* footwear of the Reindeer Chukchee, for example, W. Bogoras (Material Culture of the Chukchee. (Jessup North Pacific Expedition.) *Memoirs Amer. Mus. Nat. Hist.* Vol. XI, Part I, p. 248) says: "These shoes are worn with thick grass insoles, but without socks. They fit the foot closely, so that when walking ankle-deep in the numerous bogs and mountain brooks, very little water can remain in the shoe. The soles, moreover, are pierced with two rows of small holes made with a bodkin, to facilitate the outlet of the water."

[2] The Reindeer Tungus sometimes use wapiti-skin, instead of elk-skin, for the purposes mentioned in the following description.

[3] In summer the Reindeer Tungus wear somewhat similar short boots with soft-tanned hairless elk-skin uppers, and soles of elk-skin with the hair left on and facing outwards.

called *aramus* (see below). The inners are woollen socks with a padding of elk hair (p. 265).

Chikhami (fig. 19; U.M.A.E., 33.396). These are winter boots of the Khingan Tungus in northern Manchuria. The uppers are made from the leg-skin of roedeer (*Capreolus mantchuricus*), with the hair outwards, and the soles are of roedeer neck-skin with the hair removed. The inners used with *chikhami* by the Khingan Tungus are called *dokten* (fig. 20; U.M.A.E,, 33.393). These inners are made of the winter skin of the roedeer, with the hair facing inwards, and have a slit down the front so that they can be wrapped around the leg under the outer boot.

Puttees and Leggings

These are often useful to close the gap between windproof trousers and boots. By far the best puttees are the closely woven, straight cut and very flexible goat's wool type made in Kashmir and Nepal. These are now obtainable from Arthur Beale, London, having been introduced by General Bruce for mountaineers. They may be sufficiently long to wind spirally from the ankle to the knee, where they are fastened with a tape, but shorter lengths of about 2·5 m. are generally more convenient. If the wearer is mounted, the winding should be reversed (i.e. from top to bottom), or rubbing against the horse causes it to come undone. Puttees can be used as bandages or slings in an emergency, and they occupy very little space when not in use. They seem to be preferable to the cloth spats or gaiters often used by skiers.

Light windproof cloth leggings which have been used by some recent British expeditions have not proved very satisfactory. If leggings are to be used in low temperatures, it is suggested that light chamois leather is the most suitable material. Leggings of this type are used in Manchuria. They are used by the Reindeer Tungus, and are called *aramus* (fig. 21; U.M.A.E., 35.781). Another type of legging which appears to have possibilities for adaptation to the requirements of polar expeditions is shown in fig. 22 (U.M.A.E., 35.782). These are called *ollohit* by the Reindeer Tungus of Manchuria and are made of Reindeer-(*Rangifer phylarchus*) skin, with the hair left on. They are worn outside the trousers. The lower end of the legging fits outside the outer boot, and the top extends to the thigh. It is apparently held in position by a connection with the belt. Lapps wear similar fur leggings in winter.

"Sennegrass" and Elk Hair

It has already been mentioned that certain types of footwear require some sort of inner padding which provides insulation and protection to the feet and also absorbs perspiration. For this purpose, natives in the circumpolar regions use various species of dried grass or sedge, elk or reindeer hair, the inner fibres of the bark (phloem fibres) of certain shrubs, and even feathers or dried leaves. Of these, only dried grass and elk hair will be considered here.

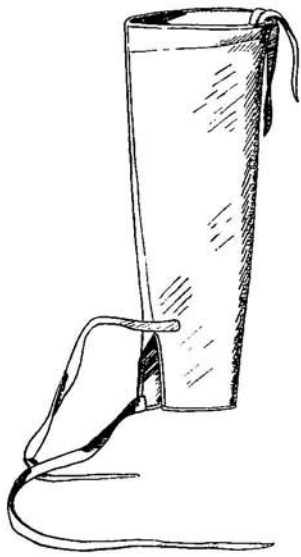

Fig. 21. Reindeer Tungus Aramus.

Fig. 22. Reindeer Tungus Ollohit.

"Sennegrass" (S.P.R.I.; 95).[1] The grass should be cut in August or September before it becomes affected by autumn frosts. After drying, it is generally beaten or combed before storage. It should be sorted into three grades for use in summer (coarse), autumn (medium) and winter (fine).

There is a widespread prejudice against the use of sennegrass among those who have never learnt how to pack it properly in footwear (a

[1] "Sennegrass" (Swedish: *skohö*, North Lappish: *gāmâ-suoi'dne*) is actually not a grass, but a sedge (*Carex vesicaria*) which has a wide distribution across Arctic Eurasia.

detailed description of this is filed at the S.P.R.I.). It certainly requires some practice before its full advantages are realised. When the footwear is removed, the sennegrass should be taken out and dried. It dries much faster than woollen socks.

Elk Hair (S.P.R.I.; 599). Certain primitive tribes (e.g. Chipewyan Indians and the Reindeer Tungus of Manchuria) use elk hair instead of dried grass. We have not used this ourselves, but we have examined a sample collected in Manchuria, and in some ways this seems to be more satisfactory than sennegrass, although it is more difficult to obtain. The hair, taken from below the throat of the elk, has a flat cross-section giving it the appearance of dried grass. It is very much softer than grass. We have experimented with the time taken to dry these two materials, and the sennegrass dried more quickly. Possibly this was due to oil in the elk hair. Sennegrass is better for packing evenly round the foot.

Duffles

There are three types of duffles, all of which originated in Arctic Canada; we propose to call them "short", "medium" and "long". Duffles are inner footwear used in combination with socks. The name is derived from the material, which is best white blanket cloth.[1] This material does not lose its shape readily, since it is coarse and heavy, and at the same time is warm, durable and easily dried.

Short Duffle (fig. 23; S.P.R.I., 11). This type is sometimes known as "duffle slipper" or "vamp" and is usually worn over two pairs of socks. The shape is excellent for footwear in which there is limited ankle room.

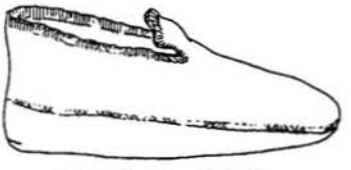

Fig. 23. Short Duffle.

It is essential that the seams should be simple overlaps, so ensuring flatness, and not of an edge-to-edge type. Excess thickness in these flat seams can be avoided by slightly shaving the pile before sewing. Fig. 24 shows the most convenient method of cutting the material.

Medium Duffle (fig. 25; S.P.R.I., 10). This is shaped like a moccasin, being provided with flaps which fold round the ankle. During the winter it is worn over the short duffle, but in the late spring and throughout the summer this type of duffle is too warm, and is really unnecessary.

[1] A very suitable fabric is obtainable from the Hudson's Bay Company.

The material is cut in the same way as described for the short duffle, but the tongue is larger, and the ankle piece with its flaps is cut separately.

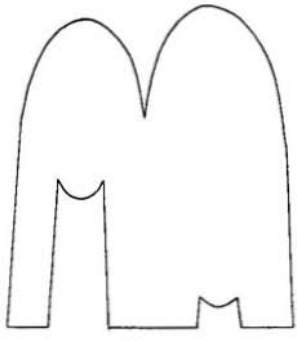

Fig. 24. Pattern for making Short Duffle.

Fig. 25. Medium Duffle.

Long Duffle (S.P.R.I., 48). This form of duffle is shaped like a mukluk, but may extend to just *above* the knee. It can be worn over a short duffle, with inner stockings of wool or skin. This type has a very limited distribution, and is too warm for most purposes.

ANTARCTIC REGIONS

Completed Expeditions

French Oceanographical Work in the Southern Ocean, 1939.

[From a preliminary report in the *Hydrographic Review*, XVI, No. 2, pp. 17–19.]

The sloop *Bougainville*, commanded by Commandant Fabre de la Ripelle, has completed a cruise of 8000 miles to the southward of Madagascar, in the Indian and Southern Oceans, between the meridians of Durban and the Islands of St Paul and Amsterdam. Leaving Diego-Suarez on January 11, 1939, the *Bougainville* first called at Durban, anchored at Marion and Crozet Islands, then steamed along the east and south coasts of the Kerguelen Islands, remained from February 7 to 19 on the east coast of this archipelago, and then anchored at Amsterdam and St Paul, after which a return was made to Diego-Suarez on March 12, with stops at the Reunion and Mauritius Islands.

The *Bougainville* made regular echo soundings. In great depths the method consisted in recording the detonation of a petard containing 135 g. of melinite, and noting the time of the return of the echo from the bottom with the aid of a simple apparatus mounted on board the sloop before its departure from Madagascar. This comprised a microphone, an amplifier, oscillographs and a Boultite recording apparatus.

The bathymetric soundings of the *Bougainville* confirm and complement in detail those which had been obtained previously in this region and which are shown in the third edition of Sheet A'IV of the *General Bathymetric Chart of the Oceans* published by the International Hydrographic Bureau, Monte-Carlo.

The Crozet Islands rest on a rather flat submarine shelf which extends, at an almost constant depth of 200 m., to a distance of nearly 40 miles from the coast. Soundings with the ultrasonic apparatus have now shown, along the edge of this plateau, a series of submarine rock pinnacles analogous to the Islands of the Apostles which emerge to the southward. These pinnacles rise abruptly from the bottom to 50 and 100 m. The insular shelf of the Kerguelen Islands is much more extended. To the north-west it slopes gently for 120 miles to the 500 m. isobath where the slope changes. To the north-east it runs in a very gentle slope for 80 miles to the 200 m. isobath which marks the steep edge of the shelf.

German Antarctic Expedition, 1938–39.

Some details of this expedition were given in *The Polar Record*, No. 18. Further information is now available from a summary published in the *Geographical Journal* for January 1940. The following is a translation of a Deutsches Nachrichter Büro report dated April 11, 1939, evidently by the captain of the *Schwabenland*.

"The German Antarctic Expedition, 1938–39, which left Hamburg on December 17, 1938, returned to Cuxhaven on Tuesday, April 11. The leader of the expedition was Captain Ritscher, and he was accompanied by a staff of scientists including an oceanographer, a biologist, a geophysicist, and a geographer. The ship, the well-known catapult ship *Schwabenland*, of the German Lufthansa, had been specifically chartered for the expedition, which was sponsored by the German Forschungsgemeinschaft of Berlin and was under the aegis of Field-Marshal Göring. Two 10 ton Dornier Wal flying-boats accompanied the expedition.

"The *Schwabenland* arrived in January in the area where it was to work, namely the sector on the zero meridian of the Antarctic Continent. 350,000 sq. km. of territory were photographed, and in all 600,000 sq. km. reconnoitred by eye observation and photography. Material was collected in the course of routine flights, totalling in all over 10,000 km., a distance corresponding to a quarter of the world's circumference. A further 2000 km. were covered in seven special flights.

"The territory reconnoitred forms a geologically self-contained section bounded on the East and West by an ice-plain rising fairly sharply in the direction of the Pole and merging south of 74° in the polar cap some 4000 m. high. Between 2° E. and 8–10° W. the polar cap falls away to the north in high steep rock precipices between 73½° and 74° S.

"The photographic map material acquired by the expedition is unique. When the photographic prints are assembled, a photographic map will be completed such as no other land possesses of this part of the Antarctic Continent.[1] This is exceptionally important in view of the Norwegian claim to sovereignty over the part of the territory explored by the expedition, based on the Norwegian Order of January 14, 1939, reserving all rights as against Germany.

"The special flights provided *inter alia* exact photographic pictures of a strip of land studded with open lakes at 71° 10′ S. and 11° 25′ E. The

[1] This claim can hardly be admitted until we see how the survey photographs are plotted without any ground control.—Ed.

special flights further enabled landings to be made at the edge of the shelf-ice and the Hakenkreuz flag to be hoisted at several points of the coast of the Antarctic Continent. During flights, at intervals of some 25 km. as also at all turning points, arrows with Hakenkreuz flags were dropped overboard.

"The flights during the first of three periods were carried out from the points 69° 10′ S., 4° 20′ W.; 68° 47′ S., 3° 47′ W.; and 68° 57′ S., 1° 5′ W.

"As a result of bad weather the *Schwabenland* on January 20 got into difficulties from which it only escaped through the piloting of one of the flying boats; in consequence it was decided to start work in the west and then to move over to the east, since ice conditions, it was hoped, would be better there. Accordingly flights during the second period were carried out from the points 69° 34′ S., 1° 17′ E.; 69° 47′ S., 6° 10′ E.; and 69° 34′ S., 7° 20′ E.

"A further change in weather conditions compelled the expedition at the end of January to move even farther east for the third period. In February 1939 a further flight was carried out from the point 69° 5′ S., 14° 45′ E. On this occasion the flying-boat flew along and photographed the edge of the shelf-ice to about 18½° E., and was able to follow it with the eye to far beyond 20° E. A further flight was carried out from the same point on February 5; this concluded activity in the air, since meteorological reports indicated further deterioration in weather conditions.

"On February 6 the expedition started homewards, since it was considered that, in view of the deterioration in the weather and ice conditions, further activity would be attended by unwarranted risk. Furthermore, it had been established that in the case of one of the flying-boats, at temperatures below minus 15°, the trimming gear no longer functioned. Otherwise the flying-boats functioned extremely well and carried out all requirements to schedule without incident.

"The most southerly point reached by the expedition was 72° 44′ S., and 0°. The most westerly point reached was 71° 23′ S., 4° 50′ W. The most easterly point reached was 72° 10′ S., 16° 30′ E. These points were marked by Hakenkreuz flags.

"The *Schwabenland* returned along the zero meridian, where oceanographic measurements were carried out. The expedition is considered to have been a great success and well worthy of Germany's great achievements in the past in Antarctic exploration. The scientific results of the expedition are also said to have been exceptionally good. The meteoro-

logists carried out all kinds of measurements. Of 119 radio soundings (*Radiosonderaufstiege*) which were carried out, thirty-six were within the South Polar Circle. Thirty-one of the soundings reached a depth of over 20,000 m.; only eleven were under 12,000 m., and the average was 18,000 m. The biologist is reported to have brought back, *inter alia*, five King and three Adélie penguins, of which no living examples have until now reached Germany."

An article in *Petermanns Mitteilungen* for June 1939 gives some further details. Captain Ritscher, the leader, was a survivor of the Schröder-Stranz Arctic Expedition of 1912–13. The *Schwabenland* was only three weeks in the Antarctic, and during these weeks there were only three flying periods of one, two and a half and three days, during which time the two machines flew 16,000 km. The most southerly point is given as 74° 25′ S., 0° 20′ W., and there is no mention of any landings.

The *Geographical Review* for January 1940 contains the following notes on another report published by the expedition. We have been unable to obtain a copy:

"Of special interest is a map of the area between 12° W. and 20° E. photographed from the air by the German Antarctic expedition of 1938–39 and called by them Neu-Schwabenland ("Ubersichtstafel von dem Arbeitsgebiet der Deutschen Antarktischen Expedition 1938–39: Neu-Schwabenland", 1 : 1,500,000, accompanying the report of the expedition published as a Supplement to the August, 1939, number of *Annalen der Hydrogr. und Marit. Meteorol.*).... Seven photographic flights were made, on which 11,000 pictures were taken. Nine exploratory flights were also made.... The territory observed from the air is estimated in the report at about 600,000 sq. km., and of this about 350,000 sq. km. was photographically mapped. The map compiled from the air photographs shows the edge of the shelf-ice between 14° W. and 20° E.... Isolated mountains and mountain groups are shown by detailed hachures, and some indication of their character is given by the use of descriptive names. A large number of altitudes of mountain crests and also of the surrounding ice-field are given. The report includes a general article by the commander on the work of the expedition and brief reports by the scientists.... The German map overlaps a considerable part of Riiser-Larsen's map of Crown Princess Martha Land, including what are evidently his Cape Norvegia and Seal Bay, though both are left unnamed."

The German Government is said to have "made the necessary reservations" in answer to the Norwegian claim (see *The Polar Record*, No. 18, pp. 169–73), apparently on the ground that "the basis for a valid international claim to unclaimed land is the will to occupation, that is to say, to settlement of the land and to continued exercise of government and sovereignty".

Press reports that the *Schwabenland* was torpedoed in the South Atlantic at the beginning of the war are without foundation. She reached Hamburg safely.

Expeditions in the Field

The United States Antarctic Service, 1939.

It was noted in the last number of *The Polar Record* that there would be a United States expedition to the Antarctic during 1939, the third under the leadership of Admiral R. E. Byrd. Since then, although no official report has been sent, information has been received from a number of sources, including *The Polar Times*, No. 9, notices in the Press, and personal letters from individual members of the expedition.

On June 30, 1939, the United States Congress appropriated $350,000, to be made available through the Division of Territories and Island Possessions of the Department of the Interior, for investigations in the Antarctic (*Expedition to the Antarctic Regions: Hearing before the . . . House of Representatives*, 76th Congr. 1st Sess., on H. J. Res. 310, Washington, 1939); and President Roosevelt created a United States Antarctic Service, with an Executive Committee whose duties were to organise, direct and coordinate its activities, consisting of representatives of the Navy Department, the Coast Guard, the Department of State, and the Department of the Interior. Rear-Admiral Richard E. Byrd, who was designated as the commanding officer of the proposed expedition, was made an ex-officio member of this committee.

Admiral Byrd thus sails under the auspices of the United States Government, the first Antarctic explorer to do so since Lieut. Charles Wilkes, exactly a century ago. The aims of the expedition appear to be exploration, scientific investigation and the strengthening of any future claims of the United States on Antarctic territory.

The expedition has a personnel of about 125 men including the crews of the ships, and 160 dogs are being taken, many of them from previous expeditions. It appears possible that further Government appropriations may allow relief parties to carry on the work for two or three years. Admiral Byrd may not stay with the sixty men who are to remain in the Antarctic from January 1940 to May 1941, but after directing land operations will return to warmer waters.

As stated in *The Polar Record*, No. 18, the original plans were for three ships to be used; but owing to the international situation, the Coast Guard cutter *Northland* had to be withdrawn from the expedition. Of the other ships, the *North Star* left Boston on November 15, carrying on board the 27 ton diesel-engined "snow-cruiser", the *Penguin*, designed

by Dr Thomas Poulter at the Research Foundation of Armour Institute. An aeroplane will be carried on top of the snow-cruiser, which is reported to be 56 ft. long by 14 ft. wide, and able to travel over any surface at a maximum speed of 28 m.p.h., with a cruising range of 6250 miles. The interior is equipped with an engine-room, sleeping quarters for four men, photographic and scientific laboratories, a chart room, radio transmitter and receiver, and storage for food and fuel for a party of four men for a year. The wheels, 10 ft. in diameter, are each equipped with hydraulic control so that they can be raised. A crevasse not more than 15 ft. in width can thus be crossed. Four planes and two light army tanks will be taken by the expedition.

The second ship, the *Bear*, left Boston on November 22. It was reported that the *North Star* arrived at Wellington, New Zealand, on December 27, where she would refuel and call at Dunedin and then start for the Bay of Whales, where she would meet the *Bear*.

The main activities of the expedition will be concentrated on the area between long. 150° and 80° W. As Little America lies to the west of this area, it may be decided to set up the "Western Base" farther to the eastward, either by landing at the Bay of Whales and hauling equipment, or by attempting a landing farther east as was done by the Japanese Expedition, 1911–12. A second or "Eastern Base" will be established west of Graham Land, and it is reported in *The Polar Times* that this may be in the vicinity of Alexander I Land. There may be additional bases. After unloading the second party, the ships will return north.

Dr Paul A. Siple will be in charge of the "Western Base", with about thirty men, and Richard B. Black of the "Eastern Base", with about twenty-six men.

Details of equipment are not yet known, but a few notes are interesting. The base houses have been specially designed by United States Army engineers. They are made of wooden panels filled with a 4 in. thickness of insulating material, and double floors, between which warm air from the galley will circulate, constantly heating the entire building, from the ground up. A new type of pemmican is being taken with a greater proportion of fat than usual.

Scientific work will be carried out. Research will be made on the upper atmosphere and on cosmic rays. Meterological stations will be established. Dr Siple will continue his work on the determination of the effects of sustained low temperatures on the human body. Professor Wade will be in charge of detailed glaciological investigations, and

instruments have been supplied by the National Bureau of Standards. It is proposed to instal a seismograph, if possible on a rock foundation, probably at a sub-base. It is hoped that this will help in determining epicentres in the southern hemisphere and on the Antarctic continent in particular, the seismic history of which is little known. It is hoped to use a magnetograph in a place where observations will contribute to the determination of the South Auroral Zone, an important problem in geomagnetics. Auroral photography will also be carried out.

The following list of the personnel of the two stations was published in *The Polar Times*, No. 9 (November 1939):

The thirty-two going to the West Base: Dr Paul A. Siple, leader of the base and geographer; L. A. Warner, geologist; J. W. Perkins, biologist; E. Lockhart, physiologist; R. Fitzimmons, physicist; M. Weiner, assistant physicist and dog-driver; Roger Hawthorne, recorder; R. C. Frazier, medical officer; L. M. Berlin, surveyor; J. C. McCoy, airplane pilot; Arthur Carroll, photographer; W. R. Giles, assistant pilot and radioman; O. Gray, airplane mechanic; Clay Bailey, radio; J. S. Reece, radio; J. Bursey, R. S. Moulton, M. C. Douglass, dog-drivers; C. F. Passel, dog-driver and assistant geologist; R. A. Butler, dog-driver and geographer; V. D. Boyd, master mechanic; R. O'Connor, carpenter; L. Colombo, supply man; I. Schlossbach, navigator; H. Gilmour, recorder; S. Gutenko, cook; Asman Adam, tank driver; M. J. Lobell, L. Musselman and Malcolm Davis, biologists; K. Helm, photographer; E. T. Clarke, physicist.

The twenty-nine who will go to the East Base: Richard Blackburn Black, field representative of the U.S. Department of the Interior in charge of the East Base; P. H. Knowles, geologist; L. S. Sims, medical officer; J. G. Dyer, surveyor; Charles Shirley, photographer; E. B. Pierce, assistant pilot and radioman; E. L. Lampleigh, radio communication; W. Pullen, airplane mechanic; H. T. Odum, radio operator; Finn Ronne, engineer; H. F. Richardson, J. Healey and Curtis Leland, dog-drivers; D. C. Hilton, dog-driver and assistant surveyor; C. Sharbonneau, carpenter; A. Morency, tank driver; A. C. Hill, cook; R. Palmer, supply man; Herwil M. Bryant, biologist; Herbert Dorsey, meteorologist; C. Ecklund, biologist; C. Steele, tank driver; H. H. Richardson, dog-driver; Z. Collier, mechanic; F. A. Wade, Ferranto, Dr Thomas C. Poulter and Petro, snow cruiser; F. G. Dustin, fuel engineer.

According to *The New York Times* for November 11, 1939, the State Department issued on November 10 a statement of policy applicable to the findings of the expedition. It states that settlement of polar regions, and not merely discovery, is necessary for claims to sovereignty. This policy was laid down in 1924 by Mr Hughes, Secretary of State, and has not been altered.

In 1924 the question was raised in private quarters whether the State Department of the United States would not declare Wilkes Land to be American. Mr Hughes answered, among other things, that "It is the opinion of this Department that the discovery of lands unknown to civilisation, even when coupled with a formal taking of possession, does not support a valid claim of sovereignty, unless the discovery is followed

by an actual settlement of the discovered country" (Miller, *Problems of Polar Research*, 1928, pp. 249–50). It is to be noted that up to the present time the United States Government has not recognised any claims made in the Antarctic either by its own citizens or by foreign governments. It has, however, in its communications with foreign governments, reserved all rights that it or its citizens may have in the Antarctic.

Norwegian Scientific Work in the Antarctic, 1939–40.

[From a note in *Norsk Hvalfangst-tidende*, 1939, Nr. 11.]

Following a recommendation adopted by the International Whaling Conference (see p. 283), biological investigations on whales are being carried out in Norwegian factory ships this season. Ten men have been engaged as assistant controllers, of whom five were zoological and five medical students. These men, together with five deputies, attended a course consisting in part of lectures and instruction in scientific work at the State Institute for Whale Research, and in part of instruction in control service at the Whaling Office of the Department of Commerce. The course was concluded by a visit to Brødrene Sæbjørnsen's whaling station at Steinshamn. It is proposed that these assistant controllers shall examine the ovaries of all the female whales which are treated during their watches, that they shall determine whether the whales are physically mature, and that they shall collect and preserve all the small foetuses they come across.

This scientific work is intended to be a continuation of the researches begun many years ago by the Discovery Committee, and which Germans have since taken up. It is the more important that this action should have been taken by Norway just now, as the Discovery Committee has finished its investigations in the south, and the Germans will be interrupted in their work by the war. Besides these duties, all the assistant controllers have been allotted special tasks such as the collection of certain types of ovaries, glands, brains, etc.

British Scientific Work in the Antarctic, 1939–40.

[From Dr N. A. Mackintosh.]

In normal times the majority of whaling inspectors who sail with factory ships are retired naval officers, but for the 1939–40 season three of them are biologists: Mr J. W. S. Marr and Dr F. D. Ommaney, both seconded from the *Discovery* staff, and Mr P. R. Crimp. So far as their

other duties permit, these inspectors are carrying out a programme of research on whales, in many respects on the same lines as previous work by members of the Discovery Committee's staff. One of the principal objects of their work will be to develop methods of determining the ages of whales by examining the copora lutea of the ovaries and epiphyses of the vertebrae. Various other routine observations will be made, and it is hoped to carry out some more whale marking if circumstances permit.

THE WORK OF THE DISCOVERY COMMITTEE

[From Dr N. A. Mackintosh.]

It is of course impracticable for the Discovery Committee to continue any further work at present with the *Discovery II* and *William Scoresby*, but although part of the scientific staff is now seconded to various forms of National Service, it has fortunately been found possible for those remaining to continue the scientific work in this country. While the ships were at work, the data and collections inevitably accumulated more quickly than they could be analysed and reported upon in full. There is, therefore, a very large body of material which would in any case require some years to be adequately dealt with. In the meantime the Committee's organisation is being kept intact, and it is expected that publication of the *Discovery Reports* will continue. Log books and other original records were removed from London at the outbreak of war and placed in safety in the cellars of the Scott Polar Research Institute.

RECENT ANTARCTIC EXPLORATION BETWEEN LONG. 20° W. AND 110° E.

During the last ten years there has been great activity in the sector of the Antarctic which lies south of the Indian Ocean. The work of various expeditions has sometimes been simultaneous, and owing to the fact that the areas visited have overlapped, more than one set of names have been published for the same features. An important advance towards the sorting out of the resulting confusion has been made by the Royal Geographical Society's new map entitled "The Course of Antarctic Exploration between Longitudes 20° W. and 110° E." (*Geographical Journal*, XCIV, No. 3, 1939, text pp. 204–8).

In this map, the first attempt has been made to show the results of all the expeditions on a single sheet. Different colours are used to show the authority for the first reasonable delineation of each part of the coast, the points at which landings have been made, and the names which have been proposed for different features or areas. References are given to the dates of discoveries and to the places in which the first publication of this information was found.

Where the present outline of the coast is due essentially to the work of Consul Lars Christensen's expeditions, it is shown in red, and the names given by him and his officers are also in red. The names assigned by Sir Douglas Mawson to the same section of the coast are shown in black, and the work of other expeditions is in green.

The photographic surveys made by the officers of Consul Lars Christensen's ship have provided an immense amount of information which is being gradually plotted by arrangement with Norges Geografiske Opmåling. In due course we shall have very detailed plans of the coast, but since there is hardly any ground control it is not possible to place these results accurately upon the map. Apparently only one astronomical position has been determined ashore, by Sir Douglas Mawson, at Scullin Monolith on the mainland.

The following chronological list of landings on or near the mainland has been compiled at the Royal Geographical Society:

1912 Feb. 21.	Wild. Queen Mary Land: ice-shelf, until February 22, 1913.
1929 Dec. 22.	Riiser-Larsen and Lützow-Holm. Enderby Land: on skerries, from plane.
1930 Jan. 13.	Mawson. Proclamation Is.
1931 Feb. 13 or 14.	Klarius Mikkelsen. Thorshavn Bay: two landings on mainland.

1931 Feb. 13.	Mawson: Scullin Monolith: mainland.
1931 Feb. 13.	Mawson. Murray Monolith: mainland.
1931 Feb. 18.	Mawson. Cape Bruce: two landings, one on mainland.
1933 Mar. 5	Riiser-Larsen. Prinsesse Ragnhild Land: ice-shelf.
1935 Feb. 20.	Klarius Mikkelsen. Ingrid Christensen Land: mainland.
1936 Feb. 26.	Rayner (RRS *William Scoresby*). Scullin Monolith: mainland.
1936 Feb. 27.	Rayner (RRS *William Scoresby*). William Scoresby Bay, Bertha Is.
1937 Jan. 30.	Lars Christensen. Scullin Monolith.
1939 Jan. 3–11.	Lincoln Ellsworth 1938–39 Expedition. Jan. 3: Svenner Ids. in long. 76° 30′ E. Jan. 6: Rauer Ids. Jan. 9; landing on what appeared to be mainland in long. 77° E. Jan. 11: landing on bay ice in 68° 30′ S., 79° E.

NAMES IN THE AUSTRALIAN ANTARCTIC TERRITORY

The Commonwealth Government has assigned the following limits in longitude to the "Lands" in the Australian Antarctic Territory: Enderby Land, 45°–55° E.; Kemp Land, 55°–60° E.; Mac-Robertson Land, 60°–73° E.; Princess Elizabeth Land, 73°–86° E.; Kaiser Wilhelm II Land, 86°–91° E.; Queen Mary Land, 91°–102° E.; and Wilkes Land, 102°–136° E.

NOTE ON ANTARCTIC HISTORY

To the student of Antarctic history the details of its discovery, and of the early voyages along its shores, are matters of great interest and are now coming under critical review. The area over which there is most difference of opinion is that part of Antarctica which projects as a great peninsula, Graham Land, to the south of South America. It is this sector which forms the subject of a recent memoir by Professor William Herbert Hobbs of Ann Arbor, Michigan, followed by a detailed review of that work by A. R. H. Professor Hobbs's memoir is entitled "The Discoveries of Antarctica within the American Sector as revealed by Maps and Documents" (*Trans. Amer. Phil. Soc. Philadelphia*, New Series, XXXI, 1939, pp. 1–71), while A. R. H.'s review appears under the heading "On Some Misrepresentations of Antarctic History" (*Geographical Journal*, XCIV, 1939, pp. 309–30). For complete understanding of the disputed facts concentrated effort is required in the reading of both authors. That A. R. H. in his review should find it necessary to state that the author of the memoir "denounces as forgeries what are most evidently genuine documents, with no further proof than his own falsification of the photograph he obtained from Cornwall House", shows the need for the student of Antarctic history not to limit his reading to one only of the two writers.

G. C. L. B.

GOUGH ISLAND

According to a note by Allan Crawford (*Geographical Journal*, XCIV, p. 412) H.M.S. *Milford* called at Gough Island in the Southern Ocean at the end of March 1938. Following instructions from the Colonial Office, the captain landed with a party to hoist the Union Jack and declare this island a dependency of St Helena. Discovered in the sixteenth century by the Portuguese, and named by them Diego Alvarez, it seems to have been lost sight of until, in 1731, Captain Gough, homeward bound in his ship *Richmond* round the Cape of Good Hope, sighted an island in the South Atlantic, which henceforth went by his name. It was only slowly that geographers came to the conclusion that Diego Alvarez and Gough were one and the same island, and then the former name gradually disappeared from charts. Gough Island has been claimed as British territory since Captain Gough reported it.

FRANK WILD

Frank Wild's death must have been the first thought of Antarctic men meeting each other this winter. Apart from the leaders, no other Antarctic figure has so impressed himself on so many of the rank and file as Wild; for he had been a member of no less than five great expeditions, second in command on the later ones, but on all, whether in high position or not, acting as the guide and instructor to those new to Antarctic work.

Wild's father had been a schoolmaster in Yorkshire, and his mother was, I think, a collateral descendant of Captain Cook. He was born in 1874 and his first sea experience was in the merchant service. His chance came when he transferred to the Royal Navy as a rating, and as an A.B. joined Scott's first expedition on the *Discovery* in 1901. Wild was not on the main southern journey, but from the start he made his mark, and Scott wrote after Vince's death: "It was not until I had selected Wild, as obviously the most cool and collected of the party, and called him aside, that I was able to get an idea of what had happened." These firm words give a vivid picture of Scott and Wild together, and the whole incident sounds very typical of these two men.

Later Wild was a member of Armitage's party on a September depot journey to the west, and took part in the long journey when Armitage reached the Plateau.

I find no record of Shackleton and Wild having been associated together on sledge journeys in *Discovery* days. Shackleton, however, must certainly have known his man, and he picked Wild as a sledge expert when he took him on his own expedition south in the *Nimrod* in 1907. Wild was in his prime, and was on the main journey, the greatest of all sledge journeys—rivalled perhaps only by Scott's supreme effort with Evans and Lashley—when Shackleton, Adams, Marshall and Wild broke the farthest south record by some 360 miles. This was the biggest single advance that has ever been made towards either Pole, and moreover included the discovery of the immense Beardmore Glacier and a long stretch over the Plateau, then shown to reach to the South Pole, less than 100 miles beyond. This was Wild's greatest feat, and his work there formed an unbreakable bond between him and his leader. Shackleton's action, too, had cemented the bond, for one day he gave part of his ration to Wild, as Wild records in his diary; they were almost in, and Wild knew that such a sacrifice would have been beyond his own powers.

On Mawson's expedition, Wild took command of an independent unit at a base in Queen Mary Land, making numerous sledge journeys, discovering the Denman Glacier, and revisiting Gaussberg. Then came the *Endurance* expedition to the Weddell Sea in 1914, with Wild as second in command. This was Wild's first experience with dogs, and he was the best of the dog-drivers, achieving success without the whip but by sheer personality. Wild steered the *James Caird* in the open-boat journey to Elephant Island. He would have been first choice for the long boat journey to South Georgia, but instead it fell to him to remain on Elephant Island, for Shackleton had picked his man as certain to hold together a weakened party on shortened rations.

On returning to this country in 1916, Wild took a commission in the Navy, and acted as transport officer on the North Russian front. In 1918–19 he wintered in Spitsbergen. Soon afterwards in 1920 he went on a farming adventure to Nyasaland, but returned to join Shackleton on the *Quest* in 1921. After the leader's death in South Georgia Wild took command and explored towards what is now called Queen Maud Land.

This was the end of Wild's exploring days. He had been awarded the Patron's medal of the Royal Geographical Society, and was by now nearly fifty years of age. He returned to Africa in 1922, this time to Swaziland, but farming was not his real calling, and he moved to Johannesburg where he died last August.

His friends have often wished in these later years to have had him with them again, but his preference was to stay in Africa. I doubt if Wild ever was the same after Shackleton's death. His great days were on the polar journey, and in the escape from the Weddell Sea ice. No one was more liked and loved, and his attraction, apart from his feats, lay partly in his simple and confiding nature, but also in his being the complete confidence-giving companion without fear.

J. M. W.

ANTARCTIC WHALING, 1938–39

[These notes are summarised chiefly from reports in *Norsk Hvalfangst-tidende*, 1939, Nr. 7, to 1939, Nr. 12.]

The most striking feature of the pelagic operations in the season 1938–39 was the great decline in the catch in spite of the employment of three factory ships and twenty-six catchers more than in the previous season.

In spite of the greater catching power, the number of Blue whales fell from 14,826 in 1937–38 to 13,828 in 1938–39, a decline of 6·7 per cent. The catch of Fin whales declined still more: from 26,475 to 19,480, or about 26·4 per cent. On the other hand, the catch of Sperm whales increased by about 200 per cent: from 824 in 1937–38 to 2474 in 1938–39. This great increase is presumably due to the smaller supply of Blue and Fin whales available and to the total protection afforded to Humpbacks by all expeditions which operated in accordance with the International Agreement.

It may perhaps be comparable with the great increase in the catch of Fin whales in the preceding seasons which appears to have resulted from the heavy destruction of the stocks of Blue whales. The Japanese expeditions hunted Humpbacks up to the beginning of February and caught altogether 860 animals. Only the Japanese operated without any restriction.

At the land station on South Georgia, the oil production rose from 90,266 barrels in 1937–38 to 111,291 barrels in 1938–39. The catch of Blue whales rose from 97 to 232, but that of Fin whales fell from 1552 to 1307, and of Sei whales from 155 to 117. If the catch in these two seasons be converted to calculated whales, the total reduction in the catch of Baleen whales off South Georgia in 1938–39 is 9·8 Blue whales less than in 1937–38. Despite this fact, the actual production of whale oil shows a considerable rise due to the fact that the output per calculated Blue whale rose by 21·6 barrels. This increase of output in 1938–39 is remarkable and must be considered in conjunction with the reports which have been received about the whaling conditions; these indicate that last season there was a considerable amassing of ice far north, and it is known that the fattest whales are usually found nearest to the ice-edge.

The continued decrease in the average size of captured Blue and Fin whales of both sexes is certain to increase the anxiety of those interested in the conservation of the stock of whales.

Whaling is to carry on as usual in the Antarctic this year. There is a general expectation of a repetition of the last war's boom, when the price of whale oil No. 1 rose from £23 to £90 a ton. Prices have already risen considerably since September. No German ships are operating this season. Germany started pelagic whaling in the Antarctic in 1936–37, and during the 1937–38 season her share increased from 1·8 to 10·7 per cent of all whales killed, and from 1·9 to 10·2 per cent of the total output of oil.[1] Japan has increased her Antarctic whaling fleet this season to six factory ships and fifty-one catchers.

Japan is now developing her industry in whale meat. The *Kosei Maru*, 8233 ton "floating refrigerator" of the Japan Marine Products Co., left Osaka in November on her first voyage to the Antarctic whaling grounds. The *Kosei Maru* is equipped with refrigerators having a capacity of about 7000 tons of frozen meat. It is understood that she expects to bring back about 3000 tons of salted whale meat, skins, etc., as well as more than 3000 tons of frozen meat. The meat is to be cut into small pieces and then wrapped in grease-proof papers by special packing machines which have been installed on board. It will then be ready for sale in department stores in Japan.

At the International Whaling Conference held in London from July 17 to 20, 1939, a recommendation was adopted that two controlling officers should be appointed for each factory ship and that one of these should, if possible, have had a biological training.

BRIAN ROBERTS

[1] Figures from *International Whaling Statistics.*

THE USE OF AIRCRAFT FOR RECONNAISSANCE SURVEYS

The technique of landing a party in the centre of a totally unmapped area and working from an aeroplane-stocked base has been developed largely by Bradford Washburn in Alaska. In the *Alpine Journal* for November 1939, p. 213, he makes some interesting remarks in this connection.

"Some may question the necessity of transporting almost 2000 lb. of supplies into the glacier for so short an expedition. The answer to this inevitable query is the result of a good many years' experience in Alaskan mountaineering from airplane-stocked bases: a party proceeding into unknown country afoot, or with a pack-train, invariably leaves caches or supply depots as it advances, which will prove invaluable sources of food and fuel on the return journey. This type of party is also familiar with every detail of the route back to civilisation, so that it can make a rapid unerring retreat in case of any emergency. A party landed by airplane in the centre of a totally unmapped area has no depots lying between it and civilisation. In case changed landing field conditions or adverse weather render it impossible for the airplane to make its scheduled return to take the party home, the returning party knows but few details about the route out to civilisation on the ground.

"On each of the three expeditions of this sort which we have recently made to Alaska, it has been our policy to carry out a detailed study of the retreat to civilisation from the air, prior to making our first landing at our mountain base. On all three of these expeditions, our field party has been equipped with a set of aerial photographs showing as completely as possible the general topography of the line of retreat on foot. Each time we have also stocked our base with almost twice as much food as we actually deemed necessary for our climb, thus allowing a wide margin of safety in case any emergency should arise. On the Lucania expedition in 1937 these precautions were amply justified. On the Yukon expedition of 1935 and on the Mt St Agnes trip, the extra cost of this emergency equipment which was not used at all may be chalked off as a very valuable sort of life insurance. In sharp contrast to this system of planning, it is interesting to study the story of the tragic Mt McKinley expedition of 1932, on which all of the party were flown to the Muldrow Glacier, no aerial photographs were taken, and not a single member of the party was familiar in detail with the route back to civilisation afoot."

THE CO-ORDINATION OF POLAR RESEARCH

In *The Polar Record*, No. 8, pp. 152–66, an article was published on "Polar Institutions throughout the World". It is a pleasure to record the existence of two additional Institutes, one in Austria and the other in Japan.

The Nippon Polar Research Institute.

The Nippon Polar Research Institute, at Seto-Shi, Japan, was founded on December 25, 1933, to promote polar knowledge. The president is Lieut. Shirase, who was leader of the Japanese Antarctic Expedition, 1910–12. Mr Yoshimasa Kimura is secretary dealing with internal affairs, while foreign matters are in the hands of Mr Z. Taniguchi. As yet no official periodical is published.

Archiv für Polarforschung, Vienna.

On June 11, 1937, H. Tollner and F. Nusser founded a Department for Polar Research (*Archiv für Polarforschung*) in the Natural History Museum at Vienna. The founders realise the importance of collecting together the various memoirs and diaries of famous Austrian polar explorers, and the Archiv has this as its primary function. The discovery of Franz Josef Land by the *Tegetthoff* Expedition in 1873 is well known as one of the outstanding achievements of polar work, and it is pleasant to record this renewed Austrian activity in the Arctic. In 1938 the Archiv published the first number of its periodical *Jahresbericht des Archivs für Polarforschung im Naturhistorischen Museum in Wien*, edited by Kurt Wegener. This is 48 pages in length, and contains papers by Wegener, Nusser and Tollner on the results of scientific work in Spitsbergen in 1937.

We send our good wishes to these two Institutes and look forward to the time when it will be possible to establish full cooperation with them.

THE PRESERVATION OF THE *GJØA*

It is reported in *Polar-årboken* for 1939 that Roald Amundsen's ship used during the North-West Passage Expedition has been saved from destruction. The Town Council of San Francisco has granted $12,500 for its restoration at the Golden Gate. When the first part of this work is completed a house will be built over the ship, as has been done with the *Fram* at Oslo.

INTERNATIONAL POLAR CONFERENCE AND POLAR EXHIBITION, 1940

Docent Adolf Hoel has issued the following statement:

"In consequence of the state of war prevailing in Europe, the International Exhibition for Polar Exploration at Bergen, Norway, in 1940 has been temporally postponed. It therefore naturally follows that the Polar Exploration Conference planned in conjunction with the Exhibition will have to be deferred until such time as the plans can be realised."

TOXIN IN THE FLESH OF THE GREENLAND SHARK AND OTHER ARCTIC ANIMALS

The poisonous properties of shark meat have long been a subject of interest to travellers and dwellers in northern regions. In a short but important paper (*Medd. om Grønland.* Bd. 125, Nr. 5, 1939, pp. 1–16) Ove Bøje gives the results of an investigation at Upernavik. He summarises former knowledge of the subject derived from both European and native sources, and goes on to an account of his experiments on sledge-dogs. Similar in their effect to the flesh of the Greenland shark (*Somniosus microcephalus*), though to a lesser extent, are the meat of the "uvac" or Greenland cod (*Gadus ogac*) and the sea scorpion (*Cottus scorpius*), and sometimes, with weakly subjects, the flesh of the halibut (*Reinhardtius hippoglossides*). Similar, but apparently not the same, are the poisonous qualities of the liver of the polar bear, the bearded seal and the Greenland sledge-dog. The toxin in the shark meat apparently is inactivated, but not destroyed by the drying process to which the flesh is normally subjected before being given by the Eskimo to his dogs. Enzymes present in the fresh tissues of any animal can apparently re-activate the toxin in the shark flesh if the two types of meat be eaten together. A number of hypotheses are discussed, and there seems to be some evidence for believing that the toxin may be derived from the common food of these various fishes on the Greenland coast in the autumn. This consists of a pelagic mollusc (a Pterapod, *Limacina helicina*), and the "uvac" and even eider ducks sometimes themselves show symptoms of poisoning after feeding on this food. The author regrets that so far he has been unable to undertake detailed chemical analysis of the flesh of the species in question. Judging by symptoms he considers that the toxin is probably related chemically to muscarine (a fungal poison).

G. C. L. B.

REVIEWS

Modern Arctic Exploration, by GUNNAR SEIDENFADEN. Translated from Danish by NAOMI WALFORD and with an introduction by PETER FREUCHEN. London: Jonathan Cape, Ltd., 1939, pp. 189. 12*s.* 6*d.*

Arctic exploration has now reached a stage when a statement of its aims and an explanation of its methods are imperative. This book fulfils this demand. The author sets out to show the great advances which improvements in equipment and technique have made possible in Arctic exploration, and to point to the role which this work plays in the forward march of man towards a better understanding of the world in which he lives.

The first chapter, which is merely an introduction to the main theme of the book, traces the stages through which Arctic exploration has passed from the unrecorded efforts of early man to obtain a living in these inhospitable regions to the present-day activities and detailed scientific research by experts.

The next six chapters, in which the author discusses the work of the various branches of science, form the main substance of the book. First comes a chapter on the expedition as a whole. Transport, winter quarters, the invaluable assistance rendered by the aeroplane, and the inestimable importance of wireless both for maintaining communications between separate working parties of the expedition and for keeping the expedition in contact with the outside world are all discussed fully. Moreover, the need for meticulous planning before the expedition sets out and for co-ordination in the working out and publication of results after the return, is made abundantly clear.

Then follows a chapter on survey, mainly taken up with a description of stereo-plotting from oblique air photographs, a chapter on the work of the geologist and palaeontologist, a chapter on biology and one on marine research. Finally, the author gives an interesting account of the investigations with regard to the Eskimo, into their history and place of origin, into their betterment and enlightenment to-day. In all these chapters the latest technique is lucidly described, and the reader is not left in doubt as to the nature and value of the results obtained. In the next chapter are mentioned the most important of recent polar flights,

and in the conclusion the author looks to the future in which he envisages a remunerative development of the resources of the Arctic lands.

One of the things which strike one about the book is that the author can say in one sentence what many require a whole text-book to set forth. It is hardly a criticism to say that the book gives so much information that it is a pity it does not give more. Thus a word on the use of the plane table and the photo-theodolite for the survey of small areas on a large scale would have been welcome. A fuller account of the work of the Danish Administration in East Greenland would have been enlightening. Finally, some mention might have been made of the Arctic from a purely aesthetic point of view. The work of the artist and photographer is not unimportant.

The only general criticism that one can level against the book is that there is a tendency to make scientific work in the Arctic appear easier than it is. But this in no way detracts from the value of the book. Its *motif* is clear and admirable, the information which it gives sound and accurate, the exposition brief and lucid. It is well illustrated and written in a style which does credit to the translator. It should appeal to the scientist and the geographer as well as to those who are not directly interested in these subjects.

The book fills a wide gap in Arctic literature both in describing the present work in the Arctic regions and in pointing to the end to which this work tends. Throughout the whole the author conveys to the reader his own enthusiasm for and excitement in this work, and we are made to realise that the modern scientific worker in the Arctic is animated as much by that high spirit of adventure as were the early explorers and pioneers in these regions. L. H. M.

Polar Exploration, by ANDREW CROFT. London: A. and C. Black, 1939, pp. x+268. 7*s*. 6*d*.

This book is one of the "Epics of the XX Century" series, and as such it "aims at showing that the Elizabethan spirit lives to-day, and that the present century has produced endeavours, which in daring, excitement and interest are unsurpassed in the history of the human race". In addition the author has aimed at describing all the more prominent expeditions of this country, and in doing so has striven to give a "true and impartial" account, with due consideration to the results of chance and modesty.

The author deserves sympathy in such a task. It is obviously too great a field to deal with satisfactorily in 250 pages, 40 of which are historical. What he has done is done well and the book is a clever précis of twentieth-century polar exploration, in which the new and outstanding features of each expedition are stressed and unnecessary repetition eliminated. As a record, therefore, apart from some minor errors, it is complete and the only book of its kind, embracing both Arctic and Antarctic exploration from 1900 to 1937. There is little popular appeal, however, in such a compilation if treated purely as a record.

As a book of adventure, the Arctic suffers in comparison with the Antarctic. A list of exciting incidents does not provide adventurous reading. For this there must be a descriptive atmosphere as well, and the author could not afford the space for this in the Arctic section. The Antarctic portion of the book is not so crowded with small important expeditions, and more space has been given to the descriptive side, making the latter half of the book the more appealing.

As a record the book is valuable in that the author, who is an experienced modern explorer, has described critically the main achievements and advances of explorations. It is refreshing to see Amundsen and Peary taking their due proportion of praise, although a little more might have been said about the Peary controversy.

The book is sparsely, but well illustrated, chiefly with some of the author's very fine selection of photographs, and the maps are neat and clear. It is unfortunate, however, that Alexander I Land is not only referred to in the text, but also mapped, as being part of the Antarctic Continent.

The reader must decide for himself as to the value of such a book, but the author is to be congratulated on accomplishing a difficult task.

A. S.

RECENT POLAR LITERATURE

This bi-annual list of recently published literature aims to supplement the notes on the plans and work of the various expeditions. It makes no claim to completeness. Readers will greatly assist the Editor by sending copies of their publications and by notifying us of such references.

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