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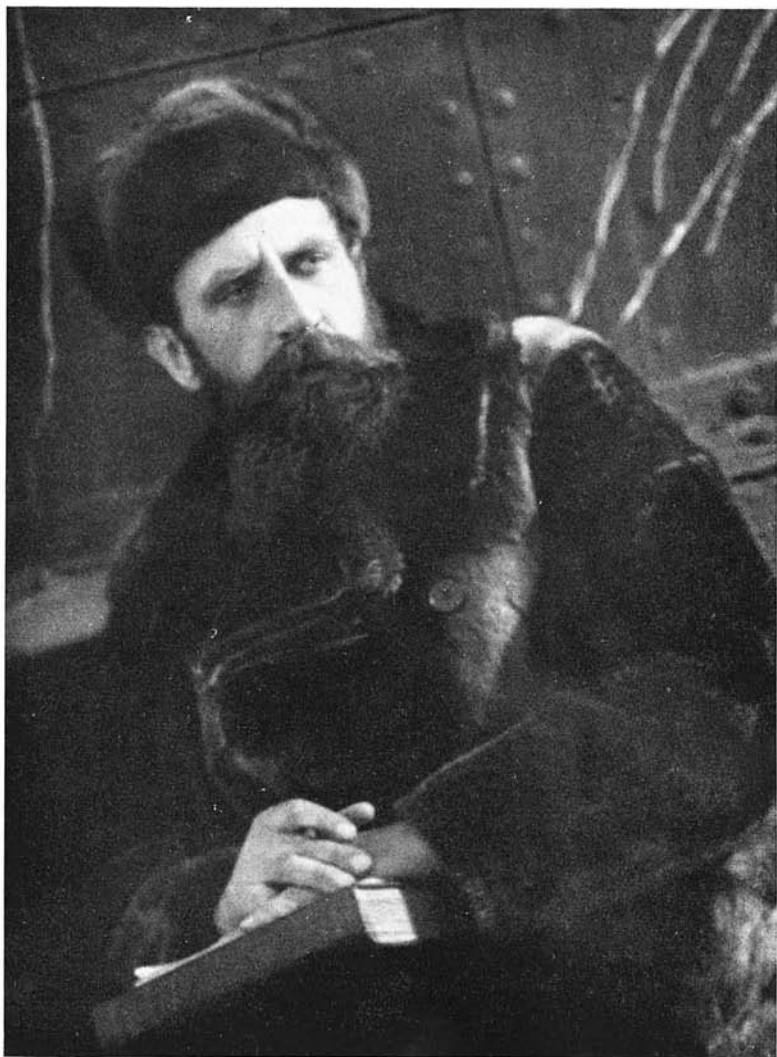
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PROFESSOR OTTO SCHMIDT

Director, General Administration of the Northern Sea
Route, Moscow, U.S.S.R.

FOREWORD

In accordance with our usual procedure we print in this issue the annual report of the Committee of Management of the Institute to the University, which to some extent takes the place of the Foreword.

An outstanding event, which was only brought to a happy conclusion after our last number had gone to press, was the magnificent flight of 2340 miles across a large sector of the Antarctic by Mr Lincoln Ellsworth, and his pilot, Mr Hollick-Kenyon. The flight was not only productive of topographic results, but sets a new standard for polar aviation, in that no less than 4 successful landings were made on the way, for the purpose of fixing position and avoiding bad weather. The only hitch throughout was the failure of their wireless equipment, which gave rise to considerable anxiety, and led to the race between R/R/S *Discovery II*, and Ellsworth's ship, the *Wyatt Earp*, to search for the missing airmen at the Bay of Whales. The former won by two days, as related elsewhere in this issue.

Mr Ellsworth has been awarded the Hubbard Medal of the National Geographic Society, presented to him by President Roosevelt; and the medal of the Explorers' Club of New York.

The steady work of the Soviet Union in the scientific exploration of their Arctic Seas has recently been clouded by a tragedy whereby at least 11 members of an expedition have died, as a result of being caught in a storm in an open boat in the Barents Sea. Details are not yet available, but it is feared that a vessel which set out to rescue the party is itself missing.

The frontispiece of this issue is a portrait of Dr Schmidt, who is probably most familiar to our readers as the leader of the *Chelyuskin* Expedition, the survivors of which were gallantly rescued by Soviet airmen in 1934.

The many friends of the late Mr H. G. Watkins will note with pleasure the announcement in the annual report of the anonymous gift to the Institute of a bronze plaque of him, modelled by Mr Cecil Thomas, and now hung in the main hall of the Museum.

ARCTIC REGIONS
SVALBARD, FRANZ JOSEF LAND AND RUSSIAN
ARCTIC REGIONS

COMPLETED EXPEDITIONS

Soviet Union Expeditions: 1934-35.

The ice-breaker *Malyguin* left Archangel on July 6, 1935, to investigate the shipping route from Cape Zhelaniya, the most northerly point of Novaya Zemlya, to Vilkitsky Strait; and from Dickson Island to Vilkitsky Strait. The work was begun off Cape Zhelaniya, whence a section was made to Einsamkeit (Lonely) Island, and two further sections in a blank space on the map to the east. The ship then set a course for Issachenko Island, and on the way discovered a new group of islands, which were surveyed and astronomically fixed. A section was next made to the Scott Hansen Islands, after which the *Malyguin* proceeded to Dickson Island for coal, arriving there on August 6. It had been hoped that Cape Gamarnik, Severnaya Zemlya, might be reached, but this was prevented by unfavourable ice-conditions, and the expedition turned south to Kirnov Island instead. Russian Island, which was next visited, was found to be farther north than it is marked on the charts, and the expedition, having verified the position, explored the triangle between Cape Neupokoev, Voronin Island and Russian Island, a little known region of the Kara Sea. Voronin Island was found to be situated some way north of the position assigned to it on the map. From Russian Island, on the completion of the work in this region, the ice-breaker set a course for the Brusevitz Islands, which, however, could not be found; and then on reaching Minin Fjord, Laptev Land, two oceanographical stations were worked, each of 24 hours' duration. A second call was then made at Dickson Island, the expedition leaving there on October 2 for the Arctic Institute Islands, making a section, and taking soundings on the way. On October 5 a section was begun to Cape Zhelaniya, which was reached on October 7, though, owing to a severe storm, the last section was not completed. The same unfavourable conditions prevented the ice-breaker from reaching Russian Harbour, and obliged the expedition to put into Matochkin Shar for shelter. A visit was next made to the west coast of Novaya Zemlya, in order to leave provisions for a party wintering there, after which the ship made for Archangel, arriving there on October 28.

The results of the work carried out will be published in due course in the *Transactions* of the Arctic Institute.

The Arctic Institute reports satisfactory results from the fisheries on Novaya Zemlya during the year 1935: namely, 50,200 kg. of Novaya Zemlya char; 68,300 kg. of cod; 16,008 codheads; and 189 kg. of cod liver oil. In 1931 the cod fisheries in Kostin Strait in the south-west of Novaya Zemlya were not considered satisfactory, and in 1934 five men were sent out by the Chief Administration of the Northern Sea Route to make investigations. Their catch amounted, in the course of a very short time, to 6 tons of cod, caught by lines. Following on this experiment, three fishing parties were sent out, in 1935, to the same region in motor yawls; and cod fishing in Matochkin Shar, Little Karmakul and Byelushya Bay gave fair results.

A biologist, A. G. Lepin, a member of the staff of the Arctic Institute, spent a year from August 29, 1934, to August 22, 1935, at the Polar Station in Matochkin Shar, making a study of the fauna for trading purposes. He reported that the Arctic fox was very rare during 1934-35, possibly owing to the scarcity of lemmings; and that the entire produce for the winter only amounted to 250 skins. About 40 polar bears were recorded in the district round the eastern entrance to the strait. Reindeer, as a result of the steps taken for their preservation, were, however, increasing. Bearded seal and walrus were very numerous. Some thousands of white whales passed along the eastern shores of Novaya Zemlya from south to north between October 21 and October 29. Mr Lepin also made a collection of 45 flowering plants, 90 species of mosses and lichens, and 50 species of insects.

A systematic survey of the Barents Sea is one of the most important tasks of the newly established "N. M. Knipovitch Institute", a branch of the Arctic Institute. In 1935, work to the west of the meridian of Kola Inlet was undertaken by scientists on board S/S *Persey*, and in the eastern region by the staff of S/S *N. Knipovitch*, and it will be continued during the summer of 1936 in the Barents Sea, north of Lat. 73° 30' N.

Wreckage, including parts of a writing desk and two bearing compasses, was recently raised from the bottom of the Barents Sea in Lat. 71° 55' N., Long. 45° 40' E., by the crew of the trawler *Spartak*. Papers found in the desk showed that it belonged to the Norwegian expedition ship *Fridtjof Nansen*, which was carrying out meteorological observations in the Barents Sea in 1933. The last entry in the ship's log was made on

September 6, 1933. It is known that the ship was then proceeding from Iceland to Norway, but no light is thrown on the fate of the vessel.

The ice-breaker *Krassin* was at work in the summer of 1935 in the little known part of the Chukchis Sea, and especially in the blank spaces east of Wrangel Island. The scientific staff included members of the State Hydrological Institute, the Arctic Institute, and the Hydrographical Department, led by D. S. Duplitsky. The ice-breaker left Vladivostok on June 27; and during the latter part of July and all August it was engaged in escorting vessels to the Kolyma River; carrying supplies to wireless stations on the coast of the Chukchis Peninsula, and relieving the wintering party at Wrangel Island. Thus the scientific programme was not started until September 1.

The Kara Sea fleet in 1935 consisted of 35 foreign and 10 Soviet ships, and the first convoy of trading vessels, escorted by the ice-breaker *Lenin*, entered the Kara Sea by way of Yugorski Shar on July 25. The last steamer bound for Igarka on the Yenisei passed through Yugorski Shar on the return journey on September 8. The return voyage, with cargoes of timber, was begun on August 19, and finished on October 10. Navigation was much facilitated by frequent air reconnaissance, and the weather throughout was favourable. From Yugorski Shar to White Island, the outward voyage was made in open water after which 60 miles of drift-ice gave place once more to open water before reaching Dickson Island.

All the ships on their way from the west put into Murmansk where they shipped Soviet coal for the entire trip. During the summer the exports were as follows: from Igarka, 39,511 standards of timber, on 30 foreign and 1 Soviet vessels; from Novy Port, 5366 standards by 5 foreign ships; from Igarka to Murmansk, 4725 on 9 Soviet ships. During the summer 17,175 tons of different technical cargoes were carried from Murmansk to Igarka, Dickson Island and Ust-Yenisei.

Dr E. Sorge's Expedition to Spitsbergen, 1935.

As announced briefly in *The Polar Record*, No. 11, Dr E. Sorge visited Spitsbergen during the summer of 1935. He landed at Longyear City with 5 companions, 2 of whom were women, and having reached the Nordenskjöld Glacier by motor boat, crossed to the highest point of the ice-cap (about 800 m.); and established headquarters about 10 km. to the east of Mount Terrier. The annual stratification of the ice-cap was studied in pits 4 m. deep. Later Dr Sorge, accompanied by Herr Oskar Luz, crossed western Spitsbergen from the base to the east of Mount

Svanberg, and followed down the course of the Negri Glacier to its face in Storfjord (Wiche Bay). They returned over the high ice to the south of the Negri Glacier, taking photographs and collecting samples of rock on the way. The two men used skis for the journey, which lasted about 8 days; and they travelled without sledges and without hot food; an experiment which proved successful, and showed that in this case, at any rate, cold food fully kept up the strength of the men.

On their return to the main base, Dr Sorge and Herr Luz rejoined the rest of the party, and they descended the Nordenskjöld Glacier to its face, proceeding later to inspect the face of the Von Post Glacier, in collapsible boats. The faces of both glaciers were surveyed, and the results compared with those of former expeditions to this region. It was found that while the front of the Nordenskjöld has not changed recently, the Von Post has advanced.

The expedition returned on board *S/S Lyngen* from Bock Bay.

Flights in the U.S.S.R. in 1936.

A flight was made from Moscow to Franz Josef Land by two Soviet airmen, M. V. Vodopianov and V. M. Makhotkin, in the early spring of 1936. The two men, each in a plane specially fitted for Arctic flying, left Moscow on March 29 at 10.45 a.m. and reached Archangel the same day at 5.43 p.m. The planes were equipped with skis, tents, sleeping bags, two rubber boats and provisions for 6 weeks, in case of a forced landing; and had wireless and radio bearing sets, with necessary spare parts. On March 30, after a call at Marian-Mare, the two men flew over the Barents Sea to Amderma, which was reached after a difficult flight through snow-storms, with a head wind. The bad weather continued, and forced the pilots to remain at Amderma until April 3, when they set off for Cape Zhelaniya; but were forced by a severe snow-storm to turn back. Pilot Vodopianov landed at the polar station on Vaigatch Island, while Pilot Makhotkin managed to reach Cape Bolvansky, 15 km. distant from the wireless station. They both returned to Amderma the next day. During the flight they had observed stretches of open water amidst the hummocky ice in the Kara Sea. The flight was resumed on April 6 at 9.30 a.m. and about 1.0 p.m. Vodopianov reached the aerodrome at Matochkin Shar, followed the next day by Makhotkin, who had been obliged to turn back to Varnek Bay on Vaigatch Island. Cape Zhelaniya was reached by both planes on April 9. In places fog was met with, and the flight was made at a height of 1000 m. At Cape Zhelaniya the pilots

were again delayed by bad weather until April 16, when they left for Calm Bay; but damage to one of the skis of Makhotkin's plane turned them back, and they made a second start later in the day. Makhotkin then found that his speedometer had sustained some damage, and he turned back for the second time, reaching Cape Zhelaniya three hours later. Vodopianov proceeded in a dense fog, taking his bearings from his direction finder, and 2 hours and 40 minutes later, having lost his course, landed on one of the eastern islands of the Franz Josef Land archipelago, which was afterwards identified as Graham Bell Island. Here he remained until April 21, when fine weather set in. He flew over Wilczek Island and Hall Island to Hooker Island, where he landed at Calm Bay safely 1 hour 15 minutes later. Meanwhile Makhotkin waited at Cape Zhelaniya until April 21 when he started at 1.50 p.m., and reached Calm Bay, after an uneventful flight, at 5.15 p.m.

This flight is a notable achievement, being the first time Franz Josef Land has been reached by plane.

On April 27, Vodopianov flew to the north of Franz Josef Land, and having reached Rudolf Island in 50 minutes proceeded northward for another hour, and turned back in Lat. 83° N. (approx.). On the return journey Vodopianov made a landing on Rudolf Island where he found that the glaciers on the eastward side of the island from Cape Fligely to Cape Habermann are, in his opinion, very suitable landing grounds for a plane. Neumayer Channel is also good. Between Rudolf Island and the 83rd parallel large ice-fields, with only small stretches of open water, were observed.

Several flights were made to Severnaya Zemlya from Cape Chelyuskin in February and March, 1936, for the purpose of organising hydrological work in the Schokalsky Strait, and to re-establish the meteorological station on Domashny Island, which has been closed since August 30, 1934.

Another flight was made at the end of March, 1936, from Moscow to Vaigatch Island; while a regular air service has been opened between Marian-Mare and the Shapkin Reindeer Farm in the Bolshezemelsky tundra.

Hunting and Trapping Conditions in Svalbard, 1935-36.

It is reported from Tromsø that, as has been the case for the past few seasons, the Norwegian sealers in the White Sea have had to combat extremely unfavourable conditions. The spring sealing in 1936 was

marked by the loss of several ships, and very few seals were caught. The Russians, who use ice-breakers for sealing, and can kill outside the regions allotted to the Norwegians, had a good season. In the western ice, round Jan Mayen, the sealing conditions were better than in the White Sea, but still far from favourable.

The trappers have also had a poor season; and prices are low. It is stated that there are too many trappers now working on the west and north coasts of Spitsbergen, where the supply of game is very limited; while foxes do not thrive on the east coast.

EXPEDITIONS IN THE FIELD

Soviet Union Permanent Research Stations, 1934-36.

Cape Chelyuskin. Three journeys were made by snow-tractors in the spring of 1936, to the Komsomolskaya Pravda Islands, and back to the station. The machines proved satisfactory, although often working on sea-ice in difficult conditions. Aeroplane flights of a total of 83 hours, as well as 17 meteorograph ascents, and 18 night flights have been made from the station since August, 1935.

Cape Zhelaniya, Novaya Zemlya. G. A. Kluge, the biologist who was sent to this station by the Arctic Institute in 1934, has now published a preliminary report of his work. He mentions a rich aquatic vegetation, and an equally rich bottom fauna. At Cape Pospelov, at the junction of the Barents and Kara Seas, the presence of both Atlantic and polar fauna is noted; and abundant plankton accounts for the prevalence of cod, white whale and other marine fauna, at different seasons, near the coast. Thirty-three different species of birds were noted in the district, while of land mammals, reindeer, lemming, arctic fox and polar bear were seen.

Cape Ugelen. On April 3, 1936, a reconnaissance flight over the rectangle, Ugelen—Serdze Kamen—and out to sea as far as the Diomedes Islands, to Cape Dezhnev, was made. The flight, which was made by Mr Volkov and Mr Bredis, lasted 4½ hours.

Cape Shelagski. A triangulation has been made of the coast between Cape Shelagski and Pevek in Chaun Bay.

Wrangel Island. Geological and survey work have been carried out at this station, including a survey of the littoral ridge between Rodgers Bay and Somnitelnyi Bay.

Soviet Union Hydrological Expeditions, 1935-36.

The hydrological section of the Arctic Institute carried out an investigation of the total inflow reaching the polar seas from the various rivers. To this end, seven hydrological expeditions were sent out in 1935 to the Lena, Khatanga, Anabar, Indigirka and Taimyr Rivers. The outward journeys of these were mentioned in brief in the last issue of *The Polar Record*, and their work, which will extend over two, and in some cases three years, will include the collection of meteorological data. Observations on the navigability of the rivers and a geographical study of the region are also included in the programme.

Oxford University Arctic Expedition, 1935-36.

An account of the activities of this expedition from its arrival in North East Land in the summer of 1935, up till November, 1935, was published in the last issue of *The Polar Record*, No. 11. The following report, which continues the narrative where it was left off, has been compiled from messages which have appeared from time to time in the press.

On October 19, 1935, Croft and Wright left the base at Brandy Bay, with two sledges, on a depot-laying journey in preparation for the main journey to the east coast of North East Land, planned for the spring of 1936. Unfortunately the work of establishing the ice-cap stations had taken longer than had been expected, with the result that Croft and Wright were obliged to make their trip at a time when sledging is usually over for the year. The sun had set finally for the winter on the day that they started, though fortunately the weather conditions continued favourable. After visiting the southern winter station, they crossed the valley which divides the North-East Land ice-cap into two parts, not without some difficulty. They were attempting to reach a small area of land reputed to exist near Cape Leigh Smith, which seemed the best location for the depot, as the rest of the east coast consists of ice-cliffs. Croft and Wright spent four days trying to negotiate the badly crevassed region which they found must be crossed before reaching this point; and finally, hampered by the darkness, which limited the travelling hours considerably, they decided to turn north and establish the depot on the land west of Cape Leigh Smith. The next two days were enlivened by two separate encounters with bears, on the second of which, as the men had no gun, the animal, which was barring the way, was put to flight by means of bluff, with an ice-axe wielded by Wright, while Croft kept back the dogs. The depot was then established, and the two men arrived back at the sledging base a week later. They were the first party to reach Cape

Leigh Smith by land; the most recent attempt, that made by the Norwegian-Swedish Expedition in 1931 having been frustrated by bad weather. Later, Croft, Keith, and Wright proceeded to the base hut to join Hamilton and Whatman for the rest of the winter.

During the winter, the ice-cap stations were manned by Godfrey and Moss at the southern winter station in the centre of the West Ice, and Dunlop-Mackenzie and Glen at the other, which was situated on the summit of the ice-cap overlooking the north coast at a height of 2200 ft. Full programmes of meteorological and other scientific work were carried out according to plan. Conditions at the stations were not as severe as had been anticipated, temperatures remained relatively high, and although one gale was experienced, during which the wind force reached 100 m.p.h., gales over 60 m.p.h. were rare. After Christmas the weather was colder, with frequent high winds.

The winter quarters are reported to have been comfortable and warm. The entrance to the central station was through a trap-door leading down a flight of steps to the main passage, 10 ft. below the snow surface, and 20 ft. long. Leading from the passage were two store rooms and a paraffin house. A second passage to the emergency exit gave access to an inclined shaft, which had been driven down nearly 40 ft. into the ice, and which enabled investigations into the ice-structure, some of which have already yielded good results, to be made. The arrangements at the northern station were simpler; and research was carried out in pits some distance away, and on glaciers flowing down to the north coast; the results of which seem to show that the ice-cap covering the north-west is gradually diminishing. The observations of the conditions of the sea-ice, made from the northern station, which commanded a view over the Seven Islands to the Polar Basin, show a prevalence of open water which must have extended sometimes as far as Lat. 82° N., until after the beginning of February, when the polar pack drifted down the north coast. The 4 ft. of drift snow which had covered the tents of both stations by mid-winter assured comfortable temperatures within. Work at the central station is being continued until the middle of June by Moss, who has been alone there since April, and who at that time had already spent 6 months on the ice-cap. The programme at the northern station was completed by February.

During the winter, Hamilton and Whatman continued their research on the ionosphere and atmospheric ozone; and the aurora was photographed whenever conditions permitted. Meteorological observations

were, of course, carried out regularly. The four months' darkness passed uneventfully, except for Croft's adventure on the ice-cap. During his stay at the northern station, he was knocked over by the wind, whilst taking meteorological observations, and was unable to find his way back to the station. He wandered about for 16 hours, until, after a short rest in a hole dug in the snow, he managed to locate the sledging base, steering by the wind.

In February, another depot-laying journey was made, this time to the south-west of North East Land; the party consisting of Croft, Godfrey and Keith. They carried, by way of an experiment, a light-weight mountain tent, which, unfortunately, was not a success. The three men spent the nights during the latter part of their trip sitting up, huddled round the stove, as the frozen state of their sleeping bags made them impossible.

At the beginning of March, Glen and Godfrey visited Plancius Bay on the north coast, and made a detailed study of some of the finest exposures of the Hecla Hook formations yet found in North East Land, which had been discovered by Wright during the summer of 1935. In the course of the return journey, further investigations were made in each of the other bays of the western half of the north coast, and at one point water was found draining from a glacier, when the air temperature was -16° F. Ice conditions off the north coast were also noted, and it was seen that the heavy pack lay north of a line between the Seven Islands and Cape Platen, inside of which was smooth bay ice. At the conclusion of this journey Glen and Whatman called at the central ice-cap station, and brought Croft back to the base, leaving Moss in charge.

The latest news from the expedition, which was dated April 6, stated that the main summer journeys had already begun. Dunlop-Mackenzie and Wright left on April 5 for their proposed survey journey round North East Land. They will use the three depots which have been laid at Cape Leigh Smith, at the Eton Glacier at the head of Wahlenberg Bay, and at the head of Palander Bay; which will enable them to remain three months in the field. The object of the journey is to complete the map of the north coast, and survey the east and south coasts of North East Land; in all, about 500 miles of coast. It is planned that Godfrey shall complete the survey, by working from Extreme Hook to Wahlenberg Bay, using the biological station in Murchison Bay as a base during the latter part of his survey.

Meanwhile, Croft and Glen will travel northwards over the pack-ice

into the Polar Basin and will make observations on the drift and physical conditions of the sea-ice, as well as investigating weather conditions for comparison with those recorded in Brandy Bay. Unfortunately the scope of this journey will be restricted by a shortage of dogs, owing to the loss during the winter of two-thirds of those available for transport.

Keith intends to spend the summer carrying out biological work, and a station for this purpose was established, after two sledge journeys, on Russian Island, in the south of Murchison Bay. The first birds to arrive, consisting of mandas, guillemots, ivory gulls and fulmar petrels, were to be found among the leads of open water, some distance outside the mouth of Brandy Bay, in the fine clear weather of mid-March.

Bengtson spent the winter and early spring hunting and trapping round Brandy Bay and Franklin Bay. The unusually ice-free season resulted in a scarcity of bears, and deposits of drift snow along the shore had a similar effect as regards the foxes. Seals and bears were hunted from a dinghy from the open water, whenever the weather permitted in the spring.

It is expected that the expedition will be picked up by the ship sometime between August 20 and September 1, and that it may be back in England by mid-September.

NOTE. In *The Polar Record*, No. 11, it was stated that Dr A. Ballantine was a member of the party. This is incorrect. Dr Ballantine being unable, after all, to join the expedition, Karl Bengtson, an experienced medical man, as well as a hunter, was appointed to the expedition in Norway.

Other Work in Spitsbergen.

Dr Hermann Ritter, who has been at Wijde Bay since the summer of 1933, making glaciological observations and trapping, is in good health.

PROJECTED EXPEDITIONS

Soviet Union Expeditions, 1936.

At a meeting of the workers of the Chief Administration of the Northern Sea Route on January 15, 1936, great stress was laid on the importance of the development of the Northern Sea Route, as the key to the economic advancement of the Soviet Arctic. The year 1935 was marked by the successful navigation of the North-East Passage in both directions by several vessels, and it is hoped that in 1936 twice the number of ships will make the double voyage. It is expected that the total cargo, exclusive of Spitsbergen coal, will reach 280,000 tons. The ice-breakers

Lenin, *Lütke*, *Yermak*, and *Krassin* will escort the ships; and it is estimated that over 25 cargo boats, apart from those engaged in the Kara Sea timber trade, will take part. Meanwhile, hydrographic and other scientific work will be carried out by the ice-breakers *Sadko*, *Malyguin* and *Sedov*; while the *Sibiriakov* and *Rusanov* will carry supplies to the various polar stations. A large number of sealers and hydrographic motor boats will also make use of the Northern Sea Route. A new item will be the transport of several thousand tons of rock salt from the newly discovered deposit at Nordvil, near the mouth of the River Khatanga, to the Far East.

The expeditions being sent out to the Arctic Ocean will work mainly in the east, in the vicinity of, and to the north of, the New Siberian Islands. It is hoped that the De Long Islands may be visited and a polar station established on one of them, and soundings and investigations will be made in the Laptev and Sannikov Straits. Scientists on board the ice-breaker *Sadko*, who will be assisted in their work by air-craft, hope to locate Sannikov Land, the existence of which is doubtful. Airmen hope to reach the unknown region between Long. 120° E. and Long. 160° E.

The work of the economic and cultural development of the northern parts of Asia is now much facilitated by the new transport routes. Besides the large rivers, Ob, Yenisei and Lena, ships have now begun to navigate the Pyasina and Khatanga; and in 1936 it is hoped that vessels will also operate on the Yana and Indigirka. The air routes along the Ob, Yenisei and Lena are open the whole year, and new routes are to be established along the Kolyma, along the whole coast-line of the Chukotsk Peninsula, and the Taimyr Peninsula; and from the Yenisei to the mouth of the Khatanga. The development of Arctic aviation has now made it possible to cover the whole of the Soviet Arctic in one flight.

The Arctic Institute is paying particular attention to geological work at present, and a geological map of the Soviet Arctic is under construction, and will be finished in the summer of 1936. The map, which is on a scale of 1 : 2,000,000, shows useful minerals and is accompanied by explanatory notes. It was compiled as a result of extensive field work carried out by members of the Arctic Institute. The summer of 1936 will see an even larger number than usual of geological expeditions in the field. Three expeditions which have been since 1935 at Ust-Pyasina, Ust-Kolymsk, and the Chukchis Peninsula, will finish their work: Mr N. A. Kulik, with 21 assistants, will spend 3 months in the Kara river basin; a party of 67 men will be at work for 8 months near the Northern Urals between

Lat. 64° 50' and Lat. 65° N.; 15 men, led by A. A. Petrenko, will go to Novaya Zemlya. There will be a seismological expedition to the Yenisei, and another, solely geological, to the Lena and Yenisei Rivers. Taimyr Peninsula, Chaun Bay, the Alazey plateau, the Yana River and the Cape Wankarem district of the Chukotsk Peninsula will provide other spheres for geological research.

Geodetic and cartographical work will be the task of parties in the Chukchis, Lena and Khatanga districts, and the Taimyr Peninsula.

The Arctic Institute bases comprise Polar Stations, fur factories, and cultural centres, and the latter serve the purpose of spreading cultural and economic influences over large areas, especially among the aboriginal population. The economic biological section of the Arctic Institute is, during the summer of 1936, making a special study of trapping, sealing and fishing from various bases along the Arctic coast, and in Novaya Zemlya.

Ice conditions during the summer of 1936 are expected to be unfavourable in the Greenland Sea; and in the north-western part of the Kara Sea, where the break-up will be late; and Severnaya Zemlya will be difficult of approach. Favourable conditions are forecasted for the seas round Spitsbergen and Franz Josef Land.

Norwegian Expeditions to Svalbard, 1936.

An expedition, sent out by the Norges Svalbard-og Ishavs-undersøkelser, left Alesund on board M/V *Polarbjörn* on June 25, planning to proceed to Spitsbergen via Tromsø; returning in September. The chief work to be undertaken will be an aerial survey of the islands, one of the seaplanes belonging to the Norwegian Navy having been lent for this purpose. Triangulation will be undertaken and echo soundings and ordinary soundings made from a motor boat. Two geological parties will also be at work.

Another party, led by the Svalbard mining inspector, will visit King Karl's Land and the east coast of Spitsbergen.

Norwegian Fisheries Expedition to Svalbard, 1936.

Captain Thor Iversen, of the Norwegian Fisheries Board, will spend three months at work on fishery investigations in the waters off the west and north coasts of Spitsbergen. He will leave Norway on board M/C *Huseland* at the beginning of July, 1936, and his work will include the collecting of biological and hydrographical material.

THE USE OF AERO-SLEDGES IN ARCTIC EXPLORATION

Following on the articles on motor transport in the Arctic which were published in *The Polar Record*, No. 11, this note on the use of aero-sledges in Siberia gives further proof of the increasing value of mechanical transport in the polar regions. The article reached us through the courtesy of Professor R. L. Samoilovitch, Director of the Arctic Institute, Leningrad.

Aero-sledges were first used in the Soviet Arctic on the ice-cap of Novaya Zemlya in 1932-33; but the experiment was, on the whole, unsuccessful. It may be of interest to describe the experiences of two other expeditions, on which they were used with highly satisfactory results, proving them to be an extremely effective and convenient means of transport.

On the expedition sent out by the Arctic Institute, in 1933-34, to the Chukchis Peninsula, two aero-sledges of the "Tsagi" type were used; one of a small pattern, which had been used before in Novaya Zemlya, and a large one, assembled by the scientific workers of the Arctic Institute. The motors were of Soviet make.

The expedition was at work at the Pevek settlement, on the eastern side of Chaun Bay, and later, 130 km. to the south, at the mouth of the Chaun River. From Pevek, journeys were made across Chaun Bay, to Ayon Island, and the west coast of the bay, as well as from the mouth of Chaun River south-west, and also south-east to the mountain ranges surrounding the Chaun depression.

The scientific work was begun in January, 1933, with journeys across Chaun Bay, for the determination of astronomical points along the western shore. In April and May, four journeys were made, lasting in all 40 days, in the course of which the country along the route was surveyed on a scale of 1 : 500,000. The most remarkable of these journeys was a crossing of the mountain ranges, which rise to heights of 1500 to 1800 m. above sea-level, on the sledges.

The distance covered by the smaller type was some 2600 km., while the large one covered 4785 km. The rate of travel in the dark winter months was from 22 to 28 km. per hour; in the spring, from 35 to 40 km. per hour: maximum speed was 70 km., and minimum 10 to 15 km. The load, including fuel and men, was usually about 700 kg. to a sledge, although sometimes amounts up to 1000 kg. or more had to be carried.

Aero-sledges may be used from November, or if there is a firm snow surface, or strong ice, even earlier, for communication between inhabited

places. For scientific work, however, which demands frequent halts en route, for journeys far inland, at any considerable distance from repair bases, and for journeys into the mountains, the dark months from November to February are not entirely favourable.

In the spring, from March till the end of May, the aero-sledge was proved by the expedition to be a very successful means of transport. During the journeys, the sledges knew almost no obstacles, except, of course, ascents of steep slopes, or large hummocks. They passed over littoral plains covered with firm snow and sastrugi; over the deep snow of the foreland valleys, where a man would sink in up to his waist, and over other areas covered with slush.

Aero-sledges were also used with great success in 1932-33, during research work carried out by the Arctic Institute at Tiksi Bay, at the mouth of the Lena River. There they were used for communication purposes, and for the determination of astronomical points. They were in use through the month of November, 1932, and from February to June 8, 1933. The total distance covered was 3400 km. Fuel used was from 600 to 650 gr. per km.; the load was usually from 400 to 1500 kg.

Thus it will be seen that experiments with aero-sledges in north-west Asia proved much more successful than in the western part of the Arctic. The main cause of failure on the ice-cap in Novaya Zemlya was the fierce snow storms which blow from the Kara Sea to the Barents Sea. It is of great importance that the personnel should be specially trained to get accustomed to the special conditions of aero-sledge work. In the opinion of the writer of this article, it may be taken for granted that, properly handled, aero-sledges may be used with success in all parts of the Arctic both for communication and for exploration purposes.

**HYDROGRAPHIC SURVEYS
ALONG THE NORTHERN SHORES OF
THE SOVIET UNION**

BY PROFESSOR JULES SCHOKALSKY

The first Russian voyages from the White Sea to the Kara Sea, and round the Yamal Peninsula to the Gulf of Ob were probably made as early as the eleventh and twelfth centuries, but these ventures were of a commercial rather than a scientific nature.

The first real attempt to make a study of these, as yet almost unknown, coasts was made by the Great Northern Expedition of 1733-43. This was a heroic enterprise, especially when it is remembered that at that time none in Russia had any knowledge of the real physical conditions of such a journey. The coast from the White Sea eastwards was divided into sections, and the explorers of the expedition had to reach their respective destinations by descending the great Siberian rivers in small vessels, which they were obliged to construct for themselves. One party surveyed the coast from the White Sea up to the mouth of the River Ob; another from the Gulf of Ob to the Taimyr Peninsula. A third worked from the mouth of the Lena westwards by way of Cape Chelyuskin as far as the River Yenisei, while a fourth took the stretch of coast from the Lena Delta to the Indigirka River. Other parties were at work in the Bering Sea, on the shores of the Sea of Okhotsk, off Alaska and North-western America, as far north as Lat. $55^{\circ} 21' N.$, and among the Kurile and Aleutian Islands. It was a vast enterprise, to which science was indebted for the first scientific exploration of these countries. It is true that the accuracy of the work, as of most surveys made at that time, was open to question; but for the two following centuries our conception of the northern shores of Eurasia was based on the maps resulting from this expedition; and the last remnant of its work was re-surveyed with modern accuracy only two or three years ago.

The wife of one of the officers of the Great Northern Expedition, Madame Prontchishcheff, was the first European woman to winter in the Arctic. She and her husband died at the mouth of the River Olenek, and their graves can still be seen at Oust-Olensk.

While dealing with these remote times, mention must be made of the work of the great Russian scientist, M. Lomonosov, who, in 1763, wrote

a book entitled *A Short Description of the Voyages in Northern Seas and the Demonstration of the possibility of navigation by the Siberian Ocean to Eastern India*. As a result of this book, two expeditions left for the Spitsbergen waters, but unfortunately both were unsuccessful. The life and works of Lomonosov are extremely well set forth in a book by M. de Lur-Saluces, in French, published in Paris in 1933.

In later years, many small expeditions worked along the coasts of Siberia, some of them in the western sector, others eastward from the Taimyr Peninsula, which still remained the chief division between the two surveys. On the western side of the Taimyr Peninsula the stretch of coast from the Kanin Peninsula to the mouth of the River Ob was re-surveyed in 1825–27 by two naval officers, Ivanov and Berezhnych.

In the second half of the nineteenth century the merchant Sidorov, an enthusiastic believer in the sea route to the western Siberian rivers, organised some small expeditions, and promoted commercial cruises from Norway and England; the latter being led by a navigator well known for his work in these waters, Captain Joseph Wiggins. Finally it was Sidorov who promoted Baron Nordenskiöld's expeditions, first to the Yenisei River; and later round the northern shores of Eurasia on board S/S *Vega* in 1878–79. This voyage was the first complete navigation of the North-East Passage; for Chelyuskin, who discovered the Cape bearing his name, travelled overland by sledge, and not by the sea route.

The first purely hydrographic expedition for the exploration of the western part of the coast of Siberia was organised as recently as 1894, in connection with the building of the Trans-Siberian Railway. The expedition was under the leadership of the well-known hydrographer, Andrew Vilkitsky, and some years were spent by him in surveying the shores of Eurasia from the Kanin Peninsula to the River Yenisei and Dickson Island. The results of his surveys, and those of his successors, made it possible to draw up and publish charts of this part of the coast, giving greater security for the voyage from Europe to the great western Siberian rivers.

After the Great Northern Expedition, the most important expeditions were led by two naval officers, Wrangel and Anjou in 1820–24. They worked on the sea-ice, using dog-transport. The main results were a survey of the shores of the continent from the River Olenek to Koliuchin Island, Bering Strait; a survey of the New Siberian Islands; and explorations northward over the sea-ice, as far as 200 km. from land. Whilst

engaged on these surveys, Wrangel began to suspect the existence of a large island somewhere to the north of Cape Jakan; and this supposition was proved correct when the American whaling captain, Long, discovered what was afterwards called Wrangel Island, in 1867. Another interesting geographical fact was the discovery of an open lead at some distance from the coast, called the "great polynia", which is due, as we know now, principally to a dynamic cause, the constant drift of the ice in the central part of the Arctic basin from the Beaufort Sea to the straits between Spitsbergen and Greenland. The *Vega* expedition was concerned principally with the North-East Passage, and the *Fram* expedition with the drift towards the Pole, and they only carried out a small amount of survey work.

The next serious step towards the mapping of Russia's northern coast-line was taken in 1911, when a special hydrographic expedition was planned for the study of the seas from Bering Strait to the Taimyr Peninsula and westwards; and two ice-breakers, *Taimyr* and *Vaigach* (each of 1500 tons) were built specially for this purpose. The survey was begun from the Bering Sea side, the vessels reaching their starting point by the ordinary southerly route. The expedition was placed under the leadership of Sergejev, a naval officer; he was succeeded in the command, after his death, by young Boris Vilkitsky, the son of the Andrew Vilkitsky already mentioned. A naval officer, Novopashennyi, was in command of the second ship. During the years 1911 to 1915 this expedition surveyed the Eurasian coast from Bering Strait to Cape Chelyuskin. New land, now known as the Severnaya Archipelago, was discovered in 1913, and the existence of Boris Vilkitsky Strait, between these islands, and Cape Chelyuskin was proved. At the same time, two land expeditions were sent to explore the coast between the mouth of the Alaseja River as far as Cape Dezhnev on the east. In 1914 the *Taimyr* and the *Vaigach*, having passed through Boris Vilkitsky Strait, were forced to winter in the sea to the west of the Taimyr Peninsula. A relief expedition was sent to their assistance under the command of O. Sverdrup on board *S/S Eclipse*. This was the last effort to investigate the waters along the Siberian coast before the Great War.

After the War the exploration of the westward stretch of coast from the White Sea to the River Yenisei was started again by order of the Government. A special Committee of the Sea Route to Siberia was created in 1920, and the careful and detailed survey of the gulfs of Ob and Yenisei was begun. This survey is now finished, and the waters

between Byeli (White) Island and Dickson Island are completely surveyed and well charted. The charting of the approaches to the Kara Sea was a more serious matter, but now both Yugorski Shar and Matochkin Shar have been completely surveyed and are safe for navigation. It is hoped that the survey of Kara Strait between Vaigach Island and the southern island of Novaya Zemlya will be completed in 1936. The fourth route to the east, round Cape Zhelaniya, in the extreme north of Novaya Zemlya, has now also been rendered safe for shipping by the publication of charts.

The first meteorological and magnetic observatory was erected in 1923 at the eastern entrance to Matochkin Shar in Lat. $73^{\circ} 16' N.$, Long. $56^{\circ} 24' E.$, and from that time onward it has worked without interruption. The staff of this observatory participated in the work of the Second International Polar Year. A station is also functioning at Yugorski Shar, Lat. $69^{\circ} 49' N.$, Long. $60^{\circ} 45' E.$, and there is another at Cape Zhelaniya in Lat. $76^{\circ} 56' N.$, Long. $69^{\circ} 00' E.$

The survey of the two islands of Novaya Zemlya has not yet been completed, nor that of the Franz Josef Land archipelago, but during the last five years, taking advantage of the favourable ice conditions, the numerous straits of Franz Josef Land have been hydrographically studied and surveyed. On the southern coast of the archipelago a meteorological and magnetic observatory was erected in 1930 at Quiet Bay, Hooker Island, in Lat. $80^{\circ} 20' N.$, Long. $52^{\circ} 48' E.$ All these observatories took part in the International Polar Year, 1932-33.

After the Great War, investigations in the Barents Sea were carried out on a much larger scale; and of recent years the chart of the Barents Sea has been revised three times. These charts were made by Mr N. N. Zubov. The intensive oceanographical research carried out recently has laid bare the principal characteristics of the Barents Sea; and, as one of the results of this work, Soviet Union scientists have been able to make discoveries on the actual heating process of the Arctic Ocean, and to compare the physical conditions of the sea now with those at the time of Nansen's voyage in the *Fram* in 1893-96.

The Kara Sea, that is to say, the waters bounded by Novaya Zemlya and a line connecting Cape Zhelaniya with the Franz Josef Land Archipelago on the western side, and the shores of Severnaya Zemlya on the east, has now been very fully investigated.

The principal achievement of 1935, from a hydrographic and oceanographic point of view, was the survey of the waters between Franz Josef

Land and Severnaya Zemlya. A new island, which was named Uschakov after the leader of the expedition, was discovered; and, of still greater importance, Einsamkeit (Lonely) Island, Wiese Island and the new one, were found to be situated on a submarine ridge, dividing the Kara Sea into two basins, both more than 500 m. deep, the one between this chain of islands and Franz Josef Land, and an eastern one between the ridge and Severnaya Zemlya. By means of these two deep channels the warm salt water of the undercurrent in the polar ocean penetrates southward to these shallow seas of the continental shelf.

It is interesting to note that in 1935 the ice-breaker *Sadko*, as a result of the favourable ice conditions, was able to penetrate as far north as Lat. $82^{\circ} 42' N.$ (between 90° and 100° East Longitude), the farthest north reached by any ship in this part of the Arctic Ocean. At this point the depth was 2365 m., a certain proof that the ship was the first to cross the continental shelf and the submarine slope between Spitsbergen and the route of the *Fram*.

On the eastern side of the Taimyr Peninsula the survey conditions were not so favourable, on account of the remoteness of the region. Of the coast-line between Cape Chelyuskin and the Lena Delta not more than 1.5 per cent. has been surveyed with modern hydrographical accuracy, though there is a running survey of about 36 per cent. There are still about 1500 miles of coast of which no regular topographical survey has been made, and some places remain as surveyed by the Great Northern Expedition of 1733-43. It is hoped that in 1936 a complete survey will be made of these parts of the coast.

The cartography of the Lena Delta is principally based on the survey made by the Russian Geographical Society's Expedition in 1883-85, from Sagastyr, the Russian station during the First International Polar Year. Work at this station was carried out, like that of the Greely Expedition at Lady Franklin Bay, for two years instead of one. From the Lena Delta to the Kolyma River the distance is approximately 1175 km., and the islands in this region possess no less than 1300 km. of shore line. In this district only 156 km. or 3.8 per cent. have been surveyed, and 42 per cent. of these surveys are based on old and doubtful work.

The shores from Kolyma to Cape Dezhnev, Bering Strait, were surveyed superficially in the nineteenth century, and in 1909.

Thus it may be seen that the survey of the eastern part of the Siberian coast still calls for some effort before it is completed. The survey of the shore line from Cape Dezhnev southwards, however, towards the Sea of

Okhotsk and the seas round Japan, was finished in 1933 at Cape Dezhnev, and all the charts of the Pacific coasts of the Soviet Union are now based on sufficiently correct data.

Many investigations have been carried out during the last 12 years, mainly since 1932, when a special polar administration was created under the direction of Professor O. J. Schmidt; and the scientific study of all waters bordering Siberia has, in consequence, gone vigorously forward.

As a proof of the great achievements of the last few years it is perhaps enough to mention the quantity and distribution of the hydro-meteorological stations along the Siberian shores and Bering Sea. Enumerating them from west to east they are as follows:

In the Barents Sea there are 14 such stations; in the Kara Sea 26; in the Laptev Sea, 19; in the eastern Siberian Sea, 7; in the Chukhotsk Sea, 6; and in the Bering Sea, 5: in all 77 stations. Of these, 5 are actual magnetic-meteorological observatories; 28 are stations of the first order with registering instruments; 24 with eye observations only; and 11 at which observations are made only three times a day. At 41 stations aerological observations are carried out reaching as high as 18-20 km. Hydrological investigations are carried out at 21 stations; and ice observations at all. The principal objects aimed at are weather forecasts and reports on ice conditions. All the stations are equipped with radio telegraphy, and thus are in communication with the world forecasting system. It will be seen that all this work demands a fully qualified staff. Those who wish to take up a career of this kind, after passing a medical test, are trained for eight months in special institutions; and there is a special school for radio operators. Up to the end of 1935, 350 assistants were trained; but still more are required. Each man or woman passes only one winter at a polar station at a time, while the time spent on the outward and return journeys is about 15 months. It is thus clear that two sets of workers must be available, of which one is at the station, and the other travelling or resting and writing up the results of the previous year's work for publication. There are medical men at 19 of the stations and at two of them, Dickson Island and Tiksi Bay, there are also hospitals. It was not easy to build hygienic houses for all these stations, and at present most of the buildings are built of wood. During the Wegener Expedition in Greenland 10 persons lived in one building of 63 sq. m.; while at the Soviet Union stations only four men live in a house of 240 sq. m.

GREENLAND

Greenland: Government Report for the Year, 1935.

The following notes are taken from the official reports *Beretninger og Kundgørelser vedrørende Grønlands Styrelse*, published by the Greenland Administration, Copenhagen.

At the end of 1934 the Greenlandic population of Greenland numbered 17,829 persons, besides some 400 Danes, the figure being made up as follows: South Greenland: 9172 (+145); North Greenland: 7393 (+164); East Greenland: 999 (+21); and Cape York: 265 (+4). The birth-rate was 47 per 1000 and the death-rate 30 per 1000. Health conditions during 1934-35 were relatively good, but during the winter of 1935-36 a serious influenza epidemic, with heavy mortality, occurred at Angmagssalik. There were 10 doctors, 15 nurses, and 113 trained mid-wives in Greenland, which is 30 times as many per 1000 inhabitants as in Denmark; and 16 hospital beds per 1000, twice as many as in Denmark. During the year, 200 teachers, of which 140 were trained, instructed 2850 school children.

Six thousand tons of coal were shipped from the mine at Kutdligssat and the new marble quarries on Agpat Island (Umanak Strait) produced 400 tons. A new quarry is to be opened at Kamarujuk (the starting point of the Wegener Expedition, 1930-31). The output of the cryolite mines increased from 15,000 tons to 25,000 tons. Fishing prospects for the next few years are less favourable, however, as the banks off the West Greenland coast show signs of having been over-fished, a fact suggested by the small size of the halibut caught. Cod-fisheries yielded 6.6 millions kg. against 7.5 in 1934, 8 in 1930 and 1 in 1925. At Holstenborg a new industry, trawling for deep sea crabs (*Pardanus borealis*), has been started; and 22,400 tins of crabs have already been sent to Denmark. Among other products of Greenland sent to Denmark, 5700 kg. of wool, 35,000 seal skins, 4600 fox furs, 31,000 shark skins, 2600 tons of salted fish and 210 tons of cod liver seem worthy of mention.

COMPLETED EXPEDITIONS

The Scientific Results of the German Greenland Expedition, Alfred Wegener, 1929 and 1930-31.

Wissenschaftliche Ergebnisse der Deutschen Grönland-Expedition Alfred Wegener, 1929 und 1930-31. Band III. *Glaziologie*, von Dr Bernhard Brockamp, Mittelschulprofessor Hugo Jülg, Dr Fritz Loewe und Studienrat Dr Ernst Sorge.



HENRY GEORGE WATKINS

Born January 29, 1907

Died August 20, 1932

Vol. II comprises the glaciological results, which, however, owing to Alfred Wegener's premature death, do not cover the whole programme of the expedition. F. Loewe treats briefly of the glacier fronts of the Umanak district; H. Jülg discusses the glaciological observations near the Western Base, including those in the 65-foot pit under the winter hut. B. Brockamp discusses the rather hypothetical conclusions which can be drawn from the elastic constants of the ice gained by seismic methods, concerning the temperature distribution in the deeper parts of the ice-cap; and details some observations of annual accumulation. The principal contribution, in size and content, is Sorge's treatise on the glaciological results of the Mid Ice Station, in which more attention is paid to careful examination of the facts than to far-reaching speculations. It contains the numerous and exact measurements of firn density, the discovery of an annual stratification of the firn, giving the annual and seasonal accumulation as far back as 1911; records of firn shrinkage, and a study of the firn structure at different depths. The firn temperatures were measured for over six months down to 50 feet; and the discussion, based on the theory of heat conductivity, shows new reliable thermal constants of firn, and also that no internal sources of heat can be distinguished owing to the stronger influence of changing annual means of air temperatures.

F. L.

EXPEDITIONS IN THE FIELD

Anglo-Danish Expedition to East Greenland, 1935-36.

The wintering party of this expedition, consisting of L. R. Wager, H. G. Wager, Dr Fontaine, W. A. Deer, P. B. Chambers, Mrs L. R. Wager and Mrs H. G. Wager were landed from the *Quest* at Skaergaards Peninsula, Kangerdlugssuak, on August 30, 1935. They have spent the winter there in company with two families of Eskimos from Angmagsalik; and planned to carry out geological and botanical work. Since the departure of the *Quest* they have been out of communication with England; but they are returning in the summer of 1936.

Arctic Air Route Observations in Greenland, 1935-36.

Pan-American Airways maintained two observers in Greenland during the year 1935-36, both Danish flying officers, who obtained leave of absence from their Government for the work. Flight-Lieut. Poul Jensen sailed from Denmark on August 3, 1935, on the *Gustav Holm*, arriving

in Scoresby Sound about August 18. He plans to return the same way at the end of the summer of 1936. Naval Lieut. K. Rudolf Ramberg left Denmark on October 10, 1935, on board *S/S Disko*, arriving at Godthaab about November 10, where he will spend a year. Both observers are studying the comparative advantages of as many localities as they can reach with convenience.

Danish Work in Greenland.

The Danish archaeologist, Mr Erik Holtved, who has been at Thule, North Greenland, since the summer of 1935, intends to remain there for another year. He is making archaeological investigations, and studying the Eskimo language.

It is reported that the Royal Geodetic Institute, Copenhagen, is still at work on the survey of the west coast of Greenland. It is hoped that this summer a series of archaeological photographs may be taken from the air over this region.

PROJECTED EXPEDITIONS

Dr Charcot's East Greenland Cruise, 1936.

Dr J.-B. Charcot proposes to visit East Greenland as usual during the summer of 1936, on board *S/S Pourquoi pas?* He will be accompanied by a scientific staff; and hopes to carry out physical, biological and oceanographical research off the coast, between Scoresby Sound and Angmagssalik, as close to the shore as possible. Calls will be made at Angmagssalik both on the outward and on the return journeys, in order to render assistance to the French Trans-Greenland Expedition, by transporting scientific equipment, and finally by taking three of the members back to Europe.

French Trans-Greenland Expedition, 1936.

An expedition, consisting of P. E. Victor (leader), Dr Robert Gessain, Count E. Knuth (Danish), and M. Perez (Swiss), three of whom spent the year 1934-35 at Angmagssalik, making anthropological and ethnographical investigations, intend to make a crossing of the Greenland ice-cap in the summer of 1936.

An advance party, consisting of the leader and his Danish colleague, reached Jakobshavn, West Greenland, on April 19; and their two companions left Copenhagen on April 24, to join them. They hoped to reach Angmagssalik at the end of June, having followed more or less the same

route across the ice-cap as de Quervain on his crossing in 1912. Two months will be spent at Angmagssalik, finishing some of the work begun in 1934-35, after which the party will return to Europe on board S/S *Pourquoi pas?*, except the leader, M. Victor, who will remain at Angmagssalik for another year in order to finish some ethnographical work.

Norwegian Bio-Chemical Research at Angmagssalik, East Greenland, 1936-37.

Dr Arne Høygaard, who, accompanied by Mr Martin Mehren, made a crossing of Greenland in 1932, proposes to spend a year at Angmagssalik, East Greenland, carrying out bio-chemical research. He will be accompanied by the following:

UNNI HØYGAARD, assistant,
EDWARD FALSEN KROHN, clinical assistant,
HARALD WAAGE RASMUSSEN, chemical assistant.

Dr Høygaard plans to make a detailed investigation of the metabolism of the Eskimos by bio-chemical methods. He also hopes to discover, in the food values of the primitive diet of the Eskimos, living chiefly as they do on meat and fish, the causes of the heavy mortality in the past of the natives of the East Greenland settlements.

Norwegian Expeditions to East Greenland, 1936.

Two Norwegian ships, sent out by the Norges Svalbard-og Ishavsundersøkelser, will visit East Greenland during the summer of 1936. S/S *Selis*, of Tromsø, left Norway in the middle of June to take supplies to the Norwegian station at Torgilsbu, in South-east Greenland, and relieve the meteorological staff. Seals will be hunted during the trip, and the ship will also call at Kangerdlugssuak to fetch Mr Wager's expedition, and transport it to Iceland.

S/S *Quest* will visit the station at Myggbukta, in North-east Greenland, carrying supplies. Two English ornithologists, E. G. Bird and C. G. Bird, who propose to winter at Myggbukta, will be given passages on this ship; and a Finnish ornithologist, Mr Munsterhjelm, will also make the voyage.

Danish Work in Greenland.

Dr Lauge Koch will visit Greenland during the summer of 1936, in order to continue the geological work of his previous expeditions. He plans to return to Copenhagen, accompanied by Dr Bütler, at the end

of the summer; but the other members of his party will spend the winter of 1936-37 at various stations, as follows:

(1) Dr H. Aldinger and Dr Vischer, assisted on their journeys by Greenlanders, will undertake stratigraphical and tectonic investigations at Eskimonaes.

(2) Dr Schaub and Dr Stauber will make similar investigations on Ella Island, also with the assistance of Greenlanders.

(3) Dr Wegmann, accompanied by a Danish engineer, will study the geology of Julianehaab, West Greenland, for comparison with conditions on the east coast.

Dr Finn Salomonsen, accompanied by Stud. B. Thorup and Stud. Chr. Vibe have left Copenhagen for Upernivik, where they propose to make biological studies with special reference to ornithology, between Upernivik and Etah, from Lat. 72°-78° N.

Oxford University Expeditions to Greenland, 1936.

Two small expeditions from Oxford University will visit Greenland during the summer of 1936; the personnel consisting almost entirely of the members of the Oxford University Exploration Club.

The larger of these ventures left England in June, 1936, led by Mr P. G. Mott, who accompanied a similar expedition led by Mr H. O'B. Hayward to West Greenland in 1935; and consisted of the following members:

PARTY I.

P. G. MOTT, leader and chief surveyor,
 J. C. S. BEARD, assistant surveyor,
 E. W. ETIENNE, wireless officer and photographer,
 A. F. JOHNSON, assistant surveyor,
 W. R. PLUNKETT, second surveyor,
 J. C. G. SUGDEN, in charge of medical supplies.

PARTY II.

J. S. T. GIBSON }
 D. M. STEVEN } zoologists.
 H. G. VEVERS }

The two parties will spend two months in the field, and will work independently.

The inland party (Party I) will continue, and if possible complete, the survey work begun by the Oxford Expedition of 1935, in the area south of the Søndre Strømfjord, West Greenland, in the neighbourhood of the Safartok River; and at Lake Tassusiak, which lies some 30 miles inland from the fjord.

Party II will carry out zoological work on the coast, near Sukkertoppen, and at the head of the Strömfjord. The work will include some investigations into the marine biology and heathland ecology of the district.

The other party from Oxford consisted of Mr M. J. Dunbar and Mr C. Hartley. They left for Julianehaab, West Greenland, at the beginning of June, and intend to carry out zoological work.

Other Work in Greenland.

Mr E. G. Bird and Mr C. G. Bird, both of Cambridge University, will leave for North-east Greenland at the end of July, 1936. They propose to spend a year in this region, making biological and ornithological observations; and will make their base at the Norwegian station at Myggbukta, Mackenzie Bay.

Komminister J. Lagerkrantz of Stockholm will be at work in the Julianehaab district during the summer of 1936, carrying out biological work.

Captain Robert Bartlett will visit the west coast of Greenland in his ship S/S *Effie Morrissey* during the summer of 1936.

ICELAND

COMPLETED EXPEDITIONS

Mr Ansell Wells' Investigation of Fresh Water Fisheries, 1935.

Mr R. Ansell Wells, with a small party, made a detailed survey of the rivers of the west, north and north-east of Iceland during the late summer of 1935. As a result of his work, some 60 rivers have been scheduled and classified as being suitable for salmon fishing, breeding and stocking. The local conditions were investigated, and measures for protection and improvement suggested.

The party left Reykjavik on August 26, 1935, and having reached Snaefellsnes, by way of Borgarfjörður, crossed the mountains, and examined the rivers flowing into Hvammsfjörður. They proceeded to Borðeyri by way of Tvidaegra, the direct route being impassable, and investigated the rivers as far east as Húsavík. The programme had been originally designed to include Þistilfjörður, in the extreme north-east of Iceland, Langaneströnd and Vopnafjörður, but as it was too late in the season to go so far east overland, the party went to Myvatn, and having made a successful crossing of the lava desert of Ódáðahraun and forded the River Jökulsá á Fjöllum, which presented rather a problem at this time of the year, reached Vopnafjörður on the east coast from the south-east. Work in this district was hampered by bad weather, the first storms of winter having set in, and the party returned to Reykjavik by boat.

It is hoped that the results of these investigations will be published in due course.

Icelandic Expedition to Langjökull, 1936.

A party of eleven men, led by Mr Tryggvi Magnússen, made a crossing of Langjökull in April, 1936. They left Reykjavik on April 8, and reached the ice-cap two days later. Four days were spent on Langjökull, which was crossed from Jarlhettur, in the south-east, to Geitlandsjökull, in the south-west, by way of Skiðufell, above Hvítavatn. From Geitlandsjökull the party reached Þórisdalur and Björnsfell, whence they returned to Reykjavik by way of Þingvellir, arriving there on April 15.

Skis were used during the entire crossing; and brief mention of other items of the equipment may be of interest. The three sledges were all of the kind used by Dr A. Pollitzer-Pollenghi for his Vatnajökull Expedition

of 1935, and were described in *The Polar Record*, No. 11, p. 51. One of the three tents was "The Improved 750 Pneumatic Tent" made by an English firm, which proved most successful. Each member of the party took a "Li-lo" air mattress, and had hickory skis, and a ski-sail, which was used whenever the wind was favourable. The weight of the whole equipment for eleven men totalled 1700 lb., including the sledges.

The weather varied during the crossing. Fog was encountered on three out of the four days on the ice-cap, as well as sleet and snow storms on two occasions. The lowest temperature met with, 8° C., was recorded on the night of April 14.

EXPEDITIONS IN THE FIELD

Expeditions to Vatnajökull, Iceland, 1936.

A Dano-Icelandic expedition, consisting of Mr J. Áskelsson, Dr Niels Nielsen and Mr A. Nöe-Nygaard, was at work on Vatnajökull, Iceland, during the summer of 1936. They left Reykjavik at the beginning of May, and up to the time of going to press had accomplished but little of their programme, owing to the almost continuous snow-storms and rain experienced on the ice-cap. It is hoped to publish a report on their work in the next issue of *The Polar Record*.

A Swedo-Icelandic expedition is also at work on the ice-cap, and is, of course, hampered by the same unfavourable conditions. The party is led by Professor H. W. Ahlmann, of Stockholm, and consists of: J. Eythórsson, S. Þórarinnsson, of Reykjavik, and two Swedish scientists, Ch. Liljehöy and C. Mannerfield.

PROJECTED EXPEDITIONS

Mr Falk's Expedition to Snaefell, Iceland, 1936.

A small expedition, led by Mr P. Falk, who has been carrying out ecological research in Iceland since 1932, will visit the Snaefell district of South-east Iceland during the summer of 1936. Accompanied by Messrs J. M. Brown, F. George, and M. Wilson, Mr Falk will reach Seyðisfjörður in East Iceland, by boat via Bergen, at the beginning of August; and proceed to Snaefell, using lorry and pony transport. Ten days will be spent in the region, during which a detailed map, and an ecological survey will be made. The party also hope to climb the mountain. The further plans are undecided, depending upon conditions.

Cambridge Expeditions to Iceland, 1936.

An expedition, consisting of the following men:

D. A. SHERRIFF, leader, ornithologist and surveyor,
D. C. HORTON, zoologist,
M. INGRAM, botanist and geologist,

left Cambridge University for Iceland on June 15th. The area to be visited is the Leirur district of Skeiðararsandur, which lies immediately to the south of Öraëfajökull. During the four weeks which will be spent in this region it is proposed to carry out zoological, botanical, geological and ornithological work; and to make a large scale map of the storm beach.

Another Cambridge expedition will visit Hvítávatn, a lake lying south-east of Langjökull, having left England on July 7. The party, making its base at a hut in the vicinity, plans to map the area of the lake, afterwards proceeding to Sandvatn to study fish. Four weeks will be spent at the work. The personnel will consist of:

M. N. H. MILNE, leader,
H. L. MCAE,
A. A. H. DOWNES.

ARCTIC CANADA, LABRADOR AND ALASKA

COMPLETED EXPEDITION

American Expedition to the Yukon, 1935.

A brief account of the expedition, compiled from press reports, appeared in *The Polar Record*, No. 11. We are now able, through the courtesy of the leader of the expedition, Mr Walter A. Wood, to amplify this short note. It will be remembered that the party consisted of J. Fobes, H. Fuehrer, Mrs Harrison Eustis, Miss A. Hazard, I. Peace Hazard, H. Wood, W. A. Wood (leader) and Mrs W. A. Wood.

The expedition started from Burwash Landing, a small town at the upper end of Kluane Lake, at the end of June, 1935; and proceeded, with horse transport, to the Wolf Creek Glacier, the approach to the mountainous region lying 40 miles to the north of Mount Logan in the Yukon. A line of camps was established up the glacier; the second base camp at an altitude of between 5000 and 6000 ft., being reached by means of pack horses. On July 26 the mountaineering section of the party, consisting of J. Fobes, H. Fuehrer, H. Wood and W. A. Wood, pushed on up the glacier to make Camp 8, immediately below Mount Steele (16,844 ft.), the first ascent of which was one of the objects of the expedition. Unfortunately the weather broke soon afterwards, and the attack on the mountain was delayed until August 14, when the party of four, following the east ridge of the mountain, reached a height of 11,000 ft. and made a survey station, afterwards returning to Camp 8. The next day they left the camp at 1.15 a.m., in cold and brilliantly clear weather. The minimum thermometer at the survey station registered -4° F. They reached the station, having followed the prepared route, at dawn. The four men then started up a 50° slope, proceeding un-rope and changing leaders every fifteen minutes. This was followed by a stretch of soft snow, and then by a ridge which afforded the only technically difficult climbing of the ascent. At 15,000 ft. they emerged on to a plateau below the final pyramid, and after laborious progress in deep snow attained the summit at 2.30 p.m. They had been extremely fortunate in the weather during the ascent, as the meteorological record kept during the expedition shows that out of 28 days Mount Steele was invisible for the greater part of 18 days, and on only one day was the mountain apparently free from driving snow. The ascent was made on one of the few cloudless and windless days. The temperature at the summit was $+15^{\circ}$ F. After taking panoramic photographs for survey purposes, the four men descended rapidly, and reached Camp 8 at the foot of the mountain at 7.15 p.m.

The aerial survey programme was also carried out, though bad flying conditions prevented its completion on the scale planned. Preliminary flights were made to Kluane Lake before the start of the expedition, but low visibility prevented photography or survey work. At the end of August, however, flights were made over the region in clear weather, and the resulting 150 photographs are being used in the construction of a map on a scale of 1:100,000. Mr Wood hopes to return to the same district, to complete the mapping programme and make investigations of the glaciers draining into the Donjek Valley.

The Hudson Bay Shipping Route, 1935.

(The following summary of the navigation conditions in the Hudson Bay region, during the open season of 1935, is published by permission of the Imperial Shipping Committee.)

Eight commercial voyages were made to Churchill, Manitoba, in 6 vessels, during the navigation season of 1935; and the ice and weather conditions on the Hudson Bay Route were the best for several years. No casualties occurred. The names of the vessels, and the dates of the voyages undertaken by them were as follows:

Name of vessel	Entered Hudson Strait	Port Churchill		Cleared Hudson Strait
		Arrival	Departure	
S/S <i>Wentworth</i> (British)	Aug. 9	Aug. 14	Aug. 20	Aug. 24
M/V <i>Leopold L-D</i> (French)	Aug. 16	Aug. 20	Aug. 23	Aug. 26
M/V <i>Leopold L-D</i> (French)	Sept. 14	Sept. 17	Sept. 19	Sept. 22
S/S <i>Pengreep</i> (British)	Sept. 14	Sept. 18	Sept. 20	Sept. 25
M/V <i>Charles L-D</i> (French)	Sept. 17	Sept. 20	Sept. 22	Sept. 26
S/S <i>Wentworth</i> (British)	Sept. 19	Sept. 23	Sept. 25	Sept. 29
S/S <i>Alma Dawson</i> (British)	Sept. 21	Sept. 25	Sept. 27	Oct. 1
S/S <i>Bilderdijk</i> (Dutch)	Sept. 25	Sept. 29	Oct. 2	Oct. 6

As usual the Government steamers *N. B. McLean* and *Ocean Eagle* patrolled the route, making observations on ice and fog conditions, and broadcasting weather reports to shipping.

At the beginning of the season there was one unusual circumstance. Contrary to previous experience the open channel was along the south shore of Hudson Strait, while along the north shore a considerable amount of heavy ice persisted to August 11. These conditions were investigated by *N. B. McLean* after her arrival at the mouth of the Strait on July 21. The ship reached Nottingham Island on July 27, and returned to Resolution on August 5, fully informed of the best routes across the Bay for the information of ships at the beginning of the season on August 10. Captain Balcom, of the *N. B. McLean*, states that, with the exception

of the ice along the south coast of Baffin Island, Hudson Strait was practically clear of ice from July 22 onwards, except for bergs and growlers, of which there were a great number in the summer of 1935. At the end of the season there was no ice in Hudson Strait up to the time the *N. B. McLean* left on October 24.

The commanders of vessels using the Hudson Bay Routes seem unanimous in their opinion as to the value of the gyro compass in Hudson Strait and Bay. The following reports of various experienced Hudson Bay navigators bear out this statement. Captain Balcom, of the *N. B. McLean*, writes as follows:

"The Sperry Gyro Compass on the *N. B. McLean* continued accurate throughout the season. This compass, now in use 5½ years, has given excellent results, notwithstanding the many hard knocks sustained in ice-breaking. The durability and continued accuracy of this machine under those conditions is a most convincing proof of the excellence of its construction, and I cannot speak too highly of its performance.

"The majority of the ships navigating Hudson Bay and Strait this season were fitted with gyro compasses and the speed and apparent confidence with which they made the passage can be attributed to this fact."

Captain Beaunis, of the *M/V Leopold L-D*, says:

"We have noticed from 58° N. and 46° W. a very great uncertainty of the magnetic compasses, which rendered them very difficult to use in the case of frequent sheers of the ship (stormy weather or high waves)."

Finally, Captain J. Whitefield, of *S/S Alma Dawson*, writes as follows:

"I think a gyro compass is the best asset for a ship on the passage in and out of Hudson Bay, as with local disturbance and the rapid change of variation it is really difficult to know exactly what course one is steering."

The Hudson Bay navigation season generally ends in the latter half of October, when slob-ice forms at the mouth of the Churchill River; but the natural close of the season comes gradually at this point, and with ample notice. This early ice, being due to floating snow, usually thaws several times before it consolidates into a serious impediment, and two tugs at Churchill, which are both reinforced for ice work, have little difficulty in keeping a way open for a belated ship.

Once clear of Churchill, the critical point in the homeward voyage in October is in the neighbourhood of Nottingham Island, where the north-east track through Hudson Bay swings to south-east through the Strait.

Here some floe ice from Foxe Channel usually comes down about mid-September, but even under the bad weather conditions of 1934 it had not closed the channel when the *N. B. McLean* left the vicinity of Nottingham Island on October 7, having escorted the last two outward bound ships as far as Wakeham Bay in Hudson Strait. It is not known how long the passage remained open in 1934 after the departure of *N. B. McLean*, but there was plenty of open water in the neighbourhood of Nottingham Island until November 18; and only patches of slob-ice at Resolution Island between November 15 and November 29.

The following report by Captain Balcom on the discoveries resulting from the Canadian Hydrographic Service Survey on the Hudson Bay Route is quoted in the *Seventh Report on Hudson Bay Marine Insurance Rates 1936*, and reproduced by permission of the Imperial Shipping Committee.

"No ice was reported by Nottingham Station up to October 31, and the history of this area ever since the station was established, is that ice has always been sighted before it entered the route, and, in my opinion, Nottingham gives positive information of its approach. The new channel south of Digges Island, charted this year, should extend the season of navigation by at least two weeks. Natives reported ice closed this channel last year (1934) on November 23; the route north of the islands was closed on November 10. . . . Two beacons or day marks are required at the western entrance to Digges Island Sound. This is a new channel, leading into Hudson Bay south of Digges Island. It is quite easily navigable, but when approaching from the westward there are no very conspicuous landmarks. . . ."

Charts of the new channel were to be available in June, 1936.

Digges Island Sound is a fine deep-water channel inside the Digges Islands, and close to the continental coast. It extends for a distance of 22 miles from Cape Wolstenholme to the most westerly of the islets, is over 100 fathoms in depth, and so straight that two courses only are required when navigating it. The channel, as Captain Balcom remarks above, remains ice-free in the autumn for about 10 days after the usual shipping route north of the Digges Islands is filled with ice from Foxe Channel, as the outswEEP of the Hudson Bay current tends to prevent this northern ice from drifting farther south than the main Digges Islands. The *N. B. McLean* was, according to the natives, the first ship to pass through the channel.

The scenery of the new channel is magnificent. At the eastern entrance, on the mainland side, the rocky cliffs of Cape Wolstenholme rise to nearly

1000 ft., and the sound is walled by high rugged cliffs for several miles. At the turn of the sound, about 15 miles from Wolstenholme, the coast is much broken by inlets, at the most easterly of which there is a large Eskimo settlement, Ivugivik, and a good anchorage. There are also good anchorages at Nuvuk Harbour.

PROJECTED EXPEDITIONS

Mr Bentham's Investigations in Southern Ellesmere Land, 1936-38.

Mr R. Bentham, a geologist, of Nottingham University, who was a member of the Oxford University Expedition to Ellesmere Land in 1934-35, proposed to spend two more years in the same region, making his headquarters, with the Royal Canadian Mounted Police Detachment at Craig Harbour, in Southern Ellesmere Land.

Mr Bentham plans to reach Craig Harbour in September, 1936, and to spend the rest of the year doing geological work in the vicinity of the station; and in carrying out a preliminary survey of Mackinson Inlet. In the spring of 1937, a geological and survey trip will be made from Craig Harbour to Bache Peninsula, following the coast as closely as possible. The summer will be spent in work along the south coast of Ellesmere Land to the west, and in laying a depot of dog food as far west as possible in preparation for the sledge journey planned for the next spring, when Mr Bentham proposes to visit Axel Heiberg, Ringnes and North Cornwall Islands. On his return from this journey, Mr Bentham will spend the summer of 1938 doing geological work in the neighbourhood of Craig Harbour, and in making a detailed survey of Mackinson Inlet.

British Canadian Arctic Expedition, 1936-39.

A three-year expedition to the Canadian Arctic, organised and led by Mr T. H. Manning, who has already spent two years on Southampton Island, left England in the spring of 1936. The personnel for the first year is as follows:

T. H. MANNING, leader, surveyor,
P. BAIRD, geologist,
P. M. BENNETT, surveyor,

R. J. O. BRAY, ornithologist and surveyor,
R. G. M. KEELING, medical officer,
G. W. ROWLEY, archaeologist.

The personnel will vary slightly each year, as returning members are replaced by others. A zoologist, R. Pilkington, proposes to join the party in 1937.

Leaving Churchill, Manitoba, in May, 1936, the expedition will proceed

to Southampton Island, where the map of the island, begun in 1934-35, will be completed, by fixing the longitudes of certain points marked by cairns. Later, a survey will be made of the coast-line, and as much as possible of the interior of Coats Island, to the south-east of Southampton Island. During the winter of 1936-37, it is proposed that part of the mainland, west of Repulse Bay, should be mapped; and three journeys made: up the centre of Melville Peninsula, to King William Island, and to the Magnetic Pole, Boothia. The next year, the expedition will proceed to Cape Dorset, Baffin Island.

During the summers, when such work is possible, more attention will be paid to archaeology, zoology, botany and ecology, ornithology and geology than to surveying, which can be done by sledge during the winter. There are important sites for excavation on Southampton and Coats Islands, also at Cape Dorset and possibly on the Nottingham, Salisbury and Mill Islands. Two large Snow and Blue Goose colonies on Southampton and Baffin will also be visited. Summer travel will be by whale boat, with a petrol engine, and freight canoe, and inland with pack dogs. Winter travel will be by dog-team.

Ice Patrols.

The Coast Guard Patrol Boat, *General Greene*, commanded by A. L. Cunningham, left Boston on April 1, 1936, for three months ice-patrol work on the North Atlantic shipping routes. The scientific staff, led by Floyd Soule, will carry out investigations of icebergs round Newfoundland and Labrador, noting their number and drift; and at the same time warning vessels of their approach.

The Bering Sea Patrol left at the same time, under the command of Captain R. W. Dempwolf, and will spend the summer in the north. The patrol will administer justice, and carry medical relief to the inhabitants of the Bering Sea coasts and islands; will protect the seal herds round Pribilof Islands during the breeding season, and continue the charting of the ocean bed.

SOME PATROLS MADE BY MEMBERS OF THE
ROYAL CANADIAN MOUNTED
POLICE IN THE CANADIAN ARCTIC, 1935

[The information contained in the following articles has been received through the kindness of Major-General Sir J. H. MacBrien, the Commissioner of the Force.]

Port Burwell to Fort Chimo, Ungava Bay.

Corporal T. A. Bolstad left the Royal Canadian Mounted Police detachment at Port Burwell, Cape Chidley, on February 14, 1935, intending to patrol as far as Fort Chimo, Ungava Bay; and if necessary visit Payne Bay as well. He was accompanied by Mr W. Davidson, Port Manager for the H.B.C. at Port Burwell, and by a native, Bobbie, with a team of nine dogs.

The weather, with the exception of a few days, was ideal throughout the entire trip. On the third day out from Port Burwell, February 16, the party was obliged to stop and make camp early, owing to bad weather; and stormy weather prevented travel on February 19, and on March 17. The pace throughout the journey was very slow, as a result of the shortage of good dogs at Port Burwell.

During the latter part of the southward journey, and during the entire homeward journey, the pace was reduced to a crawl, and all the members of the patrol walked more than three-quarters of the distance travelled. At no time did the load exceed more than 400 lb., exclusive of dog-feed, and of this the patrol never carried more than 125 lb. at any time after February 20. Bobbie was the only native at Port Burwell able to get together enough dogs to undertake a long sledge journey; no other native could muster more than five. In this connection Corporal Bolstad advises very strongly against the method of hiring a native and dogs at intervals for patrol work; and suggests that a properly trained native and the requisite number of dogs should be retained permanently at stations such as Burwell.

The patrol reached George's River on February 21, and remained there four days to rest and feed the dogs. The Manager of the H.B.C. Post had just returned from Chimo a few days before, and reported excellent travelling conditions. The natives in the vicinity were having good fur catches in comparison with the last few years, though bad when compared with those at Whale River and Fort Chimo. Sick and destitute relief was confined to widows and aged and infirm people without support.

The journey from George's River to Fort Chimo was uneventful. The party arrived at Whale River on February 28, where the Hudson Bay Company's Manager reported a good fur year, approximately 900 pelts having been taken in the vicinity. At Fort Chimo which was reached on March 1, the six European inhabitants were all found to be in good health, and as Mr Davidson and Corporal Bolstad were both weary, and the native was suffering from snow blindness, it was decided to make a stay of several days at the post; and the patrol remained there until March 10. The return journey to Port Burwell was accomplished in nine days, although, owing to the weakness of the dogs, the three men had to walk practically all the way. One day, March 14, was spent at George's River to rest the dogs.

Conditions generally were found to be quite prosperous amongst both natives and whites throughout the district. The health of all the natives visited was good, and during the autumn and winter of 1934-35 no unnatural deaths or serious accidents occurred. Good fur catches had been made by the natives at all posts visited, and fox (white, red, cross and silver), mink, otter, and muskrat were among the fur-bearing animals caught. Other game, while it was sufficient to meet the needs of the people, was generally scarcer. Ptarmigan, especially, was much less numerous than in previous years. Deer had been obtained in the vicinity of George's River, and Whale River, and probably fifteen or twenty animals killed. Wolves, which were numerous round George's River the year before, were not seen at this post in 1934-35, but four pelts were brought in to Whale River. Dog-feed was, as usual, very scarce throughout the district. From George's River to Leaf River there was only one good dog-team, which was owned by a native named Cooper; but as there are numerous lakes and rivers throughout the district all well stocked with fish, this condition was believed by Corporal Bolstad to be the result of improvidence on the part of the natives. Cooper's dogs were fed entirely on fish.

The patrol was away from the detachment for 34 days, and travelled approximately 550 miles. The party, when camping away from settlements, slept in snow houses which they erected themselves.

Pond Inlet to Home Bay, Baffin Island.

A patrol, lasting 45 days and covering about 950 miles, was made in March and April, 1935, by Corporal R. C. Gray, of the Pond Inlet detachment of the Royal Canadian Mounted Police, when he visited

Home Bay from Pond Inlet, making stops at various native settlements both on the outward and the return journey. Corporal Gray left Pond Inlet on March 18, accompanied by two natives in the service of the police, Kilikti and Koomanapik, and two teams of 12 and 15 dogs; and proceeded direct to Button Point, Bylot Island, where they remained until March 25, hunting seal, for use during the journey. Seal, however were scarce, as, owing to the uncertain condition of the ice, it was in most cases impossible to reach the open water, so Corporal Gray was obliged to purchase seal for dog-food from the natives.

On March 25, the patrol left Button Point and proceeded south along the north-east coast of Baffin Island; and for four days had very heavy travelling owing to rough ice and fairly deep snow. These conditions, which lasted as far as Coutts Point, made it necessary to relay the loads, as the dogs were unable to pull the fully loaded sledges. On leaving Coutts Point, the patrol took advantage of the fairly good surface close in to the shore; but deep snow, in some places very soft, was met with most of the way.

The Hudson's Bay Company's Post at River Clyde was reached on April 6, and three days were spent there, Corporal Gray and one of the natives leaving for Home Bay on April 9, while the other native went north-east of River Clyde to hunt seal for the return trip. The patrol arrived at the native settlement of Agbartook, Home Bay, on April 11, where they were held up for three days by bad weather; and could not leave for the return journey to Pond's Inlet by way of River Clyde until April 15. Clyde was reached once more on April 18, and after a short stay resting dogs and repairing the sledges, the three men left on April 23, and arrived at Pond Inlet on May 1.

At Button Point, all the natives, consisting of five families, were found in good health, and well supplied with meat for their own needs. The camp is in constant touch with Pond Inlet.

Coutts Inlet and its adjoining camp Kangadjuak, situated approximately six miles apart, have five or six native families respectively; and these people were found to be well supplied with food and in good health. In the autumn of 1934, five persons died from some sickness which, from the reports given by the natives, appears to have been dysentery, probably caused by getting wet and cold.

At Clyde River, the six native families were all prosperous, and only one death was reported, from pneumonia. At Home Bay, the large native settlement of 11 families was found well supplied with food. There

had been no deaths at this camp, and the natives were all in good health.

The above camps were the only ones situated east and south of Pond Inlet at that time, and native population in the Clyde district was at that time as follows: 28 men, 36 women and 75 children, making a total of 139 persons, 6 of the women being widows, and 2 of the men having 2 wives each. These statistics exclude the Button Point Settlement.

During the year 1934-35 all the natives had been well supplied with game. Seal were caught in sufficient numbers for actual use though no great numbers were seen at any time. On April 2, three seal were seen by members of the patrol on the ice near Coutts Inlet: this was quite early for seal to be up. Walrus were rather scarce; and only 17 bears were killed during the year. No fresh bear tracks were seen during the patrol which was unusual for that district. Caribou was quite abundant inland west and north-east of River Clyde and west of Coutts Inlet, and the total bag for the season was 467 caribou, all native families sharing the meat and the skins. Fox, both blue and white, were also plentiful, a total of 693, 23 of which were blue, being reached during the autumn and winter. The year 1934-35 was supposed to be the big year of the fox cycle, which is said to occur once every five or six years. One wolverine and 60 ermine were also trapped. Sea fowl, duck and geese were fairly plentiful at Coutts Inlet, Clyde and Home Bay during the year.

The patrol was fortunate in having mild and sunny weather for most of the journey, although they were held up by blizzards and snow storms for 7 days. The dogs stood the trip well, and had ample food, which was purchased for them from natives on the way. A double silk tent, warmed by two primus stoves, was used. This was found to be preferable to igloos, and only one snow house was made during the patrol.

Coppermine to Walker Bay and Richardson Island.

Constable A. J. Chartrand left the Coppermine detachment on March 12, 1935, on patrol to Walker Bay, Prince Albert Peninsula, Victoria Island, accompanied by an interpreter, Tom Goose, and a native, Kihoodlik, who acted as guide. Fourteen police dogs and 3 dogs belonging to Kihoodlik were used, divided into two teams. The patrol, which returned by way of Richardson Island, off Wollaston Foreland, in the north of Coronation Gulf, was made with the object of visiting natives, carrying mail and inspecting trading posts.

Travelling by way of Krusenstern, Austin Bay and Rymer Point, the party reached Read Island, to the north of the Dolphin and Union Strait,

on March 17, having visited natives along the route. Two days were spent inspecting posts and native settlements, and the three men were held up for a further six days by bad weather, in which it was impossible to travel. Cape Baring, the extreme westerly point of Wollaston Foreland, was reached on March 30. Prince Albert Sound, where very rough ice was met with, was crossed on March 31, and April 1, and numerous bear tracks were seen. The patrol arrived at the native seal camp at Minto Inlet on April 3, and reached Walker Bay the next day.

At Walker Bay, it was found that the native schooner *Sea Otter*, which was to have brought supplies to the Hudson's Bay Company's Post, had been unable to reach that point owing to the early freeze up. She was frozen in at De Salis Bay, an inlet on the south-east coast of Banks Island, about one hundred miles from the post. Some of the supplies had been brought across by dog-team, but the Police dry-fish for dog-feed had been dropped at Baillie Island. The dogs were very tired, and were suffering from sore feet, and should have been rested for several days; but as the H.B.C. Post was so short of food, and could provide no dog-feed, the patrol moved six miles east to the Canalaska Post, where flour for preparing dog-feed could be purchased, and also supplies for the return trip. As no proper food for the dogs was obtainable, Constable Chartrand decided to go back to Read Island, and the patrol left on the return journey on April 8, thinking that if the weather became milder, a few seals might be shot whilst crossing Prince Albert Sound. Read Island was reached on April 16, but the weather was cold all the time, and no seals were seen.

The patrol left Read Island on April 19, and arrived at Richardson Island four days later, where trading posts were inspected, and natives visited. Kugaryuak, on the mainland, was reached on April 28, and visits paid to several native families who had just come off the land to trade. The patrol arrived back at the detachment at Coppermine on May 1.

Sixty-six native families were visited in the course of the patrol; and it was found that the average worked out at about four persons to a family. All the natives from Prince Albert Sound were at Read Island for Easter, which saved the patrol visiting the head of the Sound. They reported poor sealing on account of the bad weather; but in spite of this they seemed healthy, and there had been no sickness worth recording. The fur catch was reported fair, and about the usual number of caribou had been killed; but these are never plentiful in this district. An unusual number of wolves had been seen; but none killed. Several polar bears had been caught.

Travelling conditions on the patrol were not entirely propitious, as the ice in Dolphin and Union Strait, Prince Albert Sound and Minto Inlet was unusually rough, and the patrol had to follow the land in several places, which somewhat increased the distance travelled. There was also a lot of soft snow, especially in Coronation Gulf during the last three days of the journey.

The patrol was away from the detachment for 51 days and covered a distance of about 1093 miles, and the expense of the journey amounted to \$146.85.

Fort Reliance to Boyd Lake District.

A patrol, during which a new trail was established, was made in the early spring of 1935, by three members of the Fort Reliance, Great Slave Lake, detachment of the Royal Canadian Mounted Police: Corporal J. Robinson, Constable Fabien and Constable Fyfe. The journey lasted for 25 days.

Lack of space prevents us from publishing more than a very brief account of this interesting journey. The three men left Fort Reliance on February 25, with three dog teams; and having crossed Charleton Bay, an arm of Great Slave Lake, followed Pike's Portage to McKinley Lake, where they arrived at 2 p.m. the same day. Here they loaded up with 350 lb. of fish, a stove and a tent. Bad weather delayed a further start for 2 days, and they did not leave this point until February 28. Camp was made that night by a tributary of Snowdrift River. The next day, March 1, the patrol reached Sandy Lake, and from there travelled south-east over Whitefish Lake to a river forming the connection with Lynx Lake. March 4 was spent lying up in order to rest the dogs, at Timber Bay, one of the southern inlets of Lynx Lake: and the following day the party crossed the Lower Thelon River, and arrived at Lake Price. From here the patrol broke new ground. Travelling approximately due east, three lakes were crossed in succession, and named Timber Lake, Cleopatra Lake and Round Lake respectively. Continuing east, the patrol arrived at Elk River, about 4 hours' dog travel from Price Lake, and followed the river for about 2 miles. They report that there seems no doubt that it runs approximately north-east, and eventually joins the Thelon River at Granite Falls. The Department of the Interior Map of Northwest Territories, Sheet 2, tentatively shows this river to be running due south from Granite Falls, which would mean that the distance between the river and Lake Price would be about 40 miles; whereas, in reality, based on dog-miles, it is about 15 miles, leaving Elk River, and continuing south-east.

The next day the patrol, travelling south-east by east, reached, after about an hour's travel, a large lake which was named Andy Lake, after one of the dogs. A rocky ridge was then passed, on which cairns were seen, either erected by native children, or else by some exploring party; and a cairn was left at this point by the police. They then descended to a flat prairie, extending about 10 or 12 miles east, and as far as could be seen north and south. Later the same day, another large lake was crossed, about 7 miles wide, stretching towards the north. It was named Irish Lake, and the patrol made their camp there for the night.

On Friday, March 8, the journey was continued in an east-south-easterly direction, and after crossing small lakes and muskegs, the patrol struck two long lakes trending north; and the leader came to the conclusion that these might be two arms of the lakes noted by Pilot R. W. May, of the Canadian Airways, when he was flying in the Wholdaia Lake district. On continuing the journey east, the next day, the first setback was met with when rocks barred further progress. Several attempts were made to continue the journey; but after three false starts, lack of dog-food necessitated a return. The hope of getting any caribou was very faint, as nothing but a few tracks had been seen since leaving Fort Reliance. Accordingly, the patrol started back towards Elk River on March 12. Game was unusually scarce for the time of the year, as it had been reported by trappers who had been in the Thelon River district for some time that March is the month for the great eastward migration of the caribou. The leader of the patrol suggests that similar patrols should not leave Reliance before March 15, to allow time for the caribou to make their way into the district. He is also of opinion that such a patrol should continue due east from Whitefish Lake to the "bend" on the Thelon River, instead of going south-east by way of Lynx River and Elk River; and thence to Carey Lake, where the option would be either to go south to Boyd Lake, or north to Dubawnt Lake, depending on circumstances and dog-food.

Except for the three days when the patrol was held up by storm, two of which were at the beginning of the patrol, the weather was very favourable for the trip; and though extremely cold, the visibility was uniformly good. No complaints were received from either Indians or trappers encountered, and all were in good health.

The patrol returned to Fort Reliance on March 21, having covered 715 miles.

ANTARCTIC REGIONS

COMPLETED EXPEDITION

Ellsworth Antarctic Expedition, 1935-36.

The welcome news of the relief of Mr Lincoln Ellsworth and Mr Hollick-Kenyon by R/R/S *Discovery II* reached us just as the last issue of *The Polar Record* went to press. We were unable, therefore, to give details either of the Trans-Antarctic flight or the movements of the relief ships. We are glad to rectify the omission in this number by the following account compiled from *The Polar Times*, by permission of the American Polar Society, and from news in the press; and by the publication of the article by Admiral Sir Percy Douglas elsewhere in this issue.

Mr Ellsworth and his pilot, Mr H. Hollick-Kenyon, left the base ship *Wyatt Earp*, then at Dundee Island, off north-east Graham Land, at 8 a.m. G.M.T. on November 23, 1935, for the Bay of Whales. It was hoped that, given good conditions, the flight could be accomplished in 14 hours; but it was planned that in the event of bad weather, the two men would land and wait for better conditions. The plane, a low-wing Northrop monoplane, was chosen for the flight, because, apart from its known efficiency, its low wing and pedestaled landing gear lent themselves best for fastening to the snow in case of an enforced camping during a blizzard. The gross load of the plane was between 7000 and 8000 lb., the weight of the machine on skis being 3614 lb.

For the first part of the flight Mr Ellsworth and his companion followed the east coast of Graham Land for a distance of about 500 miles, as far as Stefansson Strait. Here they confirmed Sir Hubert Wilkins' discovery of a strait separating Graham Land from the Antarctic continent, though the strait did not appear to be more than a mile or so wide—much less than is shown on the maps. For the first 300 miles of the flight, as far as about Lat. 69° S., the Weddell Sea was quite open.

At 12.22 p.m., Stefansson Strait was crossed, and found to be much narrower than represented on Sir Hubert Wilkins' reconnaissance map. The low black conical peaks of Cape Eielson were easily distinguishable to the left. The plane had climbed to a height of 13,400 ft., where the temperature was 7.6 degrees below zero. From now onwards the flight was over unknown territory. Almost immediately high mountains were reached, some of them rising sheer to 12,000 ft., and extending as far as could be seen. This group was named by Mr Ellsworth the Eternity

Range, and three peaks passed on the right at 2.25 p.m., Mount Faith, Mount Hope, and Mount Charity. Both this range and the Graham Land mountains were, in Mr Ellsworth's opinion, of sedimentary formation; but the Hearst Land mountains were a rugged irregular range, without glacier filled valleys. By 2.30 p.m., the mountains had dwindled out into isolated nunataks, merging into a great snow plateau at a height of between 6000 and 7000 ft. Isolated patches of sastrugi were seen occasionally to the right, during the next half hour, but no crevasses. A quarter of an hour later, a mountain range with isolated black peaks appeared on the distant right horizon, but it faded out 20 minutes later. At 5 p.m., a few more peaks were seen on the same horizon.

On the left horizon from 5.20 to 5.45 p.m., mountains, 120-140 miles distant were observed, and there were also a few distant peaks. At 5.45 p.m., Mr Ellsworth dropped the Stars and Stripes on the hitherto unclaimed territory, and named the region between the meridians of 80° and 120° James W. Ellsworth Land, after his father, claiming it for the United States. The visibility at 6.20 p.m. became bad; but 110 miles further on another mountain range was seen on the right. It was about 75 miles long, and symmetrically formed, with peaks rising to 13,000 ft., clustered into a central mass, and dwindling down at each end to merge with the plateau. This Mr Ellsworth named the Sentinel Range, and the central peak he called after his wife, Mount Mary Ulmer. A quarter of an hour later, a long black topped range was seen on the southern horizon, about 100 miles distant, which was estimated to extend through one degree of latitude. The visibility during the flight had been from 120 to 150 miles, flying at an average height of 10,000 ft., with clear weather. About 9.55 p.m., low visibility made it advisable to land the plane, after a flight lasting 13 hours, 50 minutes. Camp was made in Lat. 79° 12' S., Long. 104° 10' W. at a height of 6400 ft. The undulating plateau, later named after Mr Hollick-Kenyon, extended in every direction. The distance from Dundee Island was 1450 miles direct, but owing to wind and clouds at the edge of Hearst Land, the actual mileage covered by the plane was considerably more.

The two fliers took off again at 5 p.m. on November 24, but after a flight of half an hour, bad visibility once more forced them down, and they remained in camp until November 27, when they started at midnight, hoping for better conditions. After a flight lasting fifty minutes, they were forced to land again by the worst weather they had so far experienced, the beginning of a severe blizzard which kept them in camp

for three days more. On December 4, at 11.10 p.m., a start was made, but the visibility was poor and the wind uncertain, so the two men landed once more to fix their position, which was Lat. $79^{\circ} 17' S.$, Long. $153^{\circ} 16' W.$ They took off again at 9 a.m. on December 5th, and flew over the plateau until within a few miles of Little America, their destination, where their fuel ran out, and they landed for the last time. There was no hurry, as the base ship, *Wyatt Earp*, was not expected to arrive in the Bay of Whales until the middle of January, so the two men remained four days with the plane, and secured her firmly to the ice before starting off for Little America, dragging their home-made sledge. They arrived at the abandoned huts of the Byrd Expedition on December 15, 19 days after leaving Dundee Island.

Meanwhile, owing to the failure of the transmitter of the plane, the base ship and the world at large were entirely ignorant of the fate of the two fliers, who were immediately reported missing; and various search schemes were set on foot. The plane radio set had failed at 4.15 p.m. on the first day of the flight, the switch and antennae lead having become defective; and between that time, and the arrival of R/R/S *Discovery II* in the Bay of Whales, no further news of the two men was received. On January 17, 1936, a cable from the master of *Discovery II* informed the world of the safety of the two men after their successful flight. The adventures of *Discovery II* are described in full in the article by Admiral Sir Percy Douglas.

Following on the silence of Mr Ellsworth and his companion, the party on board the *Wyatt Earp* immediately set about carrying out the rescue plans arranged with Mr Ellsworth before his departure, described in *The Polar Record*, No. 11. A Northrop plane was flown down from Kansas City, U.S.A., by Mr D. Merrill and picked up by Sir Hubert Wilkins on board the *Wyatt Earp* at Magellanes, Chile. The plane was fitted with interchangeable wheels, skis and pontoons for use in reconnaissance flying over any type of terrain or ice in the Antarctic. The *Wyatt Earp* left Magellanes on December 23, en route for Charcot Island, where Mr Ellsworth had requested Sir Hubert Wilkins to lay a depot for his relief in case a forced landing caused him to sledge in that direction. Passing through Cockburn Channel, the ship made good progress, and five days after leaving Magellanes was skirting the pack-ice within 55 miles of Charcot Island, but fog, snow squalls and heavy swell prevented the plane from taking off. The ship waited in the same locality until January 1, hoping for better conditions; but the fog and squally

weather continued, and thick ice barred all progress towards the island. This being the case it seemed advisable to proceed without further delay towards the Bay of Whales, the more so as the ship would then be following a course parallel to Mr Ellsworth's flight, at a distance of less than 500 miles; and it seemed possible that wireless signals might be heard at some part of the journey. It appeared to Sir Hubert Wilkins that, judging from the position of the plane when the wireless failed, Mr Ellsworth was more likely to be nearer the Bay of Whales than Charcot Island; and the ship's party had therefore no hesitation in pushing on to Little America with all speed, without waiting to land at Charcot Island. On January 4, 1936, the *Wyatt Earp* had reached Lat. $68^{\circ} 32' S.$, Long. $114^{\circ} 46' W.$, a position near the point attained by Rear-Admiral Byrd in the *Jacob Ruppert*; and still 2000 miles from the Bay of Whales. During the next few days, the ship made her way through quantities of icebergs, and on January 9 was only 700 miles from her destination. Two days later, while R/R/S/ *Discovery II* was waiting in Lat. $71^{\circ} 37' S.$, Long. $177^{\circ} 42' W.$ for an opening in the ice, the *Wyatt Earp* was being pushed slowly northwards by the northerly trend of the ice edge, and a strong wind. On January 13, however, she was able to turn southward once more, and proceed through long leads of open water helped by a strong north-easterly half gale. During this time, the absence of any message from the missing fliers was causing grave apprehension. At last, on January 20, the *Wyatt Earp* arrived in the Bay of Whales to find Mr Ellsworth and Mr Hollick-Kenyon safely on board *Discovery II*. The *Wyatt Earp* left Little America, having salvaged Mr Ellsworth's plane, at the end of January, and the expedition reached New York on April 19.

The flight is generally recognised to be the most important yet made in the Antarctic, not only because of the distance covered, but also for the results obtained. Lacking detailed maps and information, it is not possible at present to assess these at their true worth, but it seems probable that Mr Ellsworth will be in a position to confirm the belief of Byrd's pilot, Mr H. June, that there is no strait between the Ross Sea and the Weddell Sea. Mr Ellsworth's discoveries link up with those of Byrd, for the western margin of the Hollick-Kenyon plateau, behind the Edsel Ford Range, was seen by members of the Byrd Expedition, and the long rise to the plateau was surveyed by them up to 4000 ft.

Not least is the flight remarkable for the methods which brought it to a successful conclusion. The fact that the two men were able to land and

camp when the weather became unfit for travel, and after lying up in camp for several days to proceed, when the weather cleared, marked a new departure in polar flying; and that they were able to do this several times is a noteworthy feat. Other expeditions have made landings away from their base, but at no great distance; Mr Ellsworth cut loose entirely, and depended on nothing but his own resources for a flight of 2100 miles.

EXPEDITION IN THE FIELD

British Graham Land Expedition, 1934-37.

The British Graham Land Expedition has now carried out the plans outlined in *The Polar Record*, No. 11, and an advance base has been set up on "The Debs", a small group of six islands, half a mile west of the Fallières Coast, Marguerite Bay, in Lat. 68° 10' S., Long. 66° 52' W. The ship, having left the advance party there, has now returned to Port Stanley, Falkland Islands, and will refit either there or at South Georgia. The following account, compiled from various sources, takes up the story from the beginning of the open season of 1935-36.

The expedition spent the Antarctic spring of 1935 more or less confined to the Argentine Islands, the uncertain state of the ice making sledging journeys out of the question. The base, where they had lived since March, 1935, was established on one of the three main islands of the Argentine group, named Winter Island, on a rocky promontory running out from the foot of a steep snow hill, and forming one side of Stella Creek, which separates Winter Island from Galindez Island. Skua Island, the third of the group, lies to the westward. *Penola* was moored fore and aft in a bay off Stella Creek, about 300 yards away from the base hut. The base consisted of three buildings, the main two-storied hut, the hangar and the dog house. The front of the house and hangar faced straight on to the creek, and an ice-cliff opposite; and the house had a porch the whole length of the building, where the charging engine was kept. The hangar doors opened on to a slipway, so that the plane could be run straight into the water. On the hill behind the hut the meteorological screen was erected, with telescopic legs so that its height could be altered in deep snow.

The period from September to December, 1935, was spent in detailed scientific work, which was described in *The Polar Record*, No. 11, in the vicinity of the base; and in preparation for the move farther south. During this time, the plane was thoroughly overhauled by Hampton; the tractor, which had fallen through a weak place in the ice in July, and which had been lying in five fathoms of water since then, was salvaged by Millett and Moore, and made to work again; and a new boat

was built by Ryder. On December 17 Rymill and Bingham began to saw up and break the ice in the creek, in order to free the ship, and ashes were laid down preparatory to cutting out the main mass of ice between the ship and McMeek Channel. The work was continued on December 23, 24 and 25 by Bingham, Rymill and Moore. A network of cuts was made with ice saws, and during high tides the floes of ice thus freed were pushed clear of one another. By December 28 the creek had been opened up, as far back as the ship, thus enabling her to move about and carry out engine trials. At the same time the ice mass to the north-west moved out leaving only scattered floes, and allowing the ice to get out of the strait. The motor boat *Stella* was launched, and on January 3, the Captain and Second Mate having explored a route the day before, *Penola* was warped out, and started for Deception Island, towed by the *Stella* out of the creek, and as far as Uruguay Island. The *Penola* reached the open water an hour or two later, the engines going well. She was manned by the 7 members of the ship's party, and Moore and Roberts, and the object of the trip was to collect timber for building the hut at the advanced base, and to pick up the mail left at Deception Island for the expedition by Mr Ellsworth's ship *Wyatt Earp*.

On January 14 Rymill, Stevenson and Fleming started on a sledging trip, which they hoped would take them across the mainland of Graham Land. They were transported by *Stella* and a dory to a point just north of Cape Rasmussen, and, assisted by Hampton and Meiklejohn, climbed a stiff slope of rock and snow, 400 ft. in height, with dogs, sledges and equipment. They were only able to make half a mile that day, having surmounted this obstacle, as they did not start serious travelling until 6 p.m. and the going was heavy. The next day, after climbing a 1500-ft. peak to get a view of their proposed route, they decided to change over to night travelling in order to get better surface conditions; and they left the camp at 11.30 p.m. that evening. The loads were too heavy for the steep slopes, and they had to make two trips before the next camp was established on the north side of a large and much crevassed glacier running into Waddington Bay.

On January 16 the three men found an easy way across the glacier, and made their way up the south side to a ridge which forms the watershed between the Waddington Bay Glacier and the huge Berthelot Glacier to the south, which reaches the sea opposite the Berthelot Islands, south of Cape Tuxen. They climbed to a height of about 3500 ft. on the south side, but found the descent the other side on to the Berthelot

Glacier was too steep for dogs and sledges so they followed the dividing ridge to the north, until they were once more above the big glacier. They had to traverse both sides, as the centre was a mass of crevasses and ice-falls. From this point there was a steep drop down to the big glacier, and it appeared likely that if they could get down, they could work their way up the side to the head of the glacier, then across to the good going on the south side. They roped themselves together, and went down on skis to prospect a route; but after traversing the side of the glacier they were blocked completely by a chaotic maze of crevasses, and forced to turn back. A previous search by aeroplane had shown that there was no other feasible route to the east. Short though the journey was, however, it afforded opportunities for research on the valley glacier; and another day was spent trying to reach a rock exposure to obtain specimens, which, however, proved inaccessible. The three men returned to the base on January 19.

Penola returned from Deception Island on January 29, bringing the first mail received by the expedition for over 13 months. Whilst at Deception Island, Bertram and Roberts had spent 5 days studying a penguin rookery covering 15 acres and comprising 150,000 birds; and also making glaciological observations. Millett and Moore had managed to get an old workshop going on the island, and to make requisite spare parts for the ship's engines.

After a fortnight's hard work everything was loaded on the ship by February 14. To make room for all the cargo most of the interior fittings were removed; and on February 18 she sailed south, heavily loaded, and with a tremendous deck cargo. As there was no room for the plane on board, Hampton and Stephenson were left behind to fly on and join the ship when they received wireless instructions from the leader of the expedition.

The voyage was undertaken in stages; for each stage the route was prospected from the plane, and *Penola* then sailed to an anchorage seen from the air, the plane joining the rest of the party when conditions at the anchorage were suitable for landing. The ship followed a passage between the Biscoe Islands and the mainland, which had been roughly charted from the air; and thus reached her first objective, an anchorage since named Mutton Cove, 60 miles south of the old base. There she was delayed for three days by a strong northerly wind. On February 21 the voyage was continued, the route taking the ship west of the more southerly Biscoe Islands and Adelaide Island to an anchorage in a bay of small islands, 10 miles north of Jenny Island. Hampton and Stephenson were

informed by wireless, and they arrived the next day after a flight of $2\frac{1}{2}$ hours from the Argentine Islands. On February 27 Hampton and Rymill made a reconnaissance flight down the coast, and reported that there was a belt of loose pack some 10 miles to the south-east, but beyond that a lead of open water extending along the coast. The expedition got under way immediately, and *Penola* having forced her way through the light pack-ice, anchored at the new base in Lat. $68^{\circ} 10' S.$, Long. $66^{\circ} 52' W.$, 50 miles south-east of Adelaide Island, the same evening.

The new base is established on a small island, one of the group of six named "The Debs", 50-60 ft. above sea-level, with a shingle beach on which to erect the hut. The position is approximately where Nyen Fjord (which does not exist) is marked on current maps. The house has only one storey and a loft, but otherwise is much like the old base in plan. The advance party, consisting of Bertram, Bingham, Fleming, Hampton, Meiklejohn, Moore, Riley, Rymill and Stephenson, moved into their new quarters on March 24. As Roberts, who was to have been a member of the advance party, had been suffering from recurrent appendicitis, it was deemed advisable that he should change places with Bertram, and go north with the ship. *Penola* left the base for the Falkland Islands on March 12, and arrived at Port Stanley 10 days later. The engines were used only for the first 90 miles, until the ship was out of Marguerite Bay, and for the last 70 miles of the voyage. The ship sailed the remaining distance of some 1000 miles, and enjoyed favourable winds. *Penola* will refit, and return to pick up the advance party early in 1937.

In the course of two important flights in February and March, 1936, a large expanse of new land was discovered. On February 27, when Rymill and Hampton flew south to prospect for a base site from the islands where *Penola* was then at anchor 10 miles north of Jenny Island, a high range of mountains was seen about 190 miles away to the south, apparently linking up Alexander I Land, previously thought to be an island, with the rest of South Graham Land to the east. On March 10 a flight was made south from the new base to confirm this discovery, but after a flight of 30 miles, the visibility became so poor that the fliers were obliged to turn back. On March 13 the conditions were perfect for flying, and Rymill and Stephenson took off from the base at 11.15 a.m., and flew south for 75 miles, climbing to 5000 ft. What they saw to the south confirmed the impression which Rymill had formed from his more distant view. To the west of Alexander I Land there stood out a massive mountain group with snow-capped peaks rising to over 6000 ft. The range continues south-eastwards as a long chain of high precipitous

ridges, some of them estimated at over 7000 ft., extending to the east to join the southerly continuation of Graham Land. The coastal front of the mountains was clearly seen, and high peaks, some perhaps as far as 50 miles farther south, were also discernible in the hinterland. The whole chain is some 200 miles long, and encircles a large bay, the southern side of which was covered by a sheet of fast ice, studded with bergs, which had evidently been held there for some time. Along the south-eastern shores of the bay a large mass of barrier ice is fed by broad gently sloping glaciers which in Graham Land rise at over 4000 ft. and sweep round the island-like ridges 5000 to 7000 ft. high. Casey Channel, which is now proved to be non-existent, was thought to extend as a narrow strait right across Graham Land from east to west, in the same latitude as these glaciers. Beyond Cape Pierre Baudin the coast was seen to extend unbroken to the south-west, not as had been previously inferred to the south-east. Thirty miles south-west of the place where the plane turned, a narrow fjord was seen leading eastward into a rift in the high plateau, and this was the only visible break in the coast. The head of this fjord was not visible, and it is not yet known how far inland it extends; but it is quite small, and heads into a high mountainous region, so it probably extends only a few miles inland, like many steep-sided fjords which penetrate the mountainous coast farther north. This feature is the only thing which at the moment prevents the expedition from stating definitely that the western part of the newly discovered mountain chain, which includes Alexander I Land, forms a part of Graham Land. During the flight Stephenson drew a sketch map which will serve as a basis for topographical and geological work during the season 1936-37.

The latest dispatch received from the party, dated June 12, gives some account of the winter at the new base. At the beginning of May blizzards, which were the worst yet experienced by the expedition, delayed the formation of the sea-ice. The wind at its strongest reached an average force of 110 m.p.h., and for several days maintained a hurricane force of 90 m.p.h. accompanied by low temperatures. Fortunately, the blizzards were followed by a period of cold, calm weather, hastening the formation of the sea-ice, which was bearing in most places by May 15, and was suitable for sledging a few days later. By June 12 the ice had reached a thickness of over $1\frac{1}{2}$ ft., and the temperature was then -40° F. (72 degrees of frost), 12° lower than the minimum temperature experienced at the Argentine Islands in August, 1935. These conditions promise well for the accomplishment of the longer sledge journeys.

The early Antarctic winter of 1936 was spent in the training of dog

teams; five teams of 10 dogs were ready for the depot-laying journey, with another team in the making. This leaves the expedition with an ample reserve, mostly of young pups. On June 9 Hampton, having overhauled the plane, and fitted skis, instead of floats, made two trial flights in the winter twilight, and managed to land, in spite of the difficulty of judging his height above the snow surface in the uncertain light, by coming down northwards towards the light from the setting sun, with two people standing on the ice as additional marks. Hampton then made a flight southwards, with Rymill and Fleming, and though, owing to the fading light, they could not remain long in the air, they were able, from a height of 3000 ft., to see a considerable distance south and west over Marguerite Bay. The Bay was covered by an unbroken field of ice, with a few large bergs frozen in; and no open leads were seen. On June 11 the first depot-laying party, consisting of Rymill, Moore and Stephenson, started south with three teams, followed the next day by Bertram and Bingham, with their two teams, and by Hampton and Riley in charge of the tractor, towing a load of 1600 lb. They planned to travel southwards for about 60 miles to establish a depot at a point on the mainland coast from which Hampton and Stephenson had seen, on the reconnaissance flight, a possible sledging route eastward across Graham Land; to be used on the final sledge journey to Luitpold Land. The sun set for about six weeks on June 1, so the journey was carried out in darkness, with a few hours of twilight each day. It was timed, however, to take advantage of the moon. The aurora is infrequent in this quadrant of the Antarctic, and has been seen only once.

The combined depot-laying parties were due back at the base on June 21, after which the rest of the winter will be spent in further preparations for the spring journeys. Rymill, in a private message, has stated: "We are in a strong position here and expect a fruitful year."

PROJECTED EXPEDITION

American Antarctic Expedition.

It is stated in the press that Mr Harold June, chief pilot to the last Byrd Expedition, intends to lead a new American expedition to the Antarctic two or three years hence. The expedition will spend two years exploring the large uncharted area in the Pacific Quadrant, with the help of a new tank-like Diesel-engined tractor to be designed by Mr June. The party, which will consist of about fifty men, will also take planes; and a comprehensive scientific programme is planned.

MR ELLSWORTH AND THE *DISCOVERY II*

The relief, by the R/R/S *Discovery II* on January 16 last, of Mr Ellsworth and his companion Mr Hollick-Kenyon can now be recorded from the official report of Lieutenant L. C. Hill, O.B.E., R.N.R., Captain of the *Discovery II*, which has recently been received. For the following summary of this we are indebted to Admiral Sir Percy Douglas.

Leaving Dunedin at 06.00 on January 2 the voyage to the southward was mainly favoured by good weather. This assisted the preparations for those possible emergencies which had to be provided for. Sledges were overhauled and rebound, sledge harnesses were made and rations weighed and packed. The oil fuel which was stowed in drums was gradually pumped below. On an average about 30 drums per day were emptied. The airmen too were constantly busy with their own preparations.

At 5.40 p.m. on January 7 (zone -12 hours) light pack-ice was encountered in Lat. $66^{\circ} 48' S.$, Long. $178^{\circ} 51' W.$ There was no swell at this time and as the ice looked open it was decided to penetrate into it rather than to linger at the edge where a rising swell is dangerous. Throughout the evening of January 7 and the forenoon of January 8 steady progress was made through small soft floes which were liberally composed of snow. But on the afternoon of January 8 the ice was a little closer. A maximum speed of 30 revolutions was set through this belt and without straining in any way a large lead was reached by 5 p.m. Speed was increased and by varying the speeds as leads were approached and left a really large expanse of open water was reached by 9 p.m. in Lat. $68^{\circ} 24' S.$, Long. $78^{\circ} 15' W.$ It was thought that this was the last of the pack-ice and speed was increased to 100 revolutions. The flying season was advancing and it was hoped to gain as much time as possible. Ice however was again encountered at 11 p.m. on January 8. From this moment slow progress was made through pack and leads till 8 a.m. on January 10.

At 8 a.m. on January 10 in Lat. $71^{\circ} 37' S.$, Long. $177^{\circ} 42' W.$, the ship was surrounded with very heavy pack-ice. There was no room for a reconnaissance flight so a course was continued to the southward, endeavour being made all the time to make westing; by following the ice leads the maximum eastern limit had been reached for reasonable penetration to the Ross Sea. By 10 a.m. on January 10 it was resolved to have both anchors lifted clear of the ice, as it was feared they might be caught and perhaps rip the outboard face of the hawsepipes. This

operation took some time and the ship lay to till 4 p.m. before endeavouring to proceed. By 8.30 p.m. progress of about half a mile had been made when conditions became worse. It was decided to lie to for it seemed foolish to proceed and everyone required some sleep.

At 5.30 a.m. on January 11 an officer was sent aloft to report conditions. The Captain admits that he was perplexed at this moment and if water sky had been visible to the north he would have turned in that direction. But there was no such sky. A study of the available records too indicated that unless an unusual ice year was to be experienced the open sea to the southward should be encountered in about Lat. 72° S., and surely in Lat. 73° S. That was only eighty-three miles away as opposed to three hundred and eleven miles to the north. It was decided to continue. At this period the ship's company were more than ever helpful. All available hands including the scientific officers and the airmen stationed themselves aft with poles. By a system of whistles an officer indicated whether the ship could manœuvre ahead or astern. If she could not, then the poling party exerted their strength to push the floes away from the rudder and the propeller. These parts are extremely vulnerable and former sea experience showed the great need for caution. When the oil fuel was being pumped from the drums into the tanks instructions were given that the drums in the after-hold should not be emptied. This increased the after-draught and was an additional safeguard to the rudder. Outboard platforms had been rigged to assist the airmen when working with their aeroplane. These platforms proved most helpful, for by lying flat on them the propeller and the rudder could actually be seen. The floes were never forced at full speed, but the ship was manœuvred through the cracks or if no cracks were visible endeavour was made to bring her gently head on to the floes. After impact it was safe to increase speed until the pressure forced the floes apart. Although the floes at times were as large as the football fields encountered by Captain Scott and had sheer sides of about ten feet in height, they had mostly an overhanging soft buffer of snow which acted like a fender between the ship's side and the hard ice-spurs.

The noon position on January 11 was Lat. $71^{\circ} 35'$ S., Long. $177^{\circ} 34'$ E. This would appear to be two miles north of the noon position on January 10, but the difference was probably due to a northerly current. Relative to the pack-ice the ship must have made about four miles to the south.

At 5 p.m. on January 11 there was still no sign of the ice opening up. The wind, though still moderate, had increased sufficiently to make

manœuvring difficult. In an ordinary vessel the bow moves to starboard when the engines are put astern. In the *Discovery II* the stern is inclined to move in the direction of the wind whether the wind is on the starboard quarter or on the port quarter. As one could not always anticipate this movement it was decided to "lie to" again and await better conditions. While the ship was in this position a Fin whale was observed blowing in a small opening nearby, and this suggested that open water could not be far away.

The ship proceeded again at 4 a.m. on January 12. Two icebergs had drifted through the pack-ice during the night. If these bergs had not been near the ship would have remained stopped for some time longer; bergs are dangerous in pack-ice, and as it was necessary to keep away from them it was considered that working ahead through difficult pack-ice was the more reasonable course to follow. After about two hours difficult progress conditions eased and by 8 a.m. a pool of open water had been reached. This was the first pool which was large enough for flying safety and Flight-Lieut. Douglas offered to inspect the ice from the air. Before taking off he gave assurance that he would not fly in over the ice, but that he would circle the ship and if possible attain an altitude of about 2000 ft. From this height it was estimated that he could see approximately forty-five miles. While he was away the ship's motor boat was close at hand, all ready to proceed to his assistance should a forced landing take place in the water. The flight was completed and the Moth plane hoisted inboard by noon. Flight-Lieut. Douglas reported heavy floes ahead with several good leads in the distance. His report was sound and better progress was made until 5 p.m. on January 12. At this point some old and rugged floes stretched right across their path. A moderate wind was blowing and it was again decided to wait. This was fortunate for only one hour later the wind had made openings through which, with caution, the ship was able to proceed. Conditions from then onwards improved until by 8 p.m. it was considered safe to proceed all night.

At noon on January 13 the Moth plane was again flown. The report this time was of the utmost value, for impenetrable pack-ice was observed to the east. On closer inspection this unbroken ice stretched to the east as far as could be seen. By keeping away to the western edge of this ice the ship was able to make way through cracks and leads until about 3 p.m. when a lead of fifteen miles was reached. From this time onwards ice streams and leads were navigated alternatively until 2.50 a.m. on

January 14, when the open Ross Sea was reached in Lat. $73^{\circ} 23' S.$, Long. $179^{\circ} 15' W.$

The ice was undoubtedly very heavy but the ship was never in danger. Soundings were taken every four hours and no leaks were reported. This was only achieved by waiting and never charging or "butting" the ice while the safety of the rudder and propeller was ensured by the efforts of the men who formed the "poling party". The ship was perhaps fortunate in having such good weather for it was evident that it would have been difficult for the ship to be manoeuvred at the slow speeds desired if a strong wind had been blowing.

After leaving the main pack-ice belt a course was set to reach Lat. 75° in Long. 180° . This position was reached at 10.3 a.m. on January 14, when the course was readjusted to sight the Ross Ice Barrier near Discovery Inlet. The Ice Barrier was sighted ahead at noon on January 15; the weather was good and the visibility about thirty miles. All that afternoon, while coasting the barrier towards the Bay of Whales, the effect of mirage was remarkable. Icebergs and growlers were raised well clear of the horizon.

At 7.38 p.m. on January 15 the vessel rounded the west cape of the Bay of Whales. Shortly afterwards a tent was observed on the barrier surface at the east side of the bay. Two orange-coloured streamers were standing close beside the tent. The ship steamed as near to the position of the tent as possible, blowing the syren and firing a series of rockets in an endeavour to attract attention. No answer was made to these signals and there were no other signs of life. As the weather was calm and it had been ascertained from Sir Hubert Wilkins that orange was Mr Ellsworth's signal colour the airmen were asked to fly in over the tent and then towards the charted position of Admiral Byrd's base. They left the ship at 8.58 p.m. and returned at 9.35 p.m. with the report that one man had been seen at Admiral Byrd's base. While circling over this area a food parachute was dropped and the man on the ground was seen to pick it up.

By 11.15 p.m. a party had left the ship to go and meet the man. They had not gone far, however, when they met him and he proved to be Mr Hollick-Kenyon who suggested that they should all return to the ship. They arrived on board at 0.55 a.m. on January 16. Mr Hollick-Kenyon reported then that Mr Ellsworth was safe at Admiral Byrd's base but that blistered feet had prevented him from joining that evening. The relief party was ready to go out and bring in Mr Ellsworth but Mr Hollick-Kenyon

gave assurance that there was really no need for such haste. He also mentioned that he would like a rest before going out again to guide the ship's party over a large tide crack which existed between the sea-ice and the Barrier. The ship therefore stood out to sea until clear of the bay ice and lay-to.

At 9 a.m. on January 16 Mr Hollick-Kenyon set out with a ship's party towards Admiral Byrd's base. He guided them over the tide crack which has been mentioned and returned alone to the ship by 12.30 p.m. A scientific station was worked while waiting for Mr Ellsworth who arrived on board at 9.37 p.m. on January 16. He seemed comparatively well but it was perhaps fortunate that his relief was not delayed. His foot was poisoned, and though not very bad when he was met it might have had serious consequences within a short time. He received medical attention for several days.

From information acquired in conversation with Mr Ellsworth and Mr Hollick-Kenyon it was learnt that the severance of their wireless communication during their flight was caused by the breakdown of their transmitter.

Having some time to spare before the arrival of the *Wyatt Earp* it was agreed that the time might most profitably be used by starting a brief scientific survey. The ship sailed from the Bay of Whales at 7.40 a.m. on January 17 for this purpose.

On Saturday, January 18, the vessel was again close to the barrier on her return voyage to the Bay of Whales. This time however visibility was poor. A strong southerly wind was blowing. This caused drifting frost smoke and by Saturday evening the visibility was so poor that it was decided to stand out to sea and await better conditions. The ship was able to proceed ahead by 2 a.m. on January 19. At 6 p.m. on this same evening the *Wyatt Earp* was sighted ahead and it was decided to ask Sir Hubert Wilkins on board. This enabled him to discuss his business with Mr Ellsworth and hastened the ship's final departure from the Bay of Whales. It was decided that evening that Mr Ellsworth should return to Australia in the *Discovery II* and that Mr Hollick-Kenyon should transfer to the *Wyatt Earp* to assist in the salving of the abandoned aeroplane.

The *Discovery II* arrived at the Bay of Whales at 4 a.m. on January 20 and left again at 0.40 a.m. on January 22, to complete a series of stations in the Ross Sea, there being sufficient spare oil on board.

The vessel approached Cape Crozier at 0.30 a.m. on January 26, where

the scientific officers landed to collect some rock specimens. They returned to the ship at 2 a.m. and a course was set to pass between Cape Bird and Beaufort Island so as to arrive at McMurdo Sound where a dredging station had been arranged. At 4.20 a.m. pack-ice was sighted ahead. There seemed no limit to this ice so the ship turned to the north and headed towards Franklin Island. This island was sighted, but pack-ice again hindered movements. The ice stretched far west towards the coast of Victoria Land.

From the position off Franklin Island course was directed to a position in 73° S. and 178° E. It was hoped to have a favourable passage north near this meridian. Pack-ice was sighted at 9.15 p.m. on January 27 in Lat. $73^{\circ} 37'$ S., Long. $177^{\circ} 59'$ E., but as it appeared to be rather heavy the ship steamed west to Long. $176^{\circ} 43'$ E. before entering. Little difficulty was experienced on the northern voyage apart from one period between 4 a.m. and 9 a.m. on January 29 in Lat. $72^{\circ} 41'$ S. and Long. 178° E. The floes here were large like those seen on the southern voyage but the openings were bigger. After passing this area the ice opened up. There were no large leads; the ice seemed to have spread out into the leads which had been noted on the way down while the floes were generally much smaller and softer. Two aerial flights were made to inspect the pack-ice on January 28. At midnight January 29-30 a definite northerly swell was observed in Lat. $71^{\circ} 57'$ S., Long. $178^{\circ} 38'$ E. This persisted until 6 p.m. on January 30 when open water was reached in Lat. $70^{\circ} 55'$ S. and Long. $178^{\circ} 40'$ E.

After leaving the pack-ice a course of 000° was steered until 10.51 a.m. on February 1 when the course was altered and the ship headed west towards the Balleny Islands. Ordinary scientific observations were made. At 5 a.m. on February 3 the most northern island of the Balleny group was sighted ahead. There was no sign of Row Island and as the weather was clear and there was no pack-ice to be seen it was thought that a brief survey of the islands would be of great interest. They were surveyed until 2.30 p.m. and during the morning good sun observations were obtained. At 2.30 p.m. the vessel had reached a position off Borradaile Island where a spit suitable for landing was seen. The motor boat was launched and a party left the ship to make a landing and collect rock specimens. They had only left the ship for about half an hour when the weather set in thick with snow. They were at once recalled and guided back to the ship by the syren. They arrived on board at 4.47 p.m. and reported they had not landed. The ship then steamed clear of the islands and lay-to hoping

for the weather to clear. A closer inspection of the islands seemed valuable for what was seen differed greatly from Balleny's report in 1839. The islands appeared much closer together than charted while the 12,000-foot peak marked on Young Island does not exist. Young Island and Buckle Island rise gently to about 3000 ft.; there are no peaks or any recent sign of volcanic activity. The weather however remained thick and at 4.32 a.m. on February 5 the survey was abandoned.

After the Balleny Islands had been cleared a course was set to pass over the reported position of Emerald Island. Good sun observations were obtained at 5.29 p.m. on February 7 and star observations were taken at 0.11 a.m. on February 8. These observations and other sun observations taken at 2.29 p.m. on February 8 show that the vessel passed two miles east of the charted position of the island at 6.15 a.m. on February 8. The sky was heavily clouded at that time but the visibility was about ten miles. The island was not sighted, while the sounding at 6.12 a.m. on February 8 was 2595 fathoms; the island therefore cannot possibly be where charted.

From February 8 until 4 a.m. on February 13 strong north-westerly winds were experienced and little progress was made. By 6.53 p.m. on February 11 a very high sea was running and the ship hove to until 9.10 a.m. on February 12. Conditions then eased and by noon on February 13 moderate south-westerly winds had developed.

Eddystone Light House was sighted at 3.53 p.m. on February 15. The course was directed through Banks Strait and the Pilot boarded off Port Phillip Heads, Melbourne, at 4.51 p.m. on February 16.

ANTARCTIC WHALING, 1935-36

By mutual agreement of the two countries British and Norwegian pelagic whaling in the Antarctic (with which for whaling purposes South Georgian waters are included) during the season 1935-36 was limited to the period December 1, 1935, to March 15, 1936. The only factory ship not limited in her operations by this restriction was the Japanese *Tonan Maru*, ex *Antarctic*, then operating under her new flag for the second time. The pelagic season was thus limited to 106 days. In actual fact many ships ceased working before March 15; two factories had reached Norway before the end of March, and nine by the middle of April. It is hoped that the curtailment of season, and in particular the later start ensured, will have afforded useful protection to the stock, particularly that of the most valuable species, the Blue whale, which is at present the most menaced by intensive whaling.

No particulars are yet available as to the numbers of whales taken during the season, but an agreement to restrict the production of Norwegian, British and Argentine factories to quantities specified in advance succeeded in keeping the output of oil substantially unchanged. During the season 1934-35 the total Antarctic production, according to the *Norsk Hvalfangst-Tidende*, was 2,420,764 barrels. Last season it was 2,393,150 barrels. It would perhaps be wise to regard all figures for last season as somewhat provisional, but there is no doubt of their essential reliability. The land stations, represented by two in South Georgia, produced only about 6 per cent. of the oil: they did well, however, with Blue whales, and it may be that the stock visiting South Georgia is recovering to some extent owing to the partial rest afforded it by the diversion of whaling effort to pelagic operations, with consequent slackening on South Georgia grounds. The national status of some whaling companies is difficult to define, but, as far as the writer can determine at present, 49 per cent. of the oil was produced by the companies of the British Empire and 46 per cent. by those of Norway. Japanese production, though estimated at only 40,000 barrels, was over four times as great as during last season.

Unfortunately so far apparently it has not proved practicable to reach any agreement as to limitation of production during the coming season,

nor has any proposal for limiting the number of whaling expeditions met with general support. The difficulty of arriving at such an agreement undoubtedly is greatly increased by the participation of Germany in next season's whaling in the south, and the continued and increased participation of Japan. Even supposing agreement could be reached as to the total production that should be permissible, to be effective this decision must cover all Antarctic whaling. Japan is not a signatory to the Whaling Convention of 1931, and Germany has not yet ratified her signature. Even were either or both of these States to come into line with the whole of the policy of limitations followed by Great Britain and Norway, including limitation of total production, the agreed total would now have to provide for the newcomers at the expense of the established companies, or to be expanded on grounds not of unobjectionable capture but of expediency. Agreement is thus very difficult, and it is increased by the fact that factories are increasing both in number and efficiency. In Germany two large factories are under construction, one of which will be a German whaler, while the other is expected to sail under the British flag: the press reports the placing of orders for a third factory ship. Japan is building a large factory, while keeping *Tonan Maru* in commission, and is reported to have plans for other vessels. A smaller factory has been bought from Norway by a British company and will be reconditioned and improved. There are reports of the building of 40 new whale catchers. Taking from all these reports only the items already established as correct, it will be seen that there is every reason to expect a great accession of strength to the southern whaling fleet. The immediate future for the industry appears only too likely to be one of a greater oil production than the whale stock can afford without depletion so great as to cause lasting damage both to the species and the whaling industry. The prime cause for this expansion is no doubt the high price of whale oil, which now has twice the value it possessed a very few years ago. Whatever the cause, however, the position is not hopeful for steady and continuous prosperity, and any method of rational restriction of whaling that would bear fairly on all or practically all the whaling interests concerned would be to the advantage of the whalers, as well as obviously assisting in the preservation of the species attacked.

J. O. B.

TRACTOR OPERATIONS ON THE SECOND BYRD ANTARCTIC EXPEDITION

For the following article we are indebted to Admiral Byrd, and also to Mr Demas, his chief transport engineer, by whom it was written. It is printed almost exactly as received, but the Editor would like to remind readers, that, though the manufacturers of the machines described are to be congratulated on their design, their successful operation in severe conditions was almost entirely due to the skill and endurance of Mr Demas and his assistants, as can be realised fully only after reading Admiral Byrd's narrative.

On the Byrd Antarctic Expedition II a third mode of transportation was added to the existing means of dogs and aircraft—the use of tractors. Previous attempts had been made to use motor transport, first on Shackleton's Expedition in 1908, Scott's in 1910, and on the Byrd Antarctic Expedition in 1928–30. Shackleton had taken a regular motor car, which was of use on the hard bay ice, for handling supplies, but it proved inadequate for the softer surface of the barrier. Scott used special tractors, but they were not a success.

On the Byrd Expedition of 1928–30, a Ford, equipped with two idler wheels on a horizontal movable axle and a metal tread running over the idler and rear wheels for traction, was used. The tread was designed for hard packed snow with a solid foundation under it. The "Fordmobile", however, did demonstrate that tractors would also be practical on the softer barrier surface. A trip of 72 nautical miles was made by this machine, but ultimately the differential gave out, due to the sudden gripping of the treads, after the machine had dug itself in, and it had to be abandoned. This machine was found in 1933, buried under 8 ft. of snow. In 1934 it was dug out and towed back to Little America; but at the last minute it had to be left behind, with three others, at the edge of the barrier, owing to the breaking up of the ice at the docking place.

Admiral Byrd was convinced of the importance of mechanical surface transportation, so he equipped his second expedition with the following machines:

- 1 30–40 Cletrac,
- 2 Fordmobiles with Arps Motor Co. Tread attachments,
- 1 Citroën-Kegresse Snow Cars.

Performance of the Cletrac.

The Cletrac travelled approximately 200 nautical miles in the unloading between the ships and Little America, hauling as much as 8 tons to a

load. It also made a 200-mile trail journey to the Bolling Advance Weather Base, a journey which was interrupted, and then resumed, as will be later explained. For this journey the machine was equipped with 24-inch plates on its 8-ft. tread, to decrease the bearing load. A 50-gallon tank for fuel was installed, giving it a total capacity of 75 gallons. The metal top on the cab was replaced by a fabric one to afford an extra means of exit in case the machine fell into a crevasse, and it also protected the personnel against injury in case they were thrown against the top. The hood was lined with asbestos cloth to decrease heat losses by radiation.

A remote control system was devised to meet the exigencies of this journey. A line was attached to each guiding lever of the tractor and brought out to the rear sled. A wooden lever operated by a line running through a pulley attached to the dash-board and then brought back to the rear sled was used to operate the clutch. The Cletrac was put into gear while the clutch was being held out, and the driver got out and then released the clutch by releasing the line, and thus operated the Cletrac from the rear sled. The tractor was stopped by throwing out the clutch by pulling on the line from the driver's position in the rear sled. The remote control system was used in traversing crevassed areas.

After the first stage of this 200-mile journey—at 67 miles from Little America—the Cletrac had to be abandoned until the next year. The crank-pin on the shaft was sheared off by the crank. The throw-out spring was weak. The crank was frozen to the bearing by condensed moisture. It was repaired, but the temperature had dropped to 60° below and we could not supply enough heat to the motor to loosen the oil so that it could be cranked.

In January, 1935, after being buried for ten months, the Cletrac was dug out of the drift, started, and completed its interrupted journey to the Advance Base. The house which Admiral Byrd had occupied there and its equipment were loaded on the sleds, and the Cletrac hauled them back to Little America along with the Fordmobile of the first expedition, which was picked up on the way home at a distance of 72 miles from Little America.

At 53 miles from Little America, on the way back, the condenser on the magneto burned out. The radio battery was then used with a Citroën coil and condenser, and, utilising the magneto as a distributor, the magneto ignition system was converted into a battery system, with which the Cletrac completed the trip and continued service until the last moment when it had to be abandoned.

Cletrac troubles. The only troubles experienced with the Cletrac were those mentioned above; there was, however, occasional clogging of the gas-line by dirt or ice from condensation. Condensation ice caused similar trouble with the air-filter.

Fordmobiles. The Fordmobiles were 1932 Model A Ford motors and chassis. The bearing surface of the treads was $4\frac{1}{2}$ feet, 14 inches wide. Skis were used in front instead of wheels. A set of skis were made of hickory on the way to the Antarctic on board the *Jacob Ruppert*, as the steel skis furnished with the machines had proved inadequate for Antarctic use on the first expedition.

The exhaust from the engines on the Fordmobiles was led through a jacket around the transmission and rear end to warm these sections while idling the cars in the extreme temperatures.

The reduction gears on the rear wheels of these Fordmobiles were found to be weak and were unable to stand up under the torque developed when the tread, which had a tendency to dig in, suddenly gripped. The gears were part of the tread arrangement installed by the Arps Company. An attempt was made to soften the gears by reheating and tempering them, but they still proved inadequate.

It is the writer's opinion that the fault was entirely with the design of the tread. It is his belief that a flat tread plate with half-inch angle rib incorporated will perform well in the Antarctic, or any place with similar snow conditions. One of these Fordmobiles was repaired with the remaining spare parts during the winter months and did considerable useful work around the camp. Extreme care had to be used, however, in driving it. It performed well if the snow was hard-packed but on soft snow it was likely to get stuck.

[Here follow specifications of the Citroën-Kegresse Snow Cars in the original article.]

General. For six weeks during the unloading period, the three Citroën Snow Cars and the Cletrac ran continuously twenty-four hours of the day. They were stopped only for minor repairs and periodic fuelling, inspection, lubrication, and greasing.

In the low temperatures it was necessary to heat the grease gun and the bearings to be greased. It would be advisable for future cold weather operations that larger grease passages be incorporated on the bearings to facilitate the greasing operations.

The Citroëns were operated in third and second gear. Due to snow conditions, no load could be pulled in the fourth gear.

Lubricants used:

At 0° F.	Tydol A.A.E. 40
At sub 0° F.	Tydol A.A.E. 10 and 20
Grease	Tydol 600 W (for transmission and rear end)
Water pump	Tydol water pump grease
Bearing grease	Tydol 600 W with 25 per cent. kerosene

Gasoline:

Tydol Triple X

Gas consumption: Tests made at 36° F.

Citroën: 3rd gear, 7000 lb. load, 1.7 nautical miles/gal.
2nd gear, 7000 lb. load, 1.2 nautical miles/gal.
3rd gear, 8-ton load, .9 nautical mile/gal.

Considerable discomfort was experienced in making these tests. A one U.S. gallon can with a rubber stopper with two holes for air and fuel delivery pipes was used. A rubber hose was used to make the connection from the can to the carburettor.

Distance covered by cars in nautical miles:

Citroën	Unloading and	Trail	Total
	loading		
	Nautical miles	Nautical miles	Nautical miles
Car 1	3500	1319	4819
Car 2	2800	970	3770
Car 3	2000	1111	3111
			Total 11,700

Method used for starting in sub-zero weather. Above zero it was necessary only to turn over the engine several times by hand to loosen the stiff oil so that the motor could be spun for starting.

Below zero temperatures, the cooling solution and oil were drained and preheated for starting. However, this consumed too much time so that it was not used more than three or four times. The method which proved quicker and less troublesome was as follows:

A Van Prag vertical blow-torch was placed under the crank case of the cars and the oil was heated in the motor. Then some of the heat got to the cylinder walls to loosen the oil. Care had to be exercised so as not to get the oil too hot. Also a constant watch was kept to prevent fire. The crank was constantly being tried, and just as soon as it moved the motor was turned over by hand to help the loosening of the oil. As soon as the motor could be spun, the torch was removed, the carburettor flooded, the ignition turned on, and the car was started.

To minimise heat losses the entire front part of the car was covered during the heating with a canvas cover made for that purpose.

The time required for starting a car varied with the temperature and wind. At 20 below, with a ten-mile wind, 45 to 60 minutes were consumed. If the car faced the wind it took 45 minutes, if not, it took an hour. At lower temperatures as much as three hours were spent in getting the machine started. Below 50° F. we found it advisable to heat the transmission and rear ends of the cars after the motor was started and previous to getting under way.

At low temperatures it required fifteen to twenty minutes on second gear before the third gear could be used. This was due to the cold bearings on the other moving parts of the machine.

Changes made on the machines for trail operations. The following is quoted from a report to Admiral Byrd by the writer:

Little America, October 20, 1934.

Subject: Safety precautions and improvements on the Tractors for Antarctic operations.

1. An oil tank has been installed under the hood of the dash-board of each machine. There is a line from the tank to the oil-filler neck with a pet-cock on it for adding oil to the engine when necessary. This tank holds ten gallons of oil which will be sufficient for a long journey. The tank, being under the hood, permits the heat from the engine, when running, to heat the oil and save fuel, which would have been used otherwise, and, preventing waste by spilling, saves an enormous amount of time. It also saves the men a good deal of cold work.

2. Drain pet-cocks have been installed on the engine block and radiators with copper tubing leading out to an accessible position for facilitating the draining of these parts of the machine if the temperature is lower than the solution can stand without freezing, or in case the solution is lost and water has to be used.

3. A small line with a T connection and a pet-cock was added to the gasoline line before it reaches the fuel-pump in order to blow the line clear in case it plugs up. This has been one of our chief troubles during our operations so far. Before, we had to take the lines apart to blow them clear, which caused connections to leak, thus increasing our troubles by permitting air to be pumped; so that there would not be sufficient gas supplied to the carburettor by the pump. By means of these pet-cocks we will be able to blow the line clear in a very short time instead of after hours of cold, miserable work with cold gasoline dripping and soaking us, and freezing our fingers.

4. We have built racks under the hood for the oil cans and grease guns so that they would be handy with warm grease and oil for greasing and oiling while on the trail.

5. We have added a pan under the entire engine to keep all possible

heat under the hood and prevent the cold air from striking the crank case pan and cooling the oil.

6. A toggle switch was installed in the ignition system for quick switching in case of an accident by falling into a crevasse and a gas line breaking, thus minimising the fire hazard.

7. A switch was installed between the generator and battery lead, so that when the generator cut-out sticks, the switch could be opened and thus prevent the burning of the cut-out and generator at low speeds of the engine.

8. Pieces of raw hide were tied to the door latches and the forward end of the door to allow the occupants an easy and quick way of operating the doors in case of an emergency.

9. New bodies were built on the rear out of angle iron frame work, with wooden floors and sides up to three feet; and the rest of canvas, due to lack of lumber.

10. Under the floor, a 145-gallon airplane gas tank was installed connecting with the regular tank of the car, giving a total capacity of 172 gallons.

11. In the rear two folding-bunks were installed which folded up against the sides. The bodies are five feet high, six and one-half feet long and eight feet wide. The centre and sides under the bunks were used for cargo space. In the forward part was a box for the cooker and cooking utensils and another box for a week's rations for two men. This arrangement saves a great deal of time while travelling the trail and will also permit twenty-four hour operation while on the trail if desired.

The following is a summary of the function of the various parts of the machines.

Cooling solution. Everready Prestone anti-freeze was used in the cooling system. It gave excellent results. The cars were operated as low as 71° F. below zero with a 60 per cent. solution. It was found necessary to mix the solution before putting it in the cars. The hydrometers supplied were found to be unreliable due to dirt sticking to the sides of the tube of the hydrometer. Care must be exercised that the solution does not reach above 62 per cent. Prestone, as the solution is reversible and at percentages greater than 62 per cent. will freeze at 10° F. above zero. However, in one of the cars (Cletrac) the 60 per cent. solution remained in the car throughout the Antarctic winter, and stood temperatures of 78° F. below zero without any damage to radiator or cooling system. A 40 per cent. solution was frozen in a can as an experiment and no noticeable expansion of the solution resulted.

Fan belts. Rubber V-shaped belts were used to drive the fan and generator. It was found that at lower temperatures than 50° F. below

zero the rubber became brittle and the belts flew apart. The belt should be warmed up before starting the engine. Then while running sufficient heat is created by the friction to keep the rubber elastic. Spare fan belts were made of leather, and notched leather pieces riveted to the circumference.

Generators. The generator cut-outs stuck frequently and burned out. They were rewound and a switch was put in the circuit to break contact, and thus save the cut-out and the generator.

The brushes showed undue wear in low temperatures. A General Electric engineer advised soaking them in kerosene and oil and this remedied the trouble. Spare brushes were made of the positive poles of dry cells on one of the mid-winter journeys.

Starters. The starters were very seldom used so that the battery current might be conserved.

Batteries. The cars were equipped with cadmium-nickel-alkali batteries which gave excellent service. Lead batteries were also used with equal success. However, care had to be exercised to keep them well charged to prevent freezing.

Ignition system. The ignition system was of 12 volts and gave excellent service. No trouble was experienced with the coil, condenser, points, or distributor. Mica spark plugs were used, due to extreme changes of operation temperatures. Porcelain plugs tended to crack under these conditions.

Fuel pump. The fuel pump was of the diaphragm type, operated from the cam shaft. It gave excellent service.

The cork gaskets on the strainer bowls, however, were a constant trouble owing to leaking air. These were replaced by rubber ones which had to be changed frequently. Rubber was the only available material for this purpose. The bowls had to be cleaned frequently due to ice condensation.

Gas-line system. The tanks were lead-coated and painted with some black paint which flaked off, clogging the gas-lines. A T fitting, with a short piece of pipe with a pet-cock was installed at the fuel strainer so that the lines could be blown clear without taking them apart. A tire-pump was used for this purpose.

On one occasion the gas-line was rubbing against the drive shaft and a hole appeared. Finally, the hole became so large that the car stopped, five miles from Little America. A blizzard started, something had to be done in a hurry to get the car going before it became cold. There were no heating torches available to warm it up. Rubber and friction tape would

not hold in the cold temperature. After hunting through the car a package of chewing gum was found; all five sticks were chewed and collected. The gum was applied to the hole and a rag wrapped around it and the car was started and driven in to Little America. Thus a package of gum saved a probable disaster for the party of five men. It was extremely dangerous to travel on foot in this crevassed area.

Carburettion. The carburettor was of the "Vertical Saalex" "starter-type". It is of simple design and operation. The jets clogged frequently from condensation. Small particles of ice would clog the metering jet which necessitated taking the lower part of the carburettor apart to clean the jet. Wing bolts were installed so that the lower part could be dropped quickly for this purpose.

Clutch. The clutch was of the Citroën two-ton type and gave excellent service. One did burn out at a most inappropriate time, but that was due to the heavy load and to previous use.

Steering gear. The steering gear was of the worm-gear type and handled surprisingly easy on the snow with wheels and skis.

Speedometer. The speedometer was connected to the transmission and calibrated in knots (nautical miles). The drive-coil spring gave out, due to solidification of the grease in the cold temperature. The mileages given in the earlier part of this report are a conservative estimate.

Transmission. Considering the fact that the cars were operated in second and third gears instead of fourth, and with 50 to 100 per cent. overload most of the time, the transmission is a credit to the manufacturer. In fact the entire car is a credit to the late Monsieur Citroën.

Drive shaft and universals. The drive shaft was of the slide steel tubing type. The universal joint housing packed with a felt washer threw the grease out due to centrifugal force and two drive shafts were ruined in the latter part of operation of the cars.

Rear end. The rear end gave excellent service. One of the cars which had fallen in a crevasse, losing its grease from the vent, ran 25 miles without grease, and 50 miles with S.E.A. 40. When inspected, the only harm indicated was slight chipping of the edge of the teeth. It was cleaned and put together and continued to give excellent service.

The rubber-coated canvas belt. The belt was 2 inches wide and had a theoretical length of 18 feet 6 inches and was fitted with:

1. On the extreme face with 68 duraluminium shoe-plates, each supporting a wearing pad of rubber with canvas base.

2. On the internal face: (a) At the centre—68 centre guides of fibre attached to the belt by bolts which also held the shoes and rubber pads. (b) On the sides—136 driving teeth (68 on each side) fixed by bolts to the belt and shoes.

The belts gave excellent service. In low temperatures, the rubber became brittle and cracked; the canvas, however, held the belt together. In all of our operations only one patch was necessary to replace one bad split on one of the belts.

Recommendations for future expeditions. Although the Cletrac and the Citroëns performed successfully in the Antarctic as low as 71° F. below zero, there is plenty of room for improvement for future low temperature operations.

A tractor for the Antarctic should be 30–40 feet long, with front and rear drive, built of light material with the weight equally distributed. It should have a wide tread with a maximum bearing load of one pound per square inch of surface. The motors should be inside the body and easily accessible. The load should be carried within the body. Air-cooled engines would be preferable. The fuel should be heated separately for starting, and the exhaust used for heating the fuel while operating.

The length is needed for bridging crevasses which proved such a hindrance to the recent operations on certain sections of the continent.

Low temperature operations would be greatly simplified if a lubricant could be developed that would retain its lubricating qualities at the temperature of the engine and at the same time remain a liquid at 75° F. below zero. There is urgent need for such a lubricant at present in Canada, Alaska and Russia, where airplanes and tractors operate at low temperatures.

Certain refinements could be made in the gasoline engine to improve its performance under extreme conditions. The fuel should be pre-heated before entering the carburettor by a fuel coil around the exhaust, or immersed in the cooling solution. The air should also be pre-heated before entering the carburettor. This would prevent clogging the jets by condensation, assist in complete vaporisation of the fuel, and improve the fuel consumption.

A magneto ignition system should be used instead of the battery. The generator and fan should be gear-driven. The generator should be used for lighting, and for operating the radio.

In conclusion, Admiral Byrd and the members of his recent expedition are grateful to the Cleveland Tractor Company, the Ford Motor Company,

the Tydol Company, and the late Monsieur Citroën for their generosity in donating the cars and supplies to the Expedition.

Their operation was an experiment in exploring a most desolate continent which has defied conquest and claimed the lives of many daring men.

It was with deepest regret that we sailed, leaving three of these machines sitting on the edge of the barrier to be claimed by the Antarctic. The Antarctic was cheated out of one car, which was brought back and is now in storage in Boston.

E. J. DEMAS

In Charge of Tractors

Byrd Antarctic Expedition II

ANNUAL REPORT OF THE NEW ZEALAND ANTARCTIC SOCIETY FOR 1935

The New Zealand Antarctic Society is now in its second year, and the first Annual General Meeting of the Society was held on March 28, 1935.

The Society has as its Patrons Sir Douglas Mawson, Vice-Admiral Sir E. R. G. R. Evans, and Rear-Admiral R. E. Byrd; the President is The Hon. Mr Justice Ostler, and the Vice-Presidents are Mrs H. T. Ferrar, Mr C. R. Ford, Mr R. A. Falla and Mr R. G. Simmers. The council numbers 14 members, and Mr C. E. Collins is Secretary.

The Society has been in touch with all expeditions to the Antarctic since its foundation, and is also in close co-operation with overseas organisations of a similar character; though, in contrast to the previous year, when several Antarctic expeditions called at Wellington, no expedition visited the Dominion during the session. The activity of the Society has been well maintained, however, by means of a course of lectures, and by active measures to increase its membership and scope. The Society has been presented with records, press-cuttings and photographs of various expeditions, including those of Shackleton, 1907-9, Scott, 1910-13, the Second Byrd Expedition, and the recent voyage by *Discovery II* to the Ross Sea. These form the nucleus of a valuable collection.

RECENT POLAR BOOKS

The following books, recently published, have come to our notice:

ARCTIC

- BIRKET SMITH, KAJ. *The Eskimos*. Translated from the Danish by W. E. Calvert and C. Daryll Ford. London: Methuen & Co. 1936. 9 × 5½ in. Ill. Maps. Pp. xiv + 256. 15s.
- BOLTON, C. K. *Terra Nova: The North-east Coast of America before 1602*. Boston: F. W. Faxon Co. 1935. 8½ × 6 in. Ill. Map. \$3.50.
- FREUCHEN, P. *Arctic Adventure*. New York: Farrar & Rinehart, 1936. Ill. Pp. 467. \$3.50.
- *Invalu: The Eskimo Wife*. New York: Lee Furman, 1935. \$2.50.
- GORKY, M. *The White Sea Canal*. Being an Account of the Construction of the New Canal between the White Sea and the Baltic Sea. Edited by Maxim Gorky, L. Auerbach and S. G. Firin. English Edition by A. Williams-Ellis. London: John Lane, 1935. 9 × 5½ in. Ill. and Sketch Map. Pp. xviii + 356. 15s.
- HELLENTHAL, J. A. *The Alaskan Melodrama*. New York: Liveright Publishing Co. 1936. Ill. Map. Pp. 312. \$3.
- HOLTEDAHN, O. *Scientific Results of the Norwegian Antarctic Expedition, 1927-28*. Oslo: Jacob Dybwad, 1935. Vol. 1. Ill.
- HUBBARD, B. R. *Cradle of the Storms*. New York: Dodd, Mead & Co. \$3.
- JENNOV, I. G. *Østgrønlands Fangstkompani "Nanok" S. "Gefion" Ekspedition*. Copenhagen: Levin & Munksgaard, 1935. Publikationer om Ostgrønland udgivet af Kartajn Alf. Trolle. Ill. Pp. 54.
- LINDBERGH, ANNE MORROW. *North to the Orient*. London: Chatto & Windus, 1935. Ill. Maps. Pp. viii + 248. 10s. 6d.
- LUNDBORG, R. *Islands Völkerrechtliche Stellung*. Edited Herbert Kraus. Berlin-Grünwald: Verlag für Staatswissenschaften und Geschichte, 1934. 9½ × 6½ in. Pp. viii + 134. RM. 11.
- MITCHELL, General W. *General Greely: The Story of a Great American*. New York: G. P. Putnam's Sons, 1936. \$2.50.
- NIZOVOY, PAUL. *The Ocean*. Translated from the Russian by John Cournois. New York: Harper, 1936. Pp. 421. \$2.50.
- O'BRIEN, JACK. *Alone Across the Top of the World*. The Authorised Story of the Arctic Journey of David Irwin. Philadelphia: John C. Winston Co. 1936. Ill. Pp. 254. \$2.
- SINCLAIR, W. E. *Cruises of the "Joan"*. London: E. Arnold & Co. 1934. 9 × 5½ in. Ill. Maps. Pp. 254. 12s. 6d.
- TALCOTT, D. V. *Report of the Company*. A narrative of voyages in the Arctic. New York: Harrison Smith & Robert Haas, 1936. Pp. 347. \$3.75.

ANTARCTIC

- ELLSWORTH, LINCOLN. *Exploring Today*. New York: Dodd, Mead & Co. Ill. Pp. 194. \$1.75.
- SIPLE, PAUL. *Scout to Explorer. Back with Byrd to the Antarctic*. New York: G. P. Putnam's Sons, 1936. Ill. Pp. 239. \$2.

GENERAL

- SELIGMAN, G. *Snow Structure and Ski Fields; being an account of snow and ice forms met with in nature and a study on avalanches and snow craft. With an Appendix on Alpine Weather by C. K. M. Douglas*. London: Macmillan & Co. 1936. Ill. 8vo. 25s.

ANNUAL REPORT OF THE COMMITTEE
OF MANAGEMENT OF THE
SCOTT POLAR RESEARCH INSTITUTE

May 22, 1936.

The Committee of Management of the Scott Polar Research Institute beg leave to present to the Senate their Annual Report.

During the year 1935-36 the average number of visitors to the Institute has been about fifteen a day, a new feature being the number of school children who have been personally conducted over the building. It is evident that each year the Institute becomes more widely known both in England and abroad; and the Director is now in touch personally or by correspondence with all the larger expeditions in the field. A distinguished visitor during the past year was Professor O. J. Schmidt, Director of the government department which controls polar work done by the Soviet Union. Other visitors from abroad included Mr Templeton Crocker, whose father was a supporter of Admiral Peary, Dr Hermann Rüdiger, the German explorer, and Mr Bradford Washburn, of the Mt Crillon Expedition.

The two Research Rooms have been in constant use during the year; one is still occupied by Dr F. Loewe, of the German Greenland Expedition 1929 and 1930-31, while the other was used by members of the Oxford University Expedition to North East Land, 1935-36, and later by Mr T. Patterson of Mr Wordie's Expedition to the Canadian Arctic, 1934; also by Mr E. G. Bird, who proposes to spend the year 1936-37 in North East Greenland.

The Oxford University Expedition to North East Land before its departure, and the Oxford University Ellesmere Land Expedition, 1934-35, since its return, have both made use of the facilities of the Institute, which have also been of service to the forthcoming Cambridge expeditions to Iceland, members of which have been at work for some time in the library and map-room.

The Polar Record has now reached its eleventh number, and has been considerably enlarged to about 100 pages. The circulation is also increasing satisfactorily, but the journal is still far from being self-supporting, and,

in order to reduce expenses, the Committee have been obliged to cut down the number of complimentary copies, and to charge a higher price for back numbers.

A very pleasing gift to the Institute is a portrait-plaque in bronze of the late Mr H. G. Watkins, executed by Mr Cecil Thomas and presented by an anonymous donor. It is placed in the main museum in a special niche.

Many other interesting gifts have been received by the Institute during the past year, including a portrait of Sir John Franklin, presented by Miss Gell, the grand-daughter of the explorer.

It is gratifying to note that gifts continue to come in; those recently received include:

Relics and Equipment.

Sealskin coat used in the Arctic in 1824
 Watch from "James Caird"
 Letter written during the Nares Expedition
 by Cdr. Wyatt Rawson
 Racket ski
 Carving in bone from Greenland
 Model of M.Y. *Penola*
 Eskimo relics from Greenland:
 Two spoons
 Two miniature sledges
 A kayak
 Money
 A doll

Donors

Misses Bell
 Mrs Cator
 The Rev. B. M. Downton
 Messrs Lillywhite
 R. Orcutt
 J. R. Rymill
 Professor A. C. Seward

Pictures and Photographs.

Portrait of Sir John Franklin
 Photographs of the church at Umanak
 Photograph of Knud Rasmussen
 Photograph of himself
 Kayaking photographs
 Photograph of Sviagigur
 Picture by Dr E. A. Wilson
 Photographs of tractors
 Photographs of the Great Geysir
 Set of photographs of Hagavatn, Iceland
 Set of photographs of Hagavatn, Iceland

Miss Gell
 Miss Hutchison
 Dr F. Loewe
 Captain E. Millelsen
 E. W. Phillips
 A. di Pollitzer-Pollenghi
 Mrs Roberts
 R. W. Starratt
 Herra S. Stefánsson
 S. White
 J. W. Wright

Books and Reprints.

Transactions and Reports
 Reports of the Norwegian Swedish Spits-
 bergen Expedition, 1924
 Report on Canadian Hydrographic Service
 The Results of the Wegener Expedition
The Fjord Region of East Greenland (Boyd)
 Reports
 Miscellaneous books

Arctic Institute of the U.S.S.R.
 Professor H. W. Ahlmann
 Captain F. Anderson
 F. A. Brockhaus
 Miss L. A. Boyd
 Canada: Department of the Interior
 Miss Custance

Books and Reprints (cont.).

Such is the Antarctic (Christensen)
Discovery (Byrd)
 Reports
 Reports
 Reports
 Annual Report
Knud Rasmussen Mindeudgave
Die Mitternächtigen Länder (Hermann)
Svalbardboken (Arnesen)
The Present Status of the Musk-oxen (Hone)
 Bound copy of *Little America Times*
Island (Jwan)
 Magazine: *Gold*
The Great North Pole Fraud (Lewin)
Sledge (Lindsay)
Wyspa mgiel i Wichrow (Lugeon)
Les Voyages extraordinaires (Verne)
Naturfredning i Grønland
Gronlaendernes Egne Samfundsorganer
Den Gronlandske Samfundslaere
 Copies of *La Géographie*
 Reports
The Voyage of the Krassin (Samoilovitch)
14 Monate in der Arktis (Tollner)
 Press cuttings
Royal Scottish Geographical Magazine. Vols.
 1-51
 Reports on the Expedition to the Canadian
 Arctic
 Cryologia Maris

Donors

Professor F. Debenham
 Professor F. Debenham
 Department of Terrestrial Magnetism, U.S.A.
 Det Norske Meteorologiske Institut
 Deutsche Seewarte
 Grenfell Association
 Gyldansalske Boghandel
 E. Hermann
 Dr A. Hoel
 Miss E. Hone
 A. Horowitz
 W. Jwan
 W. Laut
 W. H. Lewin
 Martin Lindsay
 Professor J. Lugeon
 R. W. Oates
 Dr K. Oldenow
 Dr K. Oldenow
 Dr K. Oldenow
 R. E. Priestley
 Royal Canadian Mounted Police
 R. Samoilovitch
 Dr H. Tollner
 A. Wood
 J. M. Wordie
 J. M. Wordie
 J. M. Wordie
 J. Zukriegel

Reprints.

Reprints of polar papers have been received from the following:

American Geographical Society
 Arctic Institute of the U.S.S.R.
 G. C. L. Bertram
 Dr M. Bossolasco
 Dr B. Brockamp
 Dr S. Hadwen
 P. F. Holmes
 Dr A. Høygaard
 E. W. Jones
 D. B. Keith

Professor von Klebelsberg
 Dr Lauge Koch
 Dr F. Loewe
 Professor P.-L. Mercanton
 Dr H. Rüdiger
 M. Spender
 Professor H. U. Sverdrup
 Dr W. Steinert
 V. Stefansson

A. C. SEWARD, *Chairman.*

C. S. WRIGHT.

FRANK DEBENHAM.

HUGH ROBERT MILL.

J. M. WORDIE.

ERRATA

The Polar Record, No. 11.

P. 19. Delete "Dr A. Ballantine, medical officer".

P. 26. For Dr Robert Gessen read Dr Robert Gessain.