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med boken*

DET NORSKE VIDENSKAPS-AKADEMI I OSLO

for for.

RESULTATER

AV DE NORSKE STATSUNDERSTØTTEDE
SPITSBERGENEKSPEDITIONER

(SKRIFTER OM SVALBARD OG ISHAVET)

BIND I

Nr. 1

ADOLF HOEL:
THE NORWEGIAN SVALBARD EXPEDITIONS
1906—1926

UTGITT PÅ
DEN NORSKE STATS BEKOSTNING
VED SPITSBERGENKOMITÉEN

REDAKTØR: ADOLF HOEL

OSLO
I KOMMISJON HOS JACOB DYBWAD
1929

Results of the Norwegian expeditions to Svalbard 1906—1926 published in other series. (See Nr. 1 of this series.)

The results of the Prince of Monaco's expeditions (Mission Isachsen) in 1906 and 1907 were published under the title of 'Exploration du Nord-Ouest du Spitsberg entreprise sous les auspices de S.A.S. le Prince de Monaco par la Mission Isachsen', in *Résultats des Campagnes scientifiques*, Albert 1^{er}, Prince de Monaco, Fasc. XL—XLIV. Monaco.

ISACHSEN, GUNNAR, Première Partie. Récit de voyage. Fasc. XL. 1912. Fr. 120.00.

With map: Spitsberg (Côte Nord-Ouest). Scale 1:100 000. (2 sheets.) Charts: De la Partie Nord du Foreland à la Baie Magdalena, and Mouillages de la Côte Ouest du Spitsberg.

ISACHSEN, GUNNAR et ADOLF HOEL, Deuxième Partie. Description du champ d'opération. Fasc. XLI. 1913. Fr. 80.00.

HOEL, ADOLF, Troisième Partie. Géologie. Fasc. XLII. 1914. Fr. 100.00.

SCHETELIC, JAKOB, Quatrième Partie. Les formations primitives. Fasc. XLIII. 1912. Fr. 16.00.

RESVOLL HOLMSEN, HANNA, Cinquième Partie. Observations botaniques. Fasc. XLIV. 1913. Fr. 40.00.

A considerable part of the results of the ISACHSEN expeditions in 1909 and 1910 has been published in *Videnskapsselskapets Skrifter. I. Mat.-Naturv. Klasse, Kristiania* (Oslo).

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ALEXANDER, ANTON, Observations astronomiques. 1911, No. 19. Kr. 0,40.

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HELLAND-HANSEN, BJØRN and FRIDTJOF NANSEN, The sea west of Spitsbergen. 1912, No. 12. Kr. 3,60.

ISACHSEN, GUNNAR, The hydrographic observations. 1912, No. 14. Kr. 4,20.

With chart: Waters and anchorages on the west and north coast. Publ. by the Norw. Geogr. Survey, No. 198.

HOEL, A. et O. HOLTEDAHL, Les nappes de lave, les volcans et les sources thermales dans les environs de la Baie Wood au Spitsberg. 1911, No. 8. Kr. 4,00.

GOLDSCHMIDT, V. M., Petrographische Untersuchung einiger Eruptivgesteine von Nord-westspitzbergen. 1911, No. 9. Kr. 0,80.

BACKLUND, H., Über einige Olivinknollen aus der Lava von Wood-Bay, Spitzbergen. 1911, No. 16. Kr. 0,60.

HOLTEDAHL, OLAF, Zur Kenntnis der Karbonablagerungen des westlichen Spitzbergens. I. Eine Fauna der Moskauer Stufe. 1911, No. 10. Kr. 3,00. II. Allgemeine stratigraphische und tektonische Beobachtungen. 1912, No. 23. Kr. 5,00.

HOEL, ADOLF, Observations sur la vitesse d'écoulement et sur l'ablation du Glacier Lilliehöök au Spitsberg 1907—1912. 1916, No. 4. Kr. 2,20.

VEGARD, L., L'influence du sol sur la glaciation au Spitsberg. 1912, No. 3. Kr. 0,40.

ISACHSEN, GUNNAR, Travaux topographiques. 1915, No. 7. Kr. 10,00.

With map: Spitsberg (Partie Nord-Ouest). Scale 1:200 000 (2 sheets).

GUNNAR ISACHSEN has also published: Green Harbour, in *Norsk Geogr. Selsk. Aarb.*, Kristiania, 1912—13, Green Harbour, Spitsbergen, in *Scot. geogr. Mag.*, Edinburgh, 1915, and, Spitsbergen: Notes to accompany map, in *Geogr. Journ.*, London, 1915.

All the above publications have been collected into two volumes as *Expédition Isachsen au Spitsberg 1909—1910. Résultats scientifiques. I, II. Kristiania 1916.*

As the result of the expeditions of ADOLF HOEL and ARVE STAXRUD 1911—1914 the following memoir has been published in *Videnskapsselskapets Skrifter. I. Mat.-Naturv. Klasse.*

HOEL, ADOLF, Nouvelles observations sur le district volcanique du Spitsberg du Nord. 1914, No. 9. Kr. 2,50.

The following topographical maps and charts have been published separately:

Bjørnøya (Bear Island). Oslo 1925. Scale 1:25 000. Kr. 10,00.

Bjørnøya (Bear Island). Oslo 1925. Scale 1:10 000. (In six sheets.) Kr. 30,00.

Chart of Bear Island. Oslo 1929. Scale 1:40 000. Kr. 3,00. (No. S1).

A preliminary edition of topographical maps on the scale of 1:50 000 covering the regions around Kings Bay, Ice Fjord, and Bell Sound, together with the map of Bear Island, scale 1:25 000, is published in:

Svalbard Commissioner [Kristian Sindballe], Report concerning the claims to land in Svalbard. Part I A, Text; I B, Maps; II A, Text; II B, Maps. Copenhagen and Oslo 1927. Kr. 150,00.

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A. W. RBØGGERS BOKTRYKKERI A/S

No. 1

ADOLF HOEL

**THE NORWEGIAN SVALBARD EXPEDITIONS
1906—1926**

WITH 22 TEXTFIGURES, 1 MAP, 2 PLATES, AND 18 TABLES

Preface.

ABOUT the first Norwegian Svalbard Expeditions detailed accounts have been published together with the scientific results of the expeditions. Thus a report of those fitted out by PRINCE ALBERT OF MONACO and led by Major ISACHSEN in 1906 and 1907, will be found in the publications of the Prince. Further, an account of the ISACHSEN expeditions in 1909 and 1910 has been published in the "Skifter" of the Norwegian Academy of Science. About the expeditions of 1908 and 1911—1918 short accounts were published in "La Géographie", Paris, and short narratives of the expeditions of 1919—1921 will be found in "Revue de Géographie", Paris. Nothing, however, has been published about the expeditions from 1922 onward. A list of these accounts will be found under *Literature* on page 70.

This paper deals with the expeditions up to 1926. Some of the tables, however, have been brought up to date.

The topographers of the expeditions, Messrs. ALFRED KOLLER, BERNHARD LUNCKE, and W. SOLHEIM, have contributed to the preparation of this paper, and the maps have been made by Mr. LUNCKE. The translation has been done by Mr. OLAF ANDERSEN, state geologist, and Dr. GUNNAR HORN of *Norges Svalbard- og Ishavs-undersøkelser*.

To all these and others who have assisted I wish to extend my best thanks for their valuable help.

To the Government and the Storting, and all institutions, companies, firms, and private persons who have given their generous support to our expeditions and made them possible, the author wishes to tender his most grateful thanks.

I take this opportunity of expressing my sincere thanks and appreciation to all the members of the expeditions and to the many collaborators for all their invaluable services to the expeditions and for their hearty co-operation in the work.

Oslo, Oct. 10, 1929.

Adolf Hoel.

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Early Norwegian Geographical Exploration and Special Expeditions.

The scientific exploration of Svalbard was initiated by a Norwegian, B. M. KEILHAU, professor of geology at Oslo University. His voyage was undertaken in 1827, and the results obtained were great. His geological, paleontological, and botanical investigations represent pioneer work of fundamental importance, and the information he gives about the general natural conditions and the sealing and other hunting activities of the Russians and Norwegians at Svalbard is also of very great value. KEILHAU's narrative of the expedition is one of the classical books on Svalbard.

After KEILHAU's voyage a long interval ensued in the Norwegian exploration of Svalbard. In the meantime the Swedes took up the work under the leadership of men like SVEN LOVÉN (1837), OTTO TORELL (1858, 1861), A. E. NORDENSKIÖLD (1864, 1868, 1872—1873), A. G. NATHORST (1870, 1882, 1898), and GERARD DE GEER (1882, 1896, 1899, 1901, 1908). Also Austrian, British, French, German, and Russian expeditions participated in the exploration of Svalbard during this time.

Although it is a fact that during the latter half of the nineteenth century no expeditions were sent out from Norway for the particular purpose of exploring Svalbard, yet several important geographical discoveries were occasionally made by Norwegians during this period in the part of the Arctic Ocean extending from Greenland to Novaya Zemlya and even as far east as 86° E.

These discoveries were mostly made by such captains of sealing vessels as had a bent for geographical observation work, and who used the opportunities arising during their cruises. These discoveries have been of the greatest importance. One may well claim that Norwegian sealing skippers have opened a new era in the knowledge of these remote regions.

Among these discoveries, the details of which we will not enlarge upon, the following may be mentioned, all pertaining to the Svalbard territories: The first passage through Freeman Strait (E. LUND, Hammerfest, 1847) and through Heley Sound (JOH. NILSEN, Tromsø, 1858); the discovery of King Karls Land (ELLING CARLSEN, Tromsø, 1859); the first circumnavigation of Spitsbergen (ELLING CARLSEN, 1863); the discovery of Rønnebeck Islands and Bastian Islands (NILS F. RØNNBECK, Hammerfest, 1867); discoveries on the east coast of North East Land

(ERIK A. ULVE, Tromsø, 1871); the first landing on and mapping of King Karls Land (J. ALTMANN and JOHANNES NILSEN, Hammerfest and NILS JOHNSEN, Tromsø, 1872); the discovery of White Island (Kvitøya) (JOHAN KJELDSSEN, Tromsø, 1876); the mapping of King Karls Land and the first passage through Rivalen Strait (HEMMING ANDREASEN, Tromsø, 1886); discovery of Victoria Island (JOHS. NILSEN and L. SEBULONSEN in 1898).

Thus, while Swedish expeditions were engaged in the scientific exploration of Svalbard, chiefly in the western and northern parts of the islands, Norwegian sealers contributed equally valuable work in the eastern part, which is usually blocked by ice. Making bold advances every time the conditions of the ice were favourable, these daring seamen succeeded in determining the most important features of the configuration of this part of Spitsbergen, at the same time preparing the way for the scientific expeditions to these dreaded waters. Their services to geography may be justly compared to those of Dutch whalers in the seventeenth century.

Norwegian sealers not only deserve credit for geographical discoveries in Svalbard, but they have also contributed considerably to the knowledge of the geophysical conditions of these regions. Thanks to their observations we have become familiar with the conditions of the ice in the Arctic Ocean north of Europe, and in recent years the journals from their voyages have been the principal sources for the maps of the boundaries of the ice north of our continent published by the Meteorological Institute of Denmark. Moreover, these sealers have given valuable contributions to oceanography by studying the ocean around Svalbard, taking numerous samples of the water and making observations of the temperature in these ocean areas.

Important contributions also to the knowledge of the meteorological conditions of these extreme Arctic areas are due to Norwegian trappers and sealers. Wintering on Bear Island and Spitsbergen, and equipped with meteorological instruments, chiefly from the Meteorological Institute of Norway, some of them have made extremely valuable observations. SIVERT TOBIESEN, a Tromsø skipper, may be specially mentioned for his observations on Bear Island (1865—1866), which are the first observations from these regions.

Besides the more incidental discoveries and surveys by Norwegian trappers and sealers, several scientific expeditions have been sent out to make various special investigations. They have partly been financed by private means and partly out of our scientific funds. These expeditions are:

KR. BIRKELAND: Aurora Borealis expedition 1902—1903; HANS LARSEN NORBERG: Geological work, 1900—1915; HJALMAR JOHANSEN'S expedition, 1907—1908; HANNA RESVOLL-HOLMSEN: Botanical expedition, 1908; GUNNAR HOLMSEN: Topographical and geological expeditions 1909 and 1912; CARL SCHULZ: Geological expedition, 1912. TH. VOGT:

Geological expeditions, 1925 and 1928; F. SMITH: Plant experiments, 1925; and B. LYNGE: Botanical expedition, 1926. Mention may also be made of ARVE STAXRUD's expedition in relief of the missing German SCHRÖDER-STRAZ expedition in 1913.

In addition to the exploration of Svalbard, extensive surveys of the ocean around the islands have been carried out by the Norwegians. Only a brief reference to these expeditions will be made here:

In 1872 the Norwegian Government sent out an expedition in S/S "Albert" under the leadership of S. G. OTTO, for rescuing the crews of some sealing vessels that were lost in the ice on the north coast of Spitsbergen. On this trip, which was made in November and December, meteorological and oceanographic observations were carried out. From 1876 to 1878 the Norwegian North-Atlantic Expedition led by H. MOHN and G. O. SARS worked in the northern parts of the Atlantic and Arctic, extending its exploration (geographical, oceanographic and zoological) to Svalbard. In 1901 ROALD AMUNDSEN's oceanographic cruise in the "Gjøa" took place, and in 1912 that of FRIDTJOF NANSEN in the "Veslemøy". Besides these, there were several expeditions sent out by the Director of Fisheries in Bergen for the purpose of making fishing investigations, oceanographic and zoological work. In 1900 and 1901 S/S "Michael Sars" with JOHAN HJORT as leader carried out research work in the waters around Bear Island and Spitsbergen. Investigations were made around Bear Island by KNUT DAHL, in 1902 in the S/S "Skolpen" and in 1903 with the S/S "Teisten". In 1905 THOR IVERSEN cruised around Bear Island in the S/S "Michael Sars" assisted by three sailing vessels and a motor cutter. In 1906 explorations around Bear Island were again undertaken by THOR IVERSEN in M/C "Geir", in 1914 by EINAR LEA in the "Michael Sars", and in 1922 by OSCAR SUND in the M/C "Johan Hjort". In 1923 fishery investigations of the ocean around Svalbard and Franz Joseph Land were made with M/C "Blaafjeld" and of the Svalbard waters with M/C "Tovik" in 1924 and 1925. In 1926 the research ship of the Bergen Museum M/C "Armauer Hansen" made cruises in the Svalbard waters and in the "West-Ice"; in 1928 investigations around Bear Island were made from S/S "Kirkholmen". All these expeditions were led by THOR IVERSEN.

The Norwegian Government has also taken an active part in meteorological work in Svalbard by establishing meteorological stations at Anker Haven in Green Harbour (1911) and at Tunheim on Bear Island (1923); both places in connection with wireless stations; it has also maintained a geophysical station on Quade Hoek at Kings Bay from 1920 to 1924.

Mention should also be made of the important work done by colliery and other companies. When development work commenced in Advent Bay in 1905 a topographical and geological survey of the area was started. In Green Harbour, Bell Sound, Braganza Bay, Kings Bay,

etc., the operating companies have also carried out topographical and geological work of great interest, and through the advance of the mine workings many important geological facts have been brought to light. The general survey of the country has thus been materially aided by the work carried out by private companies.

After this brief outline we will now deal with those expeditions which form the particular subject of this report. These comprise a number of expeditions commenced in 1906 on the initiative of Captain GUNNAR ISACHSEN with the financial aid of PRINCE ALBERT OF MONACO,



Fig. 1. The Wireless Station in Green Harbour.

P. Berge phot. 1924.

and afterwards continued each year with financial support from various sources. These expeditions have all had practically the same objects: Topographical and hydrographic surveying, oceanographic observations, and geological surveying; they have continually been more or less under the same leadership and have largely included the same members.

Nearly all these expeditions have been supported by the Norwegian Government, and in recent years — from 1922 onward — they have been financed solely by the Government. They have gradually become a permanent institution under the name of *Norges Svalbard- og Ishavsundersøkelser* (Norwegian Exploration of Svalbard and the Polar Regions) —, thus forming a strictly limited group of expeditions. Some of the results of these expeditions have already been published, although a great deal of material still remains to be worked out and published. The results will be printed in this series.

We shall now proceed to deal with the individual expeditions.

The Norwegian Svalbard Expeditions 1906—1926.

1906. Expedition fitted out by Prince Albert of Monaco and led by Captain G. Isachsen.

The year 1906 marks a new era in the Norwegian exploration of Svalbard. In the previous year, Captain G. ISACHSEN made an appeal to PRINCE ALBERT OF MONACO, and induced him to direct his regular oceanographic cruise to Spitsbergen waters in the summer of 1906. ISACHSEN was offered the leadership of an expedition in co-operation with this cruise, which aimed at a topographical and geological survey of the north-western part of Spitsbergen, and more particularly of the interior.

The expedition consisted of eight members, viz., three topographers: ISACHSEN, Lieutenant ARVE STAXRUD, Norwegian Army, and ALFRED KOLLER, Civil Engineer; one geologist: H. H. HORNEMAN, Mining Engineer; one physician: FERD. LOÛET, M. D. (French), and three Norwegian assistants. In addition to the Prince's yacht, "Princesse Alice", (1042.12 tons gross) the fishing steamer "Kvedfjord" of 76.60 tons gross, Captain K. JAKOBSEN, and a crew of six men were placed at the disposal of the expedition.

The field of operation was the north-west corner of Spitsbergen: north and east of Cross Bay and south of Smeerenburg Bay and Liefde Bay.

The *topographical work* consisted in measurements of eight base lines (four for the geographical map and four for large-scale maps), and in triangulation and detailed mapping with the plane table and with photogrammetric methods. The results were very satisfactory. An area of the interior of Spitsbergen of 1930 sq. kilometres was mapped on the scale of 1:100 000. Besides, the fronts of the Lilliehöök Glacier and the 14th July Glacier were measured on 1:25 000 and 1:10 000, respectively. Of the inner end of Magdalena Bay a map on 1:10 000 scale was made.

Regarding the *geological results* it may be mentioned that a geological map on the scale of 1:100 000 was made of the northern part of the area, and that an entirely new fossil fauna was discovered in the Downtonian near Red Bay.

During the winter of 1906—1907 the topographical material was worked on by a permanent staff consisting of three topographers (ISACHSEN, KOLLER and Captain NICOLAI RÆDER, Norwegian Army); one geologist (HORNEMAN); one draftsman, and one assistant.

**1907. Expedition fitted out by Prince Albert of Monaco
and led by Captain G. Isachsen.**

A fresh expedition was started to continue the work of the previous year. The members were: ISACHSEN, leader and topographer, ADOLF HOEL, geologist, Mrs. HANNA DIESET (RESVOLL-HOLMSEN), botanist, and two assistants. The expedition had at its disposal the same two ships as in the previous year. The field of operation was the Western and Northern parts of Spitsbergen, around the area mapped the previous year.

The *topographer* completed and continued the survey commenced by the 1906 expedition. Two base lines were measured for special large-scale maps. In that year practically only the photogrammetric method was used, as this had proved very satisfactory the year before. The coastal region around the Seven Ice Mountains and the land around Kings Bay and the northern part of Prince Charles Foreland were mapped. Blomstrand Harbour was mapped on the scale of 1:25 000.

During these two expeditions of 1906 and 1907 about 3526 sq. km. of the north-western part of Spitsbergen were mapped on the scale of 1:100 000 with contour intervals of 50 m. To this must be added the large-scale maps mentioned above, the area of which is included in the above figure.

The *hydrographic work*, which was conducted by PRINCE ALBERT himself, consisted in a survey of Cross Bay and its branches for a chart on the scale of 1:100 000, in all 166 sq. km. In this fjord were also made special charts on the scale of 1:12 500 of the following harbours: Ebeltoft Haven, Port Signe, and Port Möller, in all 15 sq. km. The survey work in Cross Bay were done by Lieutenant H. BOURÉE, French Navy. Besides Cross Bay, also Hamburger Bay was surveyed on the scale of 1:12 500 by ISACHSEN.

HOEL completed the *geological work* of HORNEMAN around Cross Bay and the Seven Ice Mountains and made explorations at Kings Bay and Wood Bay. At the latter place a rich Lower Devonian fauna consisting of gigantic fish fossils was found. This discovery, together with that of Downtonian fish remains made in the previous year, led to the subsequent intensive exploration of the Downtonian and Devonian of Spitsbergen by Norwegian geologists. Studies and collections were also made at Cape Thordsen Peninsula (Triassic), and in the Advent Bay and Green Harbour regions (Cretaceous and Tertiary). The velocity and ablation of the Lilliehöök Glacier were measured.

The *flora* of the north-western part of Spitsbergen was formerly practically unknown. Mrs. RESVOLL-HOLMSEN now made thorough investigations at various places and with very good results.

The topographical material was worked on in the winter of 1907—1908, and was mostly finished in the spring of 1908. The work was done by the same three topographers as in the previous winter, one geologist (HOEL), and one assistant.

The greater part of the scientific results of these two expeditions have been published in the publications of the Prince of Monaco, but most of the fossil collections are still under examination, and will be treated along with collections from later expeditions.

1908. Hoel's Expedition.

The members of this expedition, the expenses of which were defrayed by contributions from Oslo University and private persons, were: HOEL, leader and geologist; GUNNAR HOLMSEN, geologist; and Captain HJALMAR JOHANSEN. The vessel of the expedition was S/S "Holmengraa", Captain J. IVERSEN, with a crew of six men, making a total of nine members. Geological surveying was carried out at a number of places in the region around Ice Fjord, where all the geological systems occurring in Spitsbergen are represented. It was of great importance for the later Norwegian exploration of Spitsbergen that the geologists of this expedition had an opportunity of making themselves acquainted with the systems of the islands, since these systems do not occur in Norway. Also the geological collections brought home by the expedition formed a necessary basis for the further study of the geology of Spitsbergen by Norwegian geologists.

During the winter of 1908—1909 the geological material from this expedition and from previous ones was examined by HOEL. ISACHSEN continued the work on the topographical material from his own expeditions.

1909 and 1910. Isachsen's Expeditions.

Previous expeditions greatly stimulated the interest in Norway for Svalbard exploration, and in 1909 Mr. ISACHSEN started a new expedition, the cost of which was partly defrayed by the Norwegian Government, and partly by the Nansen Fund and private subscribers. The transport steamer "Farm" of the Norwegian Navy was placed at the disposal of the expedition. The members of the staff were: Three topographers: ISACHSEN, KOLLER and Captain J. LAURANTZON, Norwegian Army; two geologists: HOEL and OLAF HOLTEDAHL; two assistant geologists: GUNNAR WATNELIE and ROLF MARSTRANDER; two hydrographers: Captain A. HERMANSEN, Norwegian Navy, (in command of the "Farm") Lieutenant J. (JØRGEN) PETTERSEN-HANSEN, Norwegian Navy. With eight assistants and the crew of the "Farm" (20 men exclusive of the two officers mentioned above) the expedition numbered 37 men in all. The 1910 expedition consisted of the same geologists and hydrographers, but instead of LAURANTZON the topographer,

ARVE STAXRUD and KARL HAAVIMB, Civil Engineer were included. Instead of MARSTRANDER, KRISTIAN SØRLI acted as assistant geologist. MICHALOFF WIGDEHL, Landscape Painter, accompanied the expedition. There were seven assistants and two ships; H. M. S. "Farm" with a crew of 21 men, and the motor sloop "Laila", Skipper HANS HOLMESLET, with four men. The total strength of the expedition was thus 43 members.

The main field of operation was the region north of the Ice Fjord, south of the Kings Bay region and the country around Wood Bay.

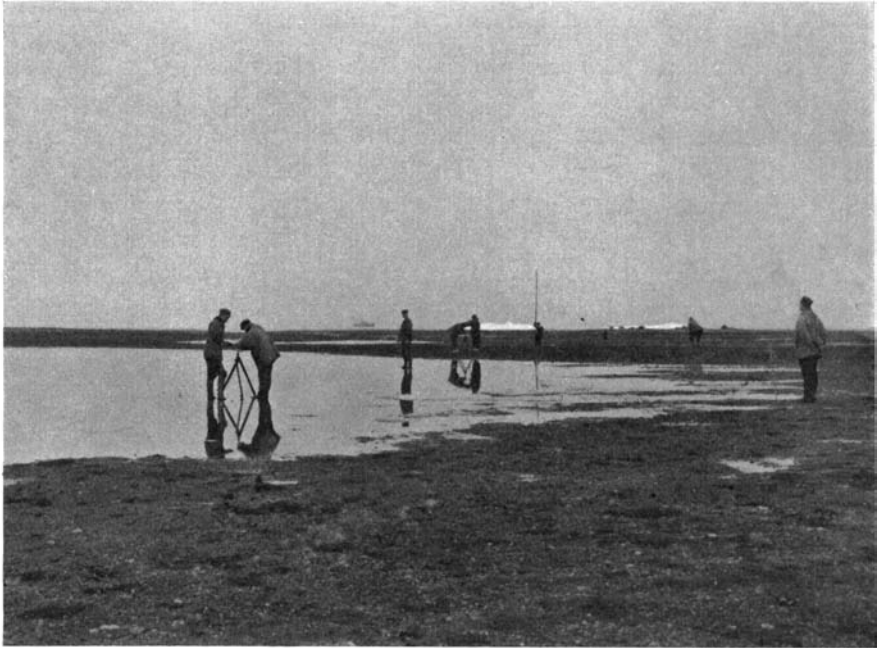


Fig. 2. Base Line Measurement on Foreland Plain.

Hoel phot. 11/7 1909.

The results of these large expeditions were most important. HERMANSEN and JØRGEN made *astronomical determinations* of the positions of seven different points by measuring the sun's altitudes with the sextant. These points were: The eastern end of the base line on Prince Charles Foreland, Observation Islet (Observationsholmen) in Kings Bay, Ebeltoft Haven, Ekholm Pt. at Virgo Bay, Sabine Pt., Cairn Bruce at Red Bay, and a station north of the base line on Reindeer Peninsula (Welcome Pt.). In addition, determinations were also made by ISACHSEN and KOLLER of the azimuth of a triangle side at the east end of the base line on Prince Charles Foreland and at the station north of the base line on Reindeer Peninsula. Three *base lines* were measured: One at Foreland Plain, one at Reindeer Peninsula, and one west of Dickson Bay. The following regions were *mapped* on the scale of 1:200 000: Reindeer

Peninsula and the country on either side of Red Bay, west and south of Wood Bay, the region north of Ice Fjord as far east as Dickson Bay and as far north as the Bar in the Foreland Sound, and Prince Charles Foreland, making a total of 5348 sq. km. To this must be added a less accurately mapped area on the south side of Ice Fjord between the west coast and Coles Bay. This region has been surveyed more in detail by later expeditions.



Fig. 3. Departure from Camp South of Richard Lagoon on Prince Charles Foreland. Rowing Boat used by the Expedition.

Hoel phot. 307/ 1909.

Soundings for charts on the scale of 1:200000 were made in Kings Bay, Foreland Sound, and Green Harbour. Several harbours in Spitsbergen and a harbour on Bear Island were surveyed on 1:25000 viz. Vulkan Haven, Hecla Haven, Finnes Haven, and Norske Haven on Bear Island. The total area sounded is 1382 sq. km., and the total length of the measured 6 m. danger lines is 37 km.

In 1910, much *oceanographic work* was carried out. Eight oceanographical sections with 35 stations and 11 single stations were made by the officers of the "Farm" in the sea between Bear Island and Spitsbergen and off the west and north coasts of Spitsbergen. Regular observations of the temperature of the surface of the sea were also made. *Meteorological observations* were made on board during the cruises.

HERMANSEN and JØRGEN made determinations of the *magnetic declination* with a box compass fitted with a diopter. The measurements were carried out in three places: At the east end of the base line on Prince Charles Foreland, at Ekholm Pt., and at Sabine Pt.

The *geologists* worked on the Foreland, on Brøgger Peninsula, between Cross Bay and Red Bay, in Reindeer Peninsula, and in the

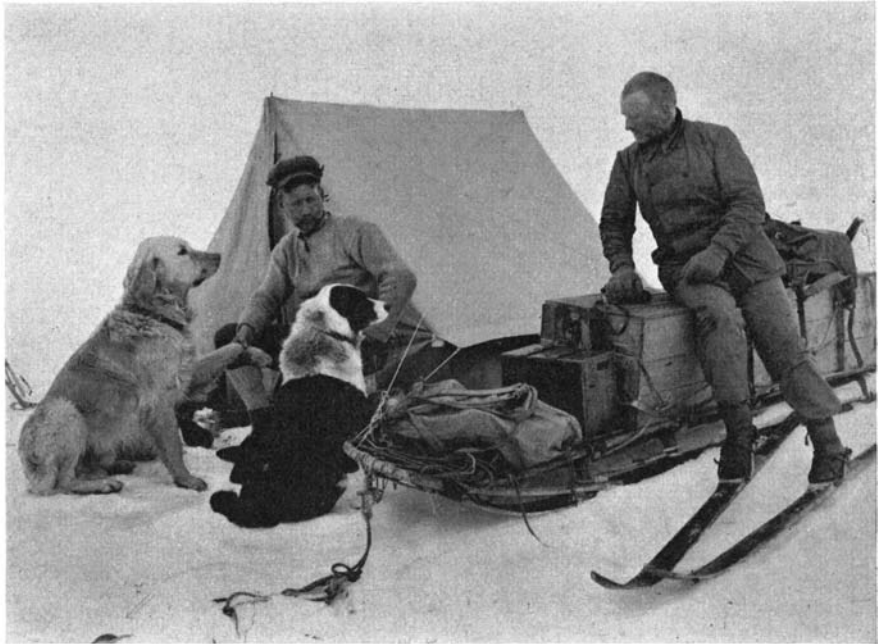


Fig. 4. Camp on the Watershed between Kings Highway and Svea Gl. Isachsen (right) and Haavimb.

G. Isachsen phot. 18/7 1910.

surroundings of Wood Bay and Bock Bay. Among the results may be noted: North-western Spitsbergen was formerly supposed to be built up of two different formations, Archæan rocks and the Hecla-Hoek system (Silurian). The investigations carried out during these two expeditions showed that the so-called Archæan must be included in the Hecla-Hoek system. In the Downtonian of the Red Bay region, in Ben Nevis and Fränkel Ridge, new localities for fossil fishes were discovered. In these mountains more than 30 fossiliferous horizons containing a great number of new or rare fish fossils were found, and immense collections of these were brought home. The Carboniferous system was the object of special examination, and several new facts were disclosed. Along both shores of Foreland Sound fields of Tertiary sandstone were found, which are bordered by great fault lines to the West and the East. Near

Bock Bay a post-glacial volcano was discovered, the most northerly in the world. In the vicinity were found thermal springs with temperatures up to 28° C. Also other young volcanic cones and necks were found. Volcanic activity as recent as this was formerly unknown in Spitsbergen. Somewhat older lava fields were also discovered. The study of glacial phenomena was continued with special regard to measurements of the velocities and ablation of Lilliehöök Glacier.



Fig. 5. Camp on the West Side of Brøgger Peninsula.

O. Holtedahl phot. 25/7 1910.

During the winter of 1909—1910 the material was worked on by a permanent staff consisting of four topographers (ISACHSEN, KOLLER, LAURANTZON, and STAXRUD), two geologists (HOEL and HOLTEDAHL), and one assistant. During the winter of 1910—1911 the staff included six topographers (ISACHSEN, KOLLER, STAXRUD, RÆDER, HAAVIMB, and HENDRIKSEN, Civil Engineer), two geologists (the same as the year before), and one assistant.

The scientific results of the expeditions have been published in "Videnskapsselskapets Skrifter", Christiania, and have also been issued as "Expédition Isachsen au Spitsberg 1909—1910. Résultats scientifiques". A great part of the geological collections is still under examination, the results of which will appear in this publication series.

1911. Hoel and Staxrud's Expedition.

In the spring of 1911 the Norwegian Government made grants for continued exploratory work in Spitsbergen. Financial aid was also given by private persons.

The topographical work was done by STAXRUD and KOLLER, and the geological work by HOEL and HOLTEDAHL assisted by WATNELIE. In addition, there were seven assistants. The expedition hired the motor sloop "Bellsund" of Tromsø, Skipper JOHAN HAGERUP, with a crew of four, making a total of 16 men.

The *topographers* worked the country between Ice Fjord and Bell Sound. A base line was measured at Coles Bay. The mapped region is situated on both sides of Green Harbour and of Green Harbour Glacier—Fridtjof Glacier, and between Coles Bay and Green Harbour; the area is 805 sq. km.

Geological work was also done in parts of the same field, covering especially the Carboniferous, Jurassic and Cretaceous systems. On a sledge journey the interior between Kings Bay, Wood Bay, and Ekman Bay was also explored. Further, work was done on Brøgger Peninsula and measurements of the movement and ablation of Lilliehöök Glacier were continued. Of the work on the Quaternary geology special mention may be made of the measurement of the altitudes of a considerable number of raised beaches by means of spirit levelling.

The permanent staff working on the material during the winter of 1911—1912 included two topographers (STAXRUD and KOLLER), two geologists (HOEL and HOLTEDAHL), one draftsman, and one assistant.

1912. Hoel and Staxrud's Expedition.

The expedition was financed by the Norwegian Government, the Nansen Fund, and private contributors. There were two topographers: A. STAXRUD and KOLLER; one geologist: HOEL; two assistant geologists: WATNELIE and JAKOB ELLINGSEN, Mining Engineer, and four assistants.

The motor cutter "Enigheden" of 56.77 tons gross, Skipper ISAK ISAKSEN, and a crew of three men, was placed at the disposal of the expedition by *Det Norske Kulcompagnie Ltd, Green Harbour* of Oslo. The expedition thus numbered 13 men.

The *topographers* continued the survey of the peninsula between Ice Fjord and Van Mijen Bay east of Berzelius Valley and Coles Bay. A base line was measured north of Cold Harbour. The map was completed towards the east to Mt. Sundevall and Mt. Nordenskiöld, a total area of 620 sq. km.

In order to facilitate navigation in Ice Fjord two *beacons* were built, one on each side of the mouth of the fjord, on Cape Linné and on the Daudmann Plain.

The most important *geological work* of this year was done on the northern coast around Wood Bay and Wijde Bay. In the Devonian system large collections of fishes were made, and the stratigraphy was also studied. For the first time the boundary between the Red Bay series (Downtonian) and the Wood Bay series (Lower Devonian) was determined. On the west side of Wijde Bay a probable Upper Devonian series, the Wijde Bay series, was discovered, and the boundary between this and the underlying Grey Hoek series (uppermost Lower Devonian

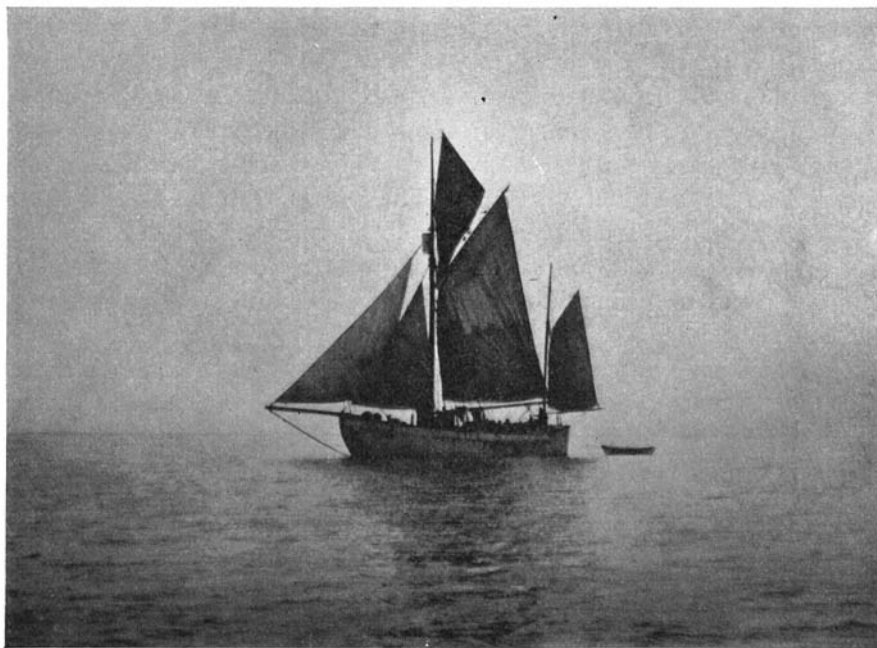


Fig. 6. M/C "Enigheden" in Wood Bay.

Hoel phot. 12/s 1912.

or lowermost Middle Devonian) was determined. These four series appeared to be very thick, their total thickness, which was now measured for the first time, amounting to about 10 000 m. Moreover, thorough investigations were made of the volcanoes, lava flows, and hot springs discovered in 1910, several new necks were found and the extension of the lava flows towards the east, as far as to Wijde Bay, was determined. The boundaries between the granites of North-West Spitsbergen on the one hand, and the Devonian and Carboniferous formations to the south and east of the granites on the other, were determined in the interior east of Kings Bay. In the surroundings of Green Harbour stratigraphical investigations of the Jurassic, Cretaceous, and Tertiary systems were made. The measurements of the velocity and the rate of ablation of Lilliehöök Glacier were continued, and a large number

of measurements of altitudes of raised beaches were also effected by levelling.

In the course of the winter of 1912—1913 two topographers (STAXRUD and KOLLER) one geologist (HOEL), and one assistant, were permanently engaged on the material.

1913. Hoel and Staxrud's Expedition.

The expenses of this expedition were defrayed by the Norwegian Government, the Nansen Fund, and private donators. STAXRUD that year being engaged in relieving the German SCHRÖDER-STRANZ expedition, the work was in charge of HOEL alone. The members were one topographer: KOLLER; one hydrographer: Lieutenant SVERRE RØVIG, Norwegian Navy; two geologists: HOEL and ANDERS K. ORVIN (OLSEN), Mining Engineer; and three assistants. For a short time ELLINGSEN participated as assistant geologist. The vessel was the motor cutter "Jenny" of Hammerfest, with a crew of three men, not including the captain who was also the hydrographer. A seagoing motor boat with one man was also available. Thus the expedition comprised the total number of 12 men.

In the course of this summer two areas were *topographically mapped*, one on the south side of the Ice Fjord between Coles Bay and Advent Bay, and one on the north side of the inner section of Van Mijen Bay. The areas occupy a total surface of 202 sq. km.

The *hydrographic work* was undertaken on the south side of the mouth of Ice Fjord from Festningen and along the coast from Ice Fjord to half-way towards Bell Sound, soundings being made over the entire Røvig's shoal. The area sounded occupies 228 sq. km., and the length of the 20 m. danger line measured is 49 km. The *beacon* erected on Cape Linné in the previous year was enlarged.

The *geological work* took place in an area between the west coast and a line from Green Harbour to Axel Island. The systematic geological mapping of the peninsula between Ice Fjord and Bell Sound-Van Mijen Bay on the scale of 1:50000 was commenced. Thorough stratigraphical investigations of the Jurassic-Cretaceous systems, previously little known, were undertaken. At Festningen on the southern side of Ice Fjord a series about 1400 meters thick belonging to these two systems was measured in detail, and fossils were collected at 45 horizons. In the Culm sandstone on the southern side of Bell Sound an important discovery of fossil plants was made, an accurate profile of the border strata between the Culm division and the Hecla-Hoek formation being traced. The tectonic relations of the younger strata (Carboniferous-Tertiary) in the mountain range on the west coast of Spitsbergen were cleared up. Finally it may be mentioned that the altitudes of a number of Quaternary marine terraces were measured.

The material collected was dealt with by a permanent staff consisting of two topographers (STAXRUD and KOLLER), one geologist (HOEL) and one assistant.

1914. Hoel and Staxrud's Expedition.

This expedition was financed by the Norwegian Government and the Nansen Fund. The following men participated: Two topographers: STAXRUD and KOLLER; one hydrographer: RØVIG; two geologists: HOEL

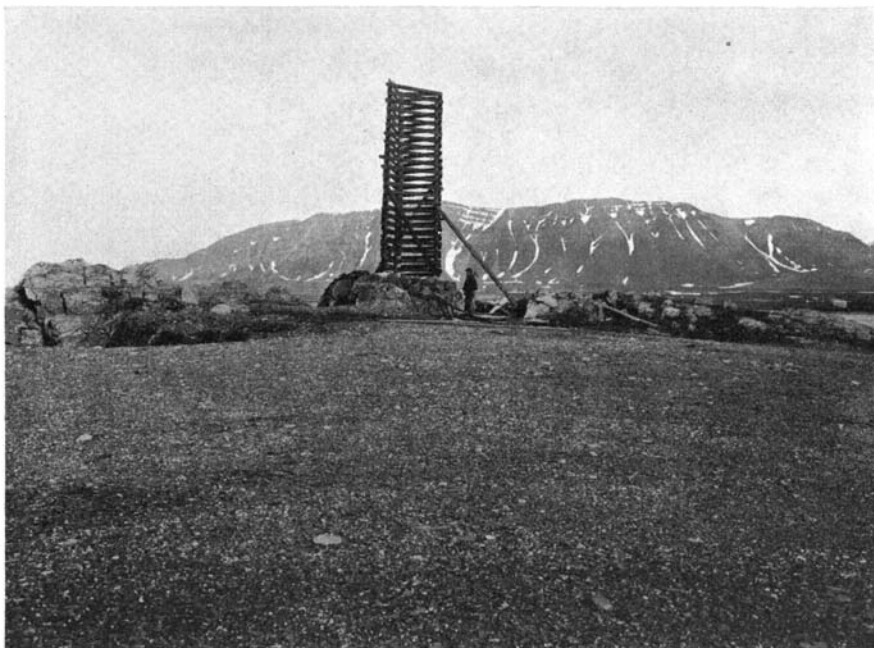


Fig. 7. Beacon on Cape Linné from the West.

Hoel phot. 5/8 1913.

and JOHAN BRAASTAD, Mining Engineer; one cinematographic operator, and four assistants. The vessel used was the motor cutter "Vaarsol" of Tromsø, having a crew of four men not including the captain, who also acted as hydrographer. The expedition numbered 14 men. The scene of operations was the peninsula between Ice Fjord and Bell Sound—Van Mijen Bay.

The *topographers* worked around Advent Valley, where an area of about 302 sq. km from the mouth of the valley and up to Brent Pass was mapped.

The *sounding work* was carried out at the mouth of Ice Fjord west of a line from Cape Heer to Cape Selma and along the coasts of Green Harbour. The area sounded amounted to 321 sq. km. and the length of the 10 and 20 m. danger line measured was 83.5 km.

The *geologists* operated between Green Harbour and Coles Bay and east of Green Harbour Glacier-Fridtjof Glacier. The systematic geological mapping on the scale of 1:50000 was continued in these areas. Several profiles were traced; detailed measurement of the profile of Festningen was continued, the Triassic and Permian strata being measured. Important discoveries of fossil shells were made in the Tertiary system. An examination of these showed that the strata on Spitsbergen are older than was formerly believed. They were



Fig. 8. Motor Boat of the Expedition in Green Harbour.

Hoel phot. June 1913.

supposed to be of Miocene age, but our discoveries showed that they very likely belong to the Paleocene age. Also several Quaternary marine terraces between Green Harbour and Coles Bay were measured by spirit levelling.

In the course of the winter of 1914—1915 the material collected was dealt with by two topographers: STAXRUD and KOLLER, one geologist: HOEL, and one assistant.

1915. Hoel's Expedition.

This year HOEL'S voyage to Spitsbergen was supported by the Nansen Fund. At the same time HOEL and A. KVALHEIM, Mining Engineer, were engaged by a Norwegian company to report upon the coal fields on the west side of Advent Bay belonging to an American

company, The Arctic Coal Co. of Boston, Mass. The voyage was undertaken in the ships of this company. The special objects were geological investigations of the Tertiary system and the coal-seams at Advent Bay.

It was of great importance for the further examination of the coal-bearing systems on the peninsula between Ice Fjord and Bell Sound—Van Mijen Bay, that the mines and exploring adits, as well as the considerable geological material in possession of the company, were made accessible to the expedition.

In the course of the winter of 1915—1916 the material from this expedition and the two previous ones was worked on by HOEL and one assistant.

1916. Hoel's Expedition.

In the summer of 1916 HOEL was engaged by a Norwegian concern as the leader of an expedition to Spitsbergen to examine coal fields south-east of Green Harbour and between Advent Valley and Conway Valley. The members of the expedition included one topographer and hydrographer: CLAUS SCHIVE, Civil Engineer; two geologists: HOEL and BRAASTAD, and 10 assistants. The motor cutter "Svalbard", Skipper OLUF OLSEN with a crew of four men, was chartered, so that the expedition totalled 17 members.

The *topographical work* consisted in special mapping on the scale of 1:1000 and 1:2000 for projected routes of aerial ropeways and sites for possible works, and in photogrammetric mapping on the scale of 1:50000 on both sides of Advent Bay and south-west of Advent Valley.

The *hydrographic work* consisted in making charts of a harbour territory east of Green Harbour at the head of the fjord on the scale of 1:1000 and soundings of Hiorthamn on the scale of 1:2000.

In order to determine the *tidal range* and high-water time and to obtain datum point for the measurements of altitudes and depths, SCHIVE made observations of the tides at Hiorthamn by means of a tide gauge that was read every hour.

The *geological work* consisted in the uncovering of coal-seams and in a general geological examination of the lowest part of the Tertiary system. The results obtained were of great importance for the study of the Tertiary and Cretaceous coal deposits.

The examination of the geological material from this expedition and the two previous ones was continued during the winter of 1916—1917 by HOEL, who was occupied at the same time with the arrangement and cataloguing of the great amount of photographic material from the ISACHSEN expeditions of 1909—1910. The expenses were defrayed by the "Universitetets Jubileumsfond" (University Jubilee Fund). For this work he had two assistants.

1917. Hoel and Røvig's Expedition.

In 1917 the Government again made grants for our Spitsbergen expeditions, but some of the expenses were also defrayed by private donators. The staff of the expedition was: One topographer: KOLLER, one hydrographer: RØVIG, three geologists: HOEL, W. WERENSKIOLD, Professor of geography at Oslo University, and ANDERS K. ORVIN, Mining Engineer. There were eight assistants and a crew of five men, not including the captain, who was hydrographer on the chartered vessel of the expedition, the motor cutter "Dyrstad" of Tromsø. Thus the expedition numbered 18 men altogether.

The *topographer* worked in the region east of Advent Bay, where an area of 115 sq. km. was mapped. A base line was measured at Hiorthamn for the control and adjustment of the trigonometric net. At the same place tidal measurements were made by reading a tide gauge every hour for about 20 days. The mean water level obtained in this way was used as datum point for the measurements of altitudes. In this way corrections of the determinations of altitudes made on previous expeditions were obtained. The datum point for these earlier determinations had not been fixed with sufficient accuracy. At the expense of the owners of the coal fields on the east side of Advent Bay, the levelling of a profile for an aerial ropeway was completed and a special map was made on the scale of 1:10 000 of the upper part of Mt. Hiorth, for use in the estimation of the coal reserves. In the territory between Horn Sound and Bell Sound reconnoitring work for topographical mapping was done by the geologists. Cairns were built, photographs taken, and a sketch map was made on the scale of 1:250 000.

Hydrographic surveying was undertaken in the waters between Ice Fjord and Bell Sound. The large bank called Sentinelle Bank situated south-west of the mouth of Ice Fjord, and the waters surrounding this bank, were sounded. The area amounts to 953 sq. km. and the length of the 20 m. danger line is 17 km.

The *geologists* first worked around Horn Sound where the Hecla-Hoek formation and the Devonian system were studied, fish fossils being collected in the Devonian strata. Also some ore deposits were examined. Furthermore, on the south side of the outer part of the fjord large areas of strata from the Lower Carboniferous and Permian systems were discovered; previously it was believed that the only rocks found here were those of the Hecla-Hoek formation. The coastal area between Horn Sound and Bell Sound was also investigated. As in the north-west part of Spitsbergen, it appeared impossible also in this area to maintain any distinction

between the previously supposed Archean and the Hecla-Hoek formation. Also here in the south of Spitsbergen igneous rocks penetrate the Hecla-Hoek formation, which contain rocks that are more or less altered by regional metamorphism. An accurate section of the entire Culm series on the north side of Bell Sound was measured. Finally, an examination of the coal deposits on the west side of Recherche Bay and around Advent Bay was made.

The topographical and geological material was worked on in the course of the winter of 1917—1918 by KOLLER and HOEL.

1918. Hoel and Røvig's Expedition.

The expedition was financed by the Government, the Nansen Fund, and private donators. The staff of this expedition included the following: Three topographers: KOLLER, WILHELM SOLHEIM, Civil Engineer, and JØRGEN GLØERSEN, a student at the Technical High School of Norway; one hydrographer: RØVIG, and two geologists: HOEL and WERENSKIOLD, who in addition to the geological investigations also carried out a considerable amount of topographical work. There were eight assistants. The motor cutter "Lancing" of Tromsø was chartered, with a crew of five men, not including the captain, who was the hydrographer mentioned above. Thus the expedition numbered 19 men in all. The field of operations was the surroundings of Horn Sound and the coastal region between this fjord and Bell Sound.

The following *topographical work* was done: One base line was measured at Goës Haven on the south side of Horn Sound and another on the west side of Recherche Bay. At the former place determinations of the water level were made in order to obtain definite datum points for the measurements of altitudes. The trigonometric net was connected to that on the peninsula north of Bell Sound, and in the country around Horn Sound sights were obtained towards the points Mt. Hedgehog and Hornsundtind in the Russian geodetic net from 1899—1901. The mapped area consists of the country on the south and east side of Horn Sound some 15 km. wide, and of the area between Horn Sound and Bell Sound west of a line from the north-east corner of Horn Sound to Point Ahlstrand in Van Keulen Bay, not including a considerable area south of the mouth of Bell Sound. The mapped area amounts to 1530 sq. km. Observations of the tide were carried out by SOLHEIM by reading a tide gauge in Goës Haven in Horn Sound.

The *hydrographic survey* consisted in sounding Ice Fjord off the coast from Russe River to 5 km. south-west of Delta Pt., including Coles Bay and Advent Bay, and also sounding east and north of Loweness on the north side of the mouth of Bell Sound. This work was considerably handicapped, as the entire crew of the vessel was down

with influenza. The area sounded amounts to 351 sq. km. and the length of the danger line is 83 km.

In the *geological work* stress was laid on geological reconnoitring of the areas topographically mapped during the summer, consisting almost exclusively of the rocks of the Hecla-Hoek formation. The Devonian system in Horn Sound was also made the subject of stratigraphical and structural investigations, and special examination was made of several coal and mineral bearing areas: The coal deposits at Advent



Fig. 9. Men drawing Sledges, Hans Gl., Horn Sound. Hoel phot. 27/7 1918.

Bay and Kings Bay, asbestos deposits at Recherche Bay, and gypsum and phosphorite deposits of the peninsula of Cape Thordsen.

In the course of the winter of 1918—1919 the permanent staff at the office of the expedition included: Two topographers: KOLLER and SOLHEIM, one geologist: HOEL, and one typist.

1919. Hoel's Expedition.

This expedition was financed by the Government, the Nansen Fund, Spitsbergen coal companies, and other private contributors. The following members participated: Three topographers: KOLLER, A. STAXRUD, and SOLHEIM; two hydrographers: HERMANSEN (captain of the expedition ship "Farm" and Lieutenant G. HOVDENAK, Norwegian Navy; two geologists: HOEL and WERENSKIOLD, who also carried out considerable topographical

work, MICHALOFF WIGDEHL, Landscape Painter, and 10 assistants. Two vessels were available: The transport "Farm" of the Norwegian Navy with a crew of 27 men, not including two officers who were the hydrographers mentioned above, and the motor cutter "Snadden", Skipper HILMAR NØIS, placed at the disposal of the expedition by the coal companies in Spitsbergen. The "Farm" carried one seagoing motorboat. The members of the expedition totalled 46 men.

The *topographical work* was done chiefly in the country between Horn Sound and South Cape and on the west coast between Cape Lyell and Cape Klaveness. Minor work was also done on the north side of Bell Sound, on the north side of the outer part of Van Keulen Bay, and on the west side of Recherche Bay. This year a complete connection between our triangular net and the Russian geodetic net was obtained, Mt. Keilhau being included in both nets. At the same time Mt. Hedgehog and Hornsundtind were located by intersection. The total area mapped amounted to 995 sq. km.

The *hydrographic work* was done in the coastal waters from the north side of Bell Sound to the south side of Horn Sound. The 20 m. danger line was traced from Cape Lyell to the south side of Horn Sound. Soundings were made in Bell Sound as far as Axel Island and also in the mouth of Horn Sound and in the waters between these two fjords outside the danger line. Inside this line the location of some rocks, sunken or otherwise, and islets was determined, and a few soundings were made. An area of 3329 sq. km was sounded, and the length of the 10 m. and 20 m. danger lines was 161,5 km.

During the entire cruise regular *meteorological observations* were made on board the "Farm". Also observations of the condition of the sea and the temperature at the surface of the sea were made.

The most important part of the *geological work* was an exploration of the country between Horn Sound and South Cape. Excepting the coast on the south side of Horn Sound, which was examined by the expeditions in 1917—1918, the geology of this area was previously entirely unknown. We succeeded in determining the most important



Fig. 10. M/C "Snadden" in Horn Sound.
Hoel phot. 20/7 1919.

features of the geological structure of the country. It was formerly believed that the entire area was built up of rocks of the Hecla-Hoek formation. Our investigations showed, however, that along the west coast and to the extreme south there was a strip of 7 or 8 km. in width consisting of rocks of the younger systems (Carboniferous, Permian, Triassic, Jurassic, and Cretaceous). The strata of the Devonian system were traced from Horn Sound to Storm Bay. In the Hecla-Hoek formation crinoid stems were found at a nunatak in the interior of the



Fig. 11. Topographer (Koller) at Work South of Hornsundtind.

Hoel phot. 28/7 1919.

country. Fossils from this formation in Spitsbergen were not previously described. Geological investigations were made of the Hecla-Hoek formation around Recherche Bay, of the coast from Dunder Bay to Cape Klaveness, of the north coast of Ferrier Haven and of the coal-seams at Green Harbour, Advent Bay, and Kings Bay.

From the west coast between Horn Sound and South Cape, the flora of which was previously quite unknown, a considerable number of *phanerogam plants* were collected.

The material was dealt with at the office of the expedition in the course of the winter of 1919—1920 by the following permanent staff: Two topographers: KOLLER and SOLHEIM; one geologist: HOEL, and one typist.

1920. Hoel's Expedition.

The expedition was financed by the Government, the Nansen Fund, Svalbard coal companies, and an insurance company. The members of the staff were: Four topographers: KOLLER, SOLHEIM, A. STAXRUD and O. STAXRUD, Civil Engineer; two hydrographers: HERMANSEN (in command of the "Farm") and Lieutenant HJ. FR. GJERTSEN, Norwegian Navy; two geologists: HOEL and WERENSKIOLD, who also did a con-

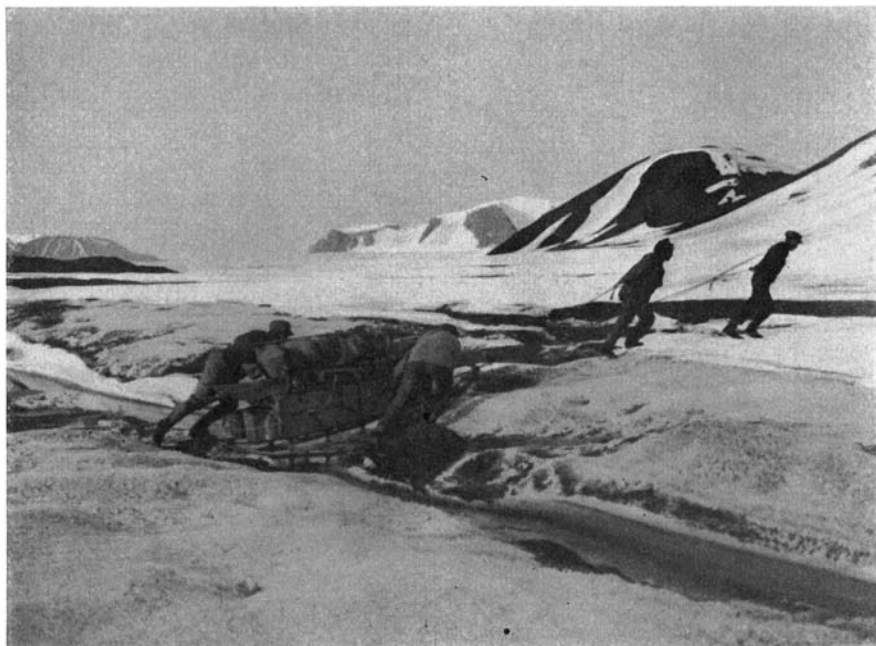


Fig. 12. Sledge Party crossing a Glacier-Stream on the Bunge Gl. South of Horn Sound.
Hoel phot. 27/7 1919.

siderable amount of topographical work. Further, one botanist: JOHANNES LID, Curator at the Botanical Museum, Oslo; and HJALMAR PEDERSØN, Landscape Painter, participated in the expedition. There were 9 assistants, and the vessel had a crew of 28 men, not including the two officers who were the two hydrographers mentioned above. The vessel of the expedition was also this year the "Farm" with a sea-going motorboat. The expedition thus totalled 47 men.

The expedition called at Bear Island. The coal mines here were operated by a company that had received financial support from the State and, according to instructions from the Ministry of Trade, the mines and surface plant were inspected by geologists of the expedition.

On Spitsbergen *topographical surveying* was carried out in three different areas: Around Van Keulen Bay, around the upper part of

Conway Valley and between the west side of De Geer Valley and Sassen Valley. In addition, several supplementary measurements were made on the south side of Advent Valley and along the coast between Horn Sound and South Cape.

Ever since 1909 the photogrammetric method of mapping has been used exclusively. In the course of these years the topographers of the expeditions have made several improvements, developing the methods to a high degree of perfection. In 1920, however, it was decided



Fig. 13. Cairn on Heim Mts. South of Van Keulen Bay.

Torjus Berge phot. 18/7 1920.

to try the stereo-photogrammetric method. A Carl Zeiss field outfit was hired from *A/S Kartkontoret Stereografik*, Oslo. Maps were made on the scale of 1:20 000 of part of the east side of Advent Bay and of a region to the south-west of Advent Valley. Maps were also made of the south side of Braganza Bay on the scale of 1:50 000 and 1:25 000, and of part of the country on both sides of Van Keulen Bay on the scale of 1:50 000. The total area of the mapped regions is 1487 sq. km.

Hydrographic surveying included a complete survey of the coastal waters from the north side of Ice Fjord to Gudrun Islet at Farm Haven. The coast line and the 20 m. danger line were traced, and soundings were made between the danger line and the shore. The southern inlet to Foreland Sound was also hydrographed, and at St. Hans Islets some soundings were made. However, the principal work was carried out in the southern part of Spitsbergen, where soundings were made from Cape Keilhau to the south side of Horn Sound. In this area the 20 m. danger line was measured and soundings were made as far as five or six nautical miles outside the danger line. Also inside this line some soundings were made and the positions of some rocks, sunken and otherwise, and islets, were determined. The hydrographical conditions of Horn Sound were also ascertained. The area sounded is altogether 1841 sq. km, and the length of the 20 m. danger line is 115,5 km.



A. Members of the 1911 Expedition on Board M/C "Bellsund" in Tromsø after the Return.

1. Koller, 2. Holtedahl, 3. A. Staxrud, 4. Hoel, 5. Watnelie, 6. Johan Hagerup, skipper.



B. Members of the 1921 Expedition on Board H. M. S. "Farm" in Tromsø after the Return.

1. Thorkelsen, 2. Hermansen, 3. Hoel, 4. Gjertsen, 5. Pederson, 6. Fønhus, 7. Koller, 8. Solheim, 9. Orvin.

The *geological work* was done partly on the north side of Van Keulen Bay, where the Jurassic-Cretaceous and Tertiary systems were subjected to investigation, partly along the coast from Horn Sound to Betty Bay, where the areas built up of strata younger than Hecla-Hoek were examined more closely. In addition to the previously known Carboniferous-Cretaceous systems, strata of the Tertiary systems were also discovered, and in these a coal-seam was found. The south-west corner of West Spitsbergen is built up of these strata. Finally, an examination was made of the coal deposits at Braganza Bay, at Advent Bay, at the Cape Boheman Peninsula, and at Kings Bay.

Botanical work was carried out more especially on the north side of Van Keulen Bay and on the coast from Horn Sound to Betty Bay. Studies of the flora were also made during short stays at several places: On Bear Island, at Green Harbour, and at Advent Bay, at Cape Boheman Peninsula and at Kings Bay. Special attention was paid to critical species of plants such as *Draba* and *Salix*, and particularly to specimens of lichens and mosses from test surfaces and profiles. The collection comprises 841 items. The principal field of operations was the country between Horn Sound and South Cape. These investigations will be the foundation of a complete description of the flora of this area, which is almost unknown botanically. It may be mentioned that LID discovered in this area a species of phanerogams, *Salix herbacea* L. not previously found in Svalbard.

Our expedition co-operated this year with a Swedish hydrographic expedition led by commander GUSTAF REINIUS, Swedish Navy. The Swedes obtained from us trigonometrical data and coast-lines of Bell Sound and Van Mijen Bay, on the basis of which the inner part of Bell Sound and Van Mijen Bay were charted on the scale of 1:120 000. Some special charts on a large scale were also made.

In the course of the winter of 1920—1921 the material was worked on at the office of the expedition, the permanent staff consisting of: Two topographers: KOLLER and SOLHEIM; one geologist: HOEL, and one typist. The maps made by stereo-photogrammetric methods were constructed by *A/S Kartkontoret Stereografik*, a Zeiss stereo-autograph being used.

1921. Hoel's Expedition.

The expedition was financed by the Government, the Nansen Fund, Svalbard coal companies, and "Norges Rederforbund" (Norwegian Ship-owners' Federation). The following members participated: Two topographers: KOLLER and SOLHEIM; three hydrographers: HERMANSEN (captain of the "Farm"), GJERTSEN, and Lieutenant KNUT THORKELSEN, Norwegian Navy; three geologists: HOEL, WERENSKIOLD (the latter also

working as a topographer), and ORVIN. HJALMAR PEDERSØN, Landscape Painter, and MIKKJEL FØNHUS, the author, also accompanied the expedition. There were nine assistants. The vessels of the expedition were: H.M.S. "Farm", M/C "Jan Mayen" of Tromsø, and a motor boat. The crew of the "Farm" consisted of 28 men (not including the officers). The motor cutter had one regular engineer. The expedition totalled 48 men.

This year, too, the expedition visited Bear Island, where the mines and plant were inspected according to instructions from the Ministry of Trade.

On Spitsbergen the following *topographical work* was done: The base line at Hiorthamn, measured with steel tape in 1917, was re-measured with Invar wire, and another base line was measured at Ny-Ålesund for a special map of the mining area. Mapping was done of the country south of Van Mijen Bay and of two smaller areas, one on the north side of Van Mijen Bay east of Blue Hoek, and the other at Cape Ahlstrand. The area mapped amounts to 502 sq. km. Finally, in September, after the ordinary topographical work was completed, a stereo-photogrammetric map on the scale of 1:1000 was made for *Kings Bay Kul Comp. A/S*, Ålesund, of the company's coal areas on the south side of Kings Bay, a total area of 12 sq. km.

The *hydrographic work* consisted in soundings of a 20 m. danger line from Sandy Bay on the east side of Prince Charles Foreland, around the south end and further along the west side and the north end of this island. Soundings of the sea south-west, west, and north of Prince Charles Foreland were carried out up to 12 nautical miles from the coast. In Ice Fjord a 10 m. danger line was sounded from Safe Harbour to Cape Boheman and from Pt. Delta towards Advent Bay. Also an area in the middle part of Ice Fjord as far east as Pt. Delta was sounded. Minor work was done at Reinius Islands on the north side of Bell Sound. The total area sounded is 3472 sq. km and the length of the measured 10 and 20 m. danger lines is 180.5 km.

Observations of the tide were made by KOLLER in Van Keulen Bay and in Kings Bay at Ny-Ålesund, and by KOLLER and WERENSKIOLD on the south side of Van Mijen Bay.

Meteorological observations were made during the entire cruise of the "Farm". Also wave motion and the temperature of the surface were noted. Observations of the *magnetic declination* were effected with a Bamberg declinatorium on Bear Island, at Green Harbour, Advent Bay, and Kings Bay.

Part of the *geological work* was undertaken in the area on the south side of Van Mijen Bay which had been topographically mapped in the same year, this area being made up entirely of Tertiary strata. Geological investigations were also made on the south side of Van Keulen Bay. In the extreme west of this area there are strata of the

Hecla-Hoek formation, then follow strongly folded strata of the systems from Carboniferous to Cretaceous, and finally, innermost, some flat-lying sandstones and slates of the Tertiary system. Further, geological work was done in the western part of the Middle Hoek peninsula where (in the same way as on the south side of Van Keulen Bay) all the systems from Hecla-Hoek to Tertiary, except the Devonian, are present, all having strongly folded and overturned strata. The Tertiary area on the peninsula south of Ice Fjord between a line from Coles Bay—Berzelius Valley and a line from Bear Valley to the east side of the mouth of Conway Valley was mapped on the scale of 1:50000, the total area being 785 sq. km. Special examination of the coal deposits was made at the following points: On the east side of Advent Bay between this bay and Coles Bay, at Cape Boheman Peninsula, in Mt. Pyramid, where a new mineral was found in a burning coal seam, and at Kings Bay. Finally, the altitudes of some raised beaches on the east side of Coles Bay were measured by spirit levelling.

During the winter of 1921—1922 the members of the permanent staff of the expedition were: Two topographers: KOLLER and SOLHEIM, two geologists: HOEL and ORVIN, and one typist. The stereophotogrammetric maps were constructed by *A/S Kartkontoret Stereografik*, Oslo.

1922. Hoel's Expedition.

The expedition was financed by the Government and the Nansen Fund. The members were: Two topographers: KOLLER and SOLHEIM; one hydrographer: EILIF IVERSEN, Civil Engineer; one oceanographer: OLAF DEVIK, Director of the meteorological division of the Geophysical Institution, Tromsø; four geologists: HOEL, WERENSKIOLD, ORVIN, and SVERRE BLEKUM, Mining Engineer. There were 11 assistants, five workmen, and a crew of eight men on the expedition vessel, the motor cutter "Ringsæl" of Tromsø, Skipper ALFRED GUDMUNDSEN. The expedition totalled 32 members.

The *topographical work* was done on Spitsbergen in July and on Bear Island in August. On Spitsbergen, the country south of Advent Bay, a total area of 67 sq. km. was surveyed. On Bear Island a base line was measured in Sørlia and also carried out triangulation work. The filling in of topographical details was largely made with stereophotogrammetry supplemented by some tacheometer measurements. In this way the following areas were measured: 6.18 sq. km on the scale of 1:2000 with contour intervals of 1 m, and 6.46 sq. km on the scale of 1:2000 with contour intervals of 2 m. The maps, the total area of which is 12.64 sq. km, include the country around South Haven and a strip of land from this bay to Salmon Lake. This work was done with a view

to erecting an aerial ropeway from the possible coal area at Salmon Lake to a projected store and loading place at South Haven.

Hydrographic work consisted in sounding South Haven for a chart on the scale of 1:1000, 4000 soundings being made. At this point also *measurements of the water level* were made by IVERSEN, in order to determine the tidal difference and the time of high water as well as to obtain a datum point for the measurements of heights and depths. For this purpose a tide gauge was read every hour for about two weeks. From the trigonometric point Tp. 16a levellings were made to one of the two bolts at Russe Haven driven into the rock in 1899 by J. G. ANDERSSON's expedition. In this way it was possible to make comparisons between the water levels in the years 1922, 1899 and also 1864 as in this year NORDENSKIÖLD's expedition fixed a bolt at Russe Haven, and the relation of this bolt to that from 1899 had been determined before. The results of the measurements show that throughout this period, at least from 1864 to 1899, the water level has been stationary. Later there has possibly been a little upheaval, but the calculated amount of this is so insignificant that it may be ascribed to errors in the measurements.

Oceanographic work consisted in making the following sections and series of measurements: Sections across the Gulf Stream west of Bear Island, a section across the cold westward South Cape current between Bear Island and South Cape, a section from Ice Fjord due westward into the Gulf Stream, a series of measurements in Cross Bay, and a section from Verlegen Hoek northward to the boundary of drift-ice, where a point of the position $81^{\circ} 29' N.$ Lat. and $19^{\circ} 20' E.$ Long. was reached. At this point, where the depth was found to be 3076 m, the temperature was measured down to the bottom, where samples of the water were also taken. This work is noteworthy because a high northern latitude was reached (the point mentioned lies near the farthest point ever reached in northern ice-free waters), and because samples were taken and temperature measurements made at the bottom of the deep polar basin. It was the first time this had been done with modern instruments. Altogether, observations were made from 29 stations, including eight single stations and 21 stations that constituted the four oceanographic sections.

Geological work on Spitsbergen consisted in an examination of the coal fields on the east side of Advent Bay belonging to *A/S De Norske Kulfellet Spitsbergen* of Bergen, and of deposits at Kings Bay belonging to *Kings Bay Kul Comp. A/S* of Ålesund. At the former place the work was done by BLEKUM, and at the latter place by ORVIN. Also HOEL took part for some time in the work at Kings Bay. A report on the coal deposits and the mines was telegraphed to the Ministry of Trade in view of the question of State support for these mines.

At Advent Bay three Tertiary coal seams not previously known from this area were found. Of these one or two were considered workable; they contained coal of better quality than that known before at this point. All the four Tertiary seams known were uncovered in seven places. Twenty-two samples of coal were taken, and these were submitted for analysis to Dr. J. GRAM, Chief Analyst of the Norwegian State Railways.

At Kings Bay a geological map was made of the entire Brøgger peninsula on the scale of 1:50000. Besides, a geological map (1:10000) of the Tertiary coal deposits was made. Numerous geological sections were made, and a considerable number of coal samples, in addition to those mentioned above, were brought home; they, too, were analysed by Dr. GRAM.

During the winter of 1922—1923 the topographical and geological material was dealt with by the permanent staff of the expedition: Three topographers: KOLLER, SOLHEIM, and JAKOB SARTORIUS, Civil Engineer; two geologists: HOEL and ORVIN, one draftsman: BERNHARD LUNCKE, Civil Engineer, and one typist. The stereophotograms taken were attended to by *A/S Kartkontoret Stereografik*. The oceanographic material was submitted to Professors FRIDTJOF NANSEN and BJØRN HELLAND-HANSEN for examination.

1923. Hoel's Expedition.

The expedition was financed by the Government and the Nansen Fund. This year, too, work was done on both Bear Island and Spitsbergen. On Bear Island the following members participated: One astronomer: Dr. HANS HENIE; three topographers: KOLLER, SOLHEIM, and LUNCKE; and seven assistants, making a total of 11 members.

On Spitsbergen were the following: Three topographers: WERENSKIOLD, who was also geologist, KÅRE GLEDITSCH, Civil Engineer, and SARTORIUS; five hydrographers: HERMANSEN, Captain LEIF HAGERUP (in command of the "Farm") Lieutenant ELIAS KJÆR, Commander R. v. KROGH, and Lieutenant KNUT THORKELSEN, all of the Norwegian Navy. There were two geologists: ORVIN and HOEL, and one taxidermist, ERLING HANSEN. Captain OTTO SVERDRUP accompanied the expedition with a view to studying the question of stationing a Government ice breaker in Svalbard waters. There were six assistants. Two vessels were at the disposal of the expedition, the "Farm" with a good-sized motor boat and the motor cutter "Blomstersæl" of Stavanger, which was kindly lent to the expedition by Bjørnøen A.S., the company owning Bear Island. During part of the summer the expedition was also permitted to use a motor boat belonging to the Government Fishery Research under the direction of THOR IVERSEN. The "Farm" had a crew of 31 men and the "Blomstersæl" one of six men. In addition, there were three officers in the "Farm" and two in the "Blomster-

sæl", who were also serving as hydrographers. The number of men on both vessels was 42, so that the expedition totalled 66 members.

Topographical mapping on Bear Island included the following work: The longitude and latitude of a point at the mining camp of Tunheim at the north-east corner of the island were determined, as was also the azimuth of a triangle side. Starting from the base line measured in 1922 was built up a primary triangle net with 29 points which have been adjusted according to the method of least squares, while the other 74 points have been adjusted on the basis of the sum of angles in the triangles, and then co-ordinated with the primary points. The datum for the levellings was the mean water level determined by measurements in 1922. Using the stereophotogrammetric method was surveyed 91.88 sq. km. on the scale of 1 : 10 000, and using the tacheometer, 28.24 sq. km. along the coast. Around the mining camp was surveyed with the tacheometer 0.64 sq. km. on the 1 : 2000 scale.

The *magnetic declination* was determined at Tunheim and found to be $3^{\circ} 51'.1 \pm 8'.65$.

The Spitsbergen party of the expedition on the M/C „Blomstersæl“ worked a few days on the northward journey on Bear Island, according to instructions from the Ministry of Trade. Reports were submitted to the Ministry on the harbour conditions, the investigations of the coal deposits, and the workings of the mines.

Topographical work on Spitsbergen. The surveying consisted chiefly in supplementing previous measurements in the following areas: The coast between Horn Sound and South Cape, the country inside Cape Klaveness, the coastal region between Bell Sound and Ice Fjord, two small valleys between Coles Bay and Bear Valley, the areas between De Geer Valley and Sassen Valley, around Temple Bay, and on the north side of Ice Fjord. The total area mapped may be estimated at 335 sq. km, including some measurements made in 1913 and 1917.

Observations of the water level were made by reading a tide gauge, at Bjona Haven and at Skans Bay.

Hydrography. Soundings were made especially in shallow waters at a number of points inside the 20 m. danger line between Cross Bay and South Cape, and two lines of soundings were made between Danes Island and Cross Bay. Also St. Johns Bay was sounded and the hydrographic work in the coastal waters from Ice Fjord southwards was completed. It may be mentioned that the excellent harbour at Dun Islands was sounded, that new anchorages were found at Ice Islands, and across the great shoal to the north was sounded a fairway for small vessels. At South Cape the large shoal extending 10 nautical miles from the coast was carefully sounded, good anchorages were found on both sides of South Cape Island, and a fairway for small

vessels was located between South Cape Island and the mainland. It was proved that the doubtful shoals recently reported, and according to older maps lying south of Bear Island, west of South Cape, at the mouth of Ice Fjord, and west of Cape Cold, did not exist. The waters surrounding the harbour at Ny-Ålesund were sounded for a chart on the scale of 1:25000. The area sounded amounts to 2308 sq. km. and the length of the 10 and 20 m. danger line is 174.5 km.

To mark the seaward approach to Kings Bay two *beacons* were put up, one on the northern point of Prince Charles Foreland and the other on the Brandal Point in Kings Bay. Two beacons were also put up to facilitate navigation across the Bar in Foreland Sound, one on Point Sars and the other on Point Murray. The beacon on Cape Linné was repaired.

Oceanographical work. West and north of Spitsbergen four sections with 18 stations were taken from the "Farm" and nine single stations from the "Blomstersæl". One of these stations had a very high northern latitude, its position being $81^{\circ} 12' N.$ Lat. and $17^{\circ} 5' E.$ Long. Thus the conditions of the ice were continually very favorable, and causally connected with these conditions were the very high temperatures observed in the Gulf Stream this year as well as last. Off the west coast of Spitsbergen the temperature was $6-7^{\circ}$, and off the north coast as far north as $81^{\circ} 12' N.$ Lat., it was about 5° .

Meteorological observations were made on the "Farm" during its entire cruise.

Determinations of the *magnetic declination* were made at four stations.

Geological work. The previous geological operations at Kings Bay continued. ORVIN mapped the Kings Bay coal field on the 1:5000 scale. Besides being of great practical value this work also gave extremely interesting scientific results, especially with regard to the Tertiary mountain folding on Spitsbergen. It may be mentioned also that the Devonian system on Brøgger Peninsula was observed for the first time.

As the Kings Bay Coal Co. applied for State support for the following winter season a report was submitted to the Ministry of Trade.

The measurement of the large geological section at Festningen on the south side of Ice Fjord, which work was started in 1912, was now finished. This work completed the detailed measurement of the continuous sequence from Upper Carboniferous to the boundary between Cretaceous and Tertiary. The total thickness of these strata is 2590 m. Moreover, several geological observations were made in the country between South Cape and Horn Sound, on the north side of Ice Fjord, on the north coast of West Spitsbergen, and on Seven Islands.

Zoological collections. On Bear Island the taxidermist collected 78 bird skins, besides nests and eggs, also skins and complete skeletons, and parts of skeletons, of various mammals; also 20 bottles of marine

invertebrates, some fresh water fishes, 14 bottles of land and fresh water insects. Among these insects one species is new to Spitsbergen. Finally, the collection also includes 11 bottles of bird parasites.

During the winter of 1923—1924 the permanent staff at the office was as follows: Four topographers: KOLLER, SOLHEIM, SARTORIUS and LUNCKE; three geologists: HOEL, ORVIN and BRAASTAD, and one secretary. The stereogrammes were dealt with by *A/S Kartkontoret Stereografik*.

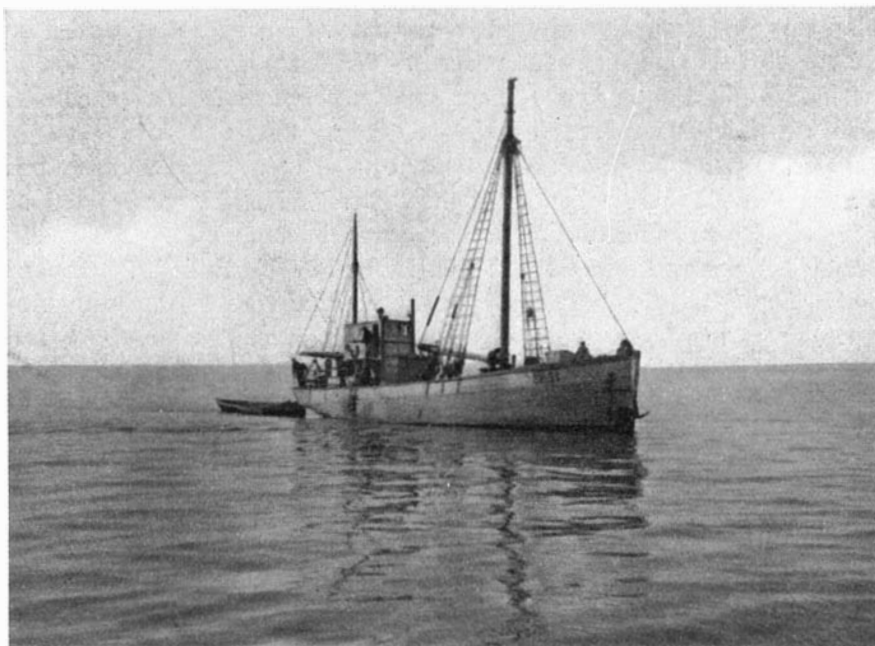


Fig. 14. M/C "Blomstersæl".

Hoel phot. 1923.

It may be mentioned that the Government, at the request of HOEL, granted 8500 kroner for collecting ship's journals from the cruises of Norwegian whaling and sealing vessels in the Arctic Ocean. Such journals, which are very important documents pertaining to geographical discoveries and the conditions of the ice in these waters, are likely to be destroyed or to disappear if not taken good care of. The work was entrusted to OTTO SVERDRUP, who assisted by HERMANSEN, travelled along the entire coast of Norway and collected 95 journals from 1853 to 1922. Later these were examined by HERMANSEN who used the data found in the journals for the drawing of charts showing the boundaries of the ice in those years. This material is of the greatest importance for the study of the problems relating to the variations in the extension of the ice. The journals are now preserved in the Library of Oslo University.

1924. Hoel's Expedition.

The expedition was financed by the Government and the Nansen Fund. This year work was done both on Bear Island and Spitsbergen.

On *Bear Island* topographical and geological work was done, and borings and surface strippings were made in order to trace the coal-seams. The following staff participated in the work: Topographers: LUNCKE and GLEDITSCH, geologists: ORVIN and G. HORN assisted by H. MARSTRANDER,



Fig. 15. View towards North-west from Ross I., northernmost Island in Svalbard.

Hoel phot. 21/s 1923.

Mining Engineer. H. MERCKOLL, Mining Engineer, was in charge of the drilling. There were four assistants and five drillers with four assistant drillers. Eight labourers were engaged in stripping. On *Spitsbergen* the members of the expedition were: Four topographers: KOLLER, SOLHEIM, SARTORIUS, and WERENSKIOLD, the last-mentioned also being geologist; three hydrographers: R. v. KROGH (in command of the "Farm"), HERMANSEN, and THORKELSEN; two geologists: HOEL and BRAASTAD; one assistant geologist: GUNNAR AASGAARD, Mining Engineer, one paleontologist: OVE HØEG, Curator of the Paleontological Museum, Oslo; one botanist: JOHANNES LID, Curator at the Botanical Museum, Oslo; and one film photographer: PAUL BERGE. There were 13 assistants for the shore parties. As in the previous year the transport "Farm" and the motor cutter "Blomstersæl" of 81 tons gross,

Skipper RICHARD EVENSEN, were at the disposal of the expedition. The crew of the "Farm" numbered 29 men, not including the three officers, and the "Blomstersæl" had eight men. Thus the expedition consisted of 90 men in all.

On *Bear Island* the following work was done:

Topographical work. Of the remaining area, 3.61 sq. km. along the coast from Rifle Pt. to Ella Lake were surveyed photogrammetrically from sea stations on the scale of 1 : 10 000, and 40.08 sq. km. chiefly in the north-western part of the island was surveyed with tacheometer. In connection with the map around the mining camp made in 1923 on the 1 : 2000 scale was further surveyed 0.98 sq. km. with the tacheometer. Thus the total area of Bear Island was mapped on the scales 1 : 10 000 and 1 : 2000, in all 178.07 sq. km.

A detailed *geological map* on the scale of 1 : 10 000 of the coal deposits was commenced. A number of *pits* and *trenches* were dug to get sections of the coal seams, and *boreholes* were drilled to obtain reliable information about the sequence in the Devonian and Culm formations. *Norsk Diamantborings A/S* of Oslo supplied the drilling outfit. Three holes were drilled, two at Tunheim and one at Haus Lake, having an aggregate length of 536.86 m. The hole at Haus Lake was drilled to a depth of 233.92 m, this being the deepest hole on the island.

As the question of a continuation of Government support for coal mining on Bear Island again became urgent, a report was submitted to the Ministry of Trade.

On *Spitsbergen* the following work was done: The *topographical work* consisted in mapping the country around Temple Bay, the outer part of the peninsula between this fjord and Klaas Billen Bay, and the country around the latter bay. Also in 1924 the stereophotogrammetric method of mapping was used. However, this year the expedition purchased a new type of field outfit from Carl Zeiss. The stereophotogrammetric maps were all constructed on the scale of 1 : 50 000 with contour intervals of 50 m. Moreover, a special map of Temple Mountain was made of the scale of 1 : 4000 with contour intervals of 4 m. in order to illustrate the remarkable forms of erosion seen in this mountain. The area mapped amounts to 785 sq. km. Also the coast line between Cape Boheman and Cape Wærn, and between Cape Wijk and Cape Thordsen, was revised, and trigonometric observations were made from Olavs Cairn. This year sights were obtained to two points, Mt. Svanberg and Mt. Backlund, in the Russian geodetic net on the east side of Spitsbergen from two of our trigonometric points.

Observations of the tide were made on the west side of Klaas Billen Bay and at Cape Boheman by SOLHEIM, and at Gips Bay by SARTORIUS.

The *hydrographic work* consisted in sounding following fjords and waters: Van Këulen Bay where the area sounded amounts to

243 sq. km and the measured danger line is 92 km. long, and Sassen Bay and Temple Bay where the corresponding figures are 331 sq. km. and 83.5 km. In Foreland Sound a 10 m. danger line was traced between Point Poole and Point Heemskerck on the Foreland side, and between Quade Hoek and St. Johns Bay on the mainland side, and also in the bay at Eidem Glacier north of Farm Haven, while soundings were made inside the danger line. Some supplementary deep soundings were also made in the sound. The area hydrographically surveyed amounts to 412 sq. km. and the length of the danger line is 171.5 km. In Kings Bay work was done at the head of the fjord inside Lovén Islands, and also between Cape Guissez and Blomstrand Peninsula. The area hydrographically surveyed at this place amounts to 68 sq. km. and the length of the danger line is 69.5 km. Some supplementary soundings were made in Tundra Bay and at Loweness. The total area of hydrographic surveys amounts to 1057 sq. km. and the length of the sounded danger line is about 416.5 km.

In order to facilitate navigation in Foreland Sound a *beacon* was built on Point Poole on the west side of the sound.

Oceanographic work. Observations of the temperature of the surface water were made at regular intervals from both vessels. Oceanographic sections were made between Bear Island and South Cape on Spitsbergen, and on the west and north sides of Spitsbergen. One section with six stations and two single stations was made by the "Farm", and three sections with 14 stations and also five single stations by the "Blomstersæl", making 27 stations in all. This year the northernmost point reached was at 80° 19' N Lat., 12° 0' E Long. At this point farther advance was checked by the ice.

Meteorological observations were made regularly on both ships of the expedition.

Geological work consisted chiefly in mapping on the scale of 1:50000 the Tertiary and Cretaceous strata south-east of Advent Bay and Advent Valley, an area of 500 sq. km. Also a considerable material of plant fossils was collected by HØEG, on Bear Island (Devonian and Culm), and on Spitsbergen (Devonian, Cretaceous and Tertiary). He also collected valuable material of Devonian fishes from the country between Dickson Bay and Wijde Bay.

At the request of the Coal Committee of the Department of Trade the mines and a newly discovered coal-seam at Kings Bay were examined, and a report was submitted on the question of Government support to the mine for the coming year. Moving pictures were taken at all the seven active mines at Svalbard, showing the state of the mining industry in the last year in which the islands were a no-man's-land.

Botanical work. The vegetation was examined by LID, who made collections on Bear Island, at Green Harbour, Cape Boheman, Advent

Bay, Dickson Bay, and Wijde Bay. A large material of Phanerogams was collected including two species that were new to Spitsbergen, namely *Juncus arcticus* WILLD. and *Erigeron uniflores* L., and also of lower plants of which several species were new to the islands. The material will presently be examined at the Botanical Museum of Oslo University. Besides the purely floristic work, several statistical examinations were made of the plant communities according to the method of HULT-SERNANDER. The temperatures were repeatedly mea-

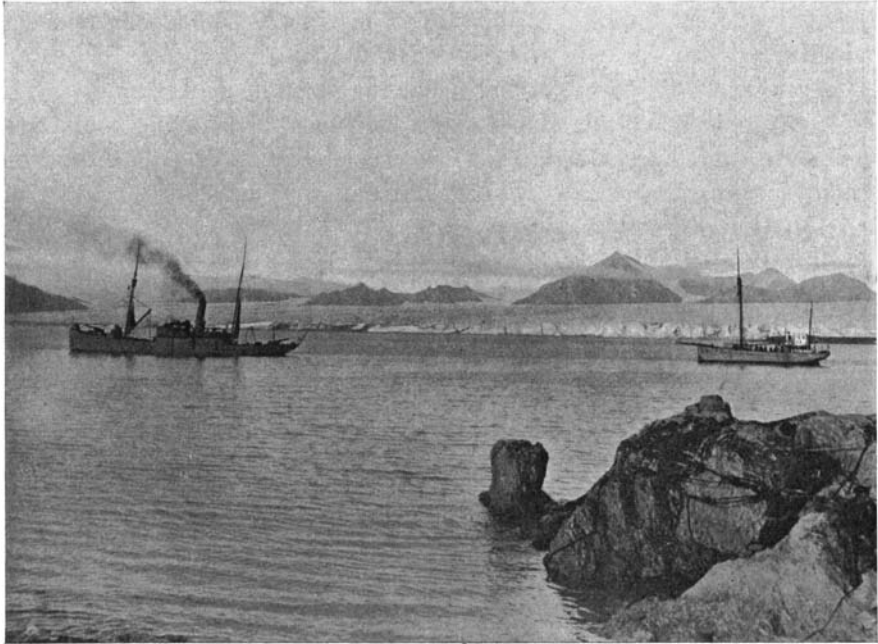


Fig. 16. H. M. S. "Farm" and M/C "Blomstersæl" in Farm Haven.

P. Berge phot. 5/8 1924.

sured both in the air and in the different layers of earth down to the frozen ground.

During the winter of 1924—1925 the permanent staff of the expedition were: Four topographers: KOLLER, SOLHEIM, SARTORIUS, and LUNCKE; four geologists: HOEL, ORVIN, BRAASTAD, and HORN; and two secretaries. The stereophotogrammetric maps were constructed by A/S Kartkontoret Stereografik.

1925. Hoel's Expedition.

The expedition was financed by the Government, and the Nansen Fund.

This year work was done on both Bear Island and Spitsbergen. On Bear Island the following members were working: One geologist:

HORN, who was also in charge of the deep drilling, and one assistant geologist: H. MARSTRANDER. They were aided by two assistants, five drillers, and seven labourers. There were 16 men altogether.

The following members worked on Spitsbergen: Four topographers: KOLLER, SOLHEIM, SARTORIUS, and LUNCKE; four hydrographers and oceanographers: HERMANSEN (in command of the expedition ship "Farm"), THORKELSEN, Captain F. SCHULZ, and Lieutenant P. BREDSDORFF, both of the Norwegian Navy and three geologists: HOEL, ORVIN, and BRAASTAD. There were 14 assistants for the land parties. The expedition's vessel was the "Farm" with a crew of 28 men, not including three officers who also served as hydrographers. For sounding work there were also two sea-going motor boats. The expedition totalled 69 men.

The expedition finished its *geological work* on *Bear Island* this summer. The areas not previously mapped were surveyed, trenches and pits were dug for the examination of coal-seams, and some drilling was done. At Vestre Flyvatn a bore was put down and carried to a depth of 223.5 m. (Outfit from *Norsk Diamantborings A/S.*) In 1924 and 1925 trenches and pits were dug at 24 places, 600 c. m. of earth and rock being thus excavated, the pits having an aggregate length of 120 m. and the adits, 15 metres. The aggregate length of the four holes drilled in 1924 and 1925 is 760.36 m, which, with previous holes drilled in 1916 and 1918 for the owners of the island, give a total length of all holes drilled in Bear Island of 1504.05 m. The lengths of the old holes north of Mt. Misery drilled in 1918, and at Herwig Haven drilled by a German expedition 1912, are unknown.

The result of the geological survey of Bear Island showed that there did not exist coal-seams of a thickness and purity necessary to make mining profitable with the low coal prices ruling at the end of 1925. The mine was therefore closed down in September 1925.

On *Spitsbergen* the following work was done:

Topographical work. A base line was measured at Braganza Bay. A large area north and north-east of the inner part of Van Mijen Bay and Braganza Bay was mapped by photogrammetric and stereophotogrammetric methods, this area including the upper part of Conway Valley and Advent Valley and reaching as far as Sassen Valley. The area amounted to 1274 sq. km. Mt. Agardh on the east side of Spitsbergen, one of the points in the Russian geodetic net, was fixed by intersection from two of our trigonometrical points.

Tidal observations were made by KOLLER at Sveagruvan at Van Mijen Bay, by reading a tide gauge.

Hydrographic work consisted in sounding the following fjords and bays: Cold Bay on the north side of Van Mijen Bay (59 sq. km.), North Fjord, Ekman Bay, Dickson Bay (total 601 sq. km.), and Klaas Billen Bay (218 sq. km.). Also a 10 m. danger line in Farm Haven

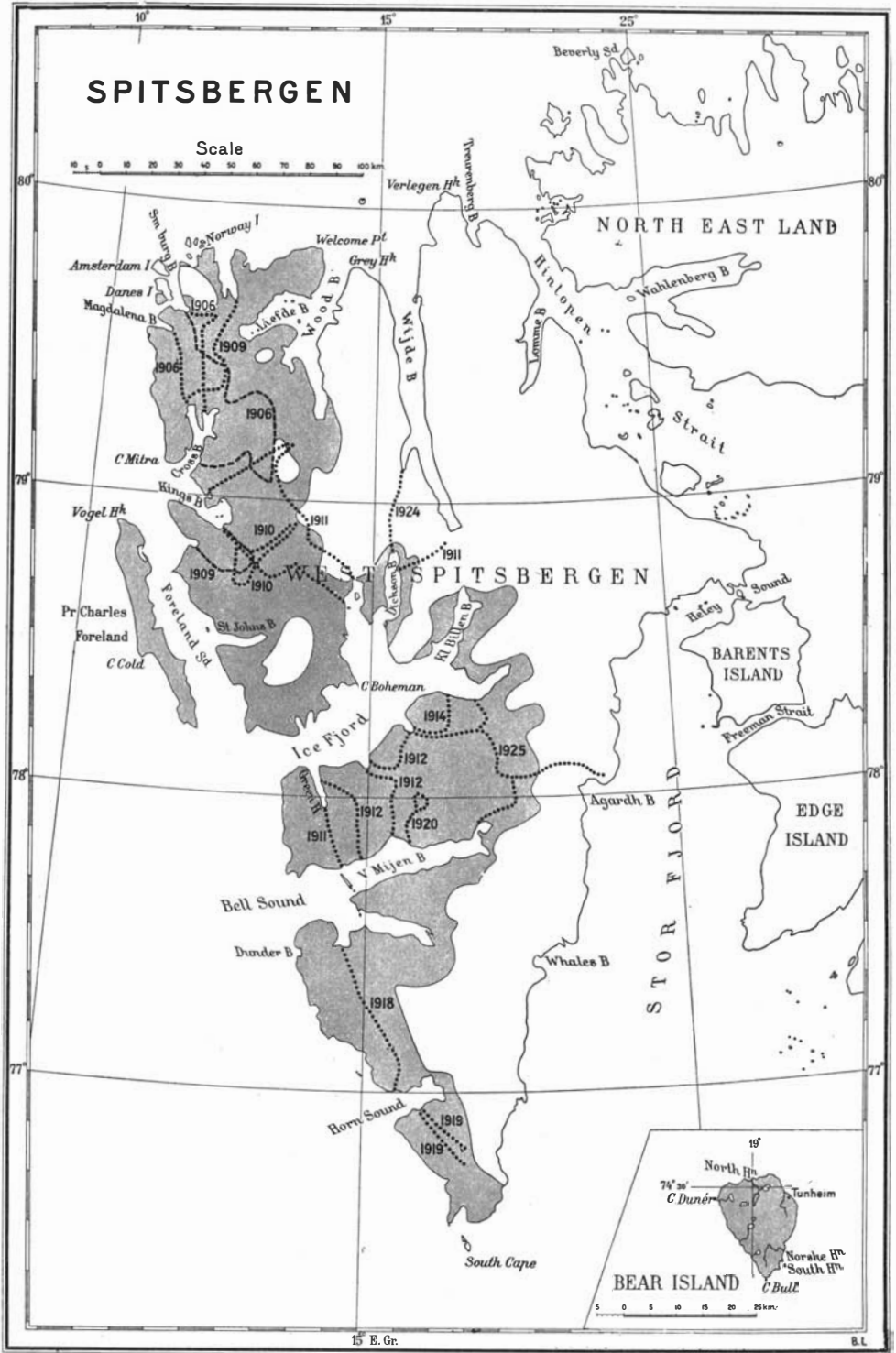
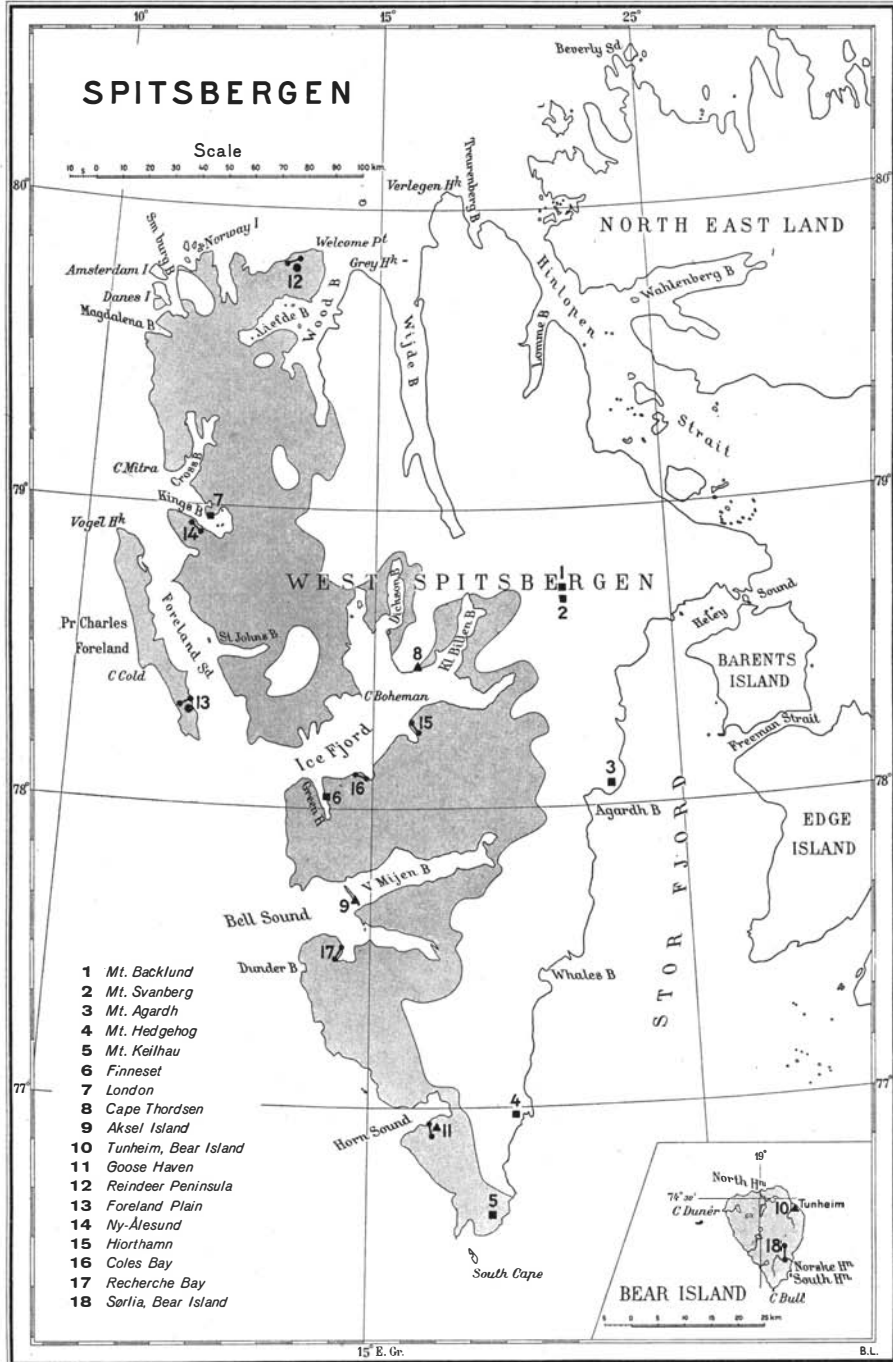


Fig. 17. General Map showing the Principal Inland Routes. Shaded Part indicates Area topographically Surveyed.



- 1-7 1st Order Astronomical Stations (Laplace stations)
- ▲ 8-11 1st " " " } connected with our triangulation net.
- 12-13 2nd " " " }
- 11-18 Main Base Lines.

Fig. 18. General Map showing Location of Astronomical Stations and Main Base Lines.

was revised, and some sounding work was done along the Seven Ice Mountains (75 sq. km.). The total length of the 10 m. danger line amounts to 294 km. and the total area sounded to 953 sq. km.

Oceanographic work. Besides the usual oceanographic sections west and north of Spitsbergen a section was also made between Bear Island and South Cape, and observations were made from stations in the fjords on the west and north coasts. Altogether, nine sections were made with 50 stations, besides five single stations. The highest latitude reached



Fig. 19. Moving Camp in the Kjellström Valley.

N. Heyerdahl phot. 29/s 1925.

was $80^{\circ} 54' N$ Lat., $12^{\circ} 0' E$ Long. The temperature at the surface of the water was read at regular intervals from the "Farm".

Meteorological observations were made at regular intervals during the entire cruise, six times every 24 hours.

Geological work consisted in mapping the peninsula between Ice Fjord and Bell Sound—Van Mijen Bay on the scale of 1:50 000. An area of 275 sq. km. on the west coast, chiefly within the Hecla-Hoek formation, was mapped. The principal work was the mapping of the eastern part of this peninsula where the systems from the Upper Carboniferous to Tertiary occur. Three separate areas were mapped. One is located between Advent Bay, Advent Valley, Sassen Valley, and Ice Fjord, 565 sq. km, the second between Conway Valley and Van Mijen Bay—Braganza Bay, 350 sq. km, and the third on the south side of



Fig. 20. General Map showing topographically Surveyed Areas, 1906—1925. (18083 sq. km.).



Fig. 21. General Map showing Charted Areas, 1909—1925. (16196.68 sq. km.).

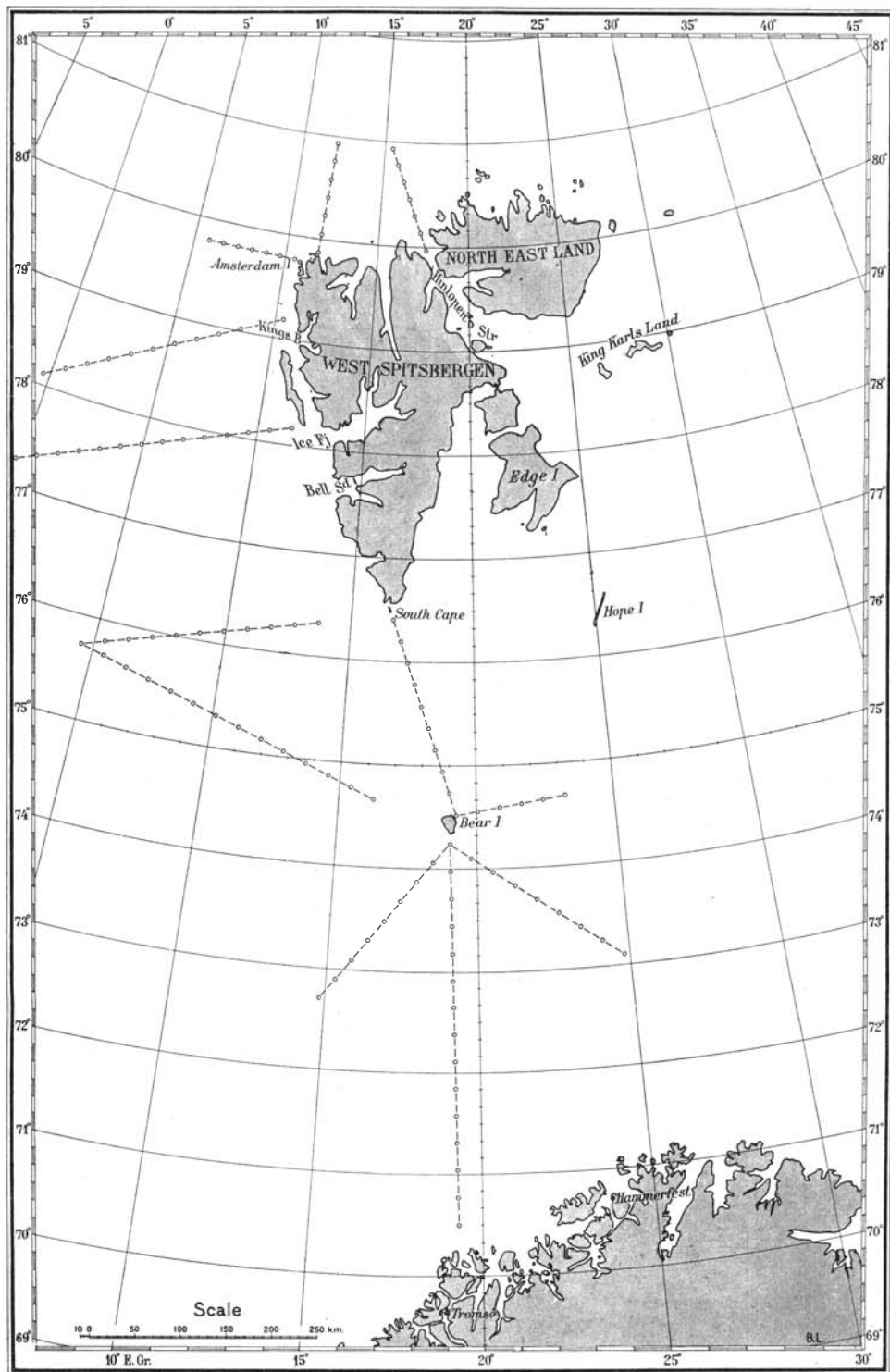


Fig. 22. General Map showing Position of Main Oceanographic Sections.

Braganza Bay and Van Mijen Bay east of Point Conwentz, 110 sq. km. The total geologically mapped area thus amounts to 1300 sq. km.

At the request of the Ministry of Trade the mines and works at Kings Bay were examined, and reports submitted on the question of Government support for the continued operation of these mines.

The permanent staff of the expedition at the office during the winter of 1925—1926 included the same 10 members as in the previous year. The stereophotogrammetric maps were constructed by SARTORIUS on the stereoautograph belonging to *A/S Kartkontoret Stereografik*, and hired by the expedition.

1926. Hoel's Expedition.

At the request of *Store Norske Spitsbergen Kulkompani A/S*, Oslo, geological surveying was done this summer on the fields of the company by ORVIN and HORN and their two assistants. In order to make possible scientific investigations in connection with this work, the Nansen Fund contributed some money to the expedition. The members of the expedition travelled to and from Spitsbergen in colliers. Their work consisted chiefly in investigations of the structural geology of certain areas. A number of remarkable springs were also examined. The results obtained were also of great value from a scientific point of view.

During the winter of 1926—1927 the permanent staff at the office was the same as during the two foregoing years.

In the Svalbard Treaty of Febr. 9, 1920 it is provided that the complicated claim questions and disputes between the occupants should be examined by a commissioner of Danish nationality. In 1925 Professor Dr. KRISTIAN SINDBALLE of Copenhagen University was nominated commissioner by the Danish Government, and in June 1926 he charged our office with the task of working out maps of the various properties, proposing the final boundaries between the properties, and preparing the boundary descriptions. Fortunately, we were in possession of maps and material for this work, as well as topographers and geologists well acquainted with the localities. Our office was engaged with this task till September 1927, when the report of the Svalbard Commissioner was published.

In the summer of 1927 no field work was done in Svalbard.

It will appear from the statements given in the preceding pages that a very comprehensive programme of mapping and geological work was gone through in Svalbard in the period from 1922 to 1925. The latter year marked an interruption in the continuous series of expeditions, none being sent to Svalbard by the Norwegian Government in 1926 and 1927. The reasons for this temporary interruption in field work will appear from the following statements.

The sovereignty over Svalbard was assigned to Norway by a treaty signed in Paris on the 9th of February 1920, providing, *inter alia*, that all disputes relative to property on the islands should be adjusted in a manner prescribed in the treaty. For that reason it was essential for the Norwegian Government to provide the best material possible in order to facilitate the decision of these disputes. Furthermore, the Norwegian Government had actively supported the Norwegian coal companies in Svalbard, and extensive topographical and geological surveys were carried out by our expeditions on the properties of the companies supported by the State, in view of the economic interests of the latter in these companies.

Finally, it was of importance to have the coastal waters surveyed so as to obtain reliable charts for the benefit of the increasing number of vessels carrying coal from the islands.

The arbitrators to whom the task of settling property disputes was entrusted, were appointed in 1925, and all reported claims were then submitted to them for consideration. Fortunately, at this time the material necessary for the decision of these disputes was available through the work of the expeditions. For practical reasons, therefore, the immediate continuation of these expeditions was not imperative, and it was also absolutely necessary for the members of the expeditions to devote some time to the handling of the tremendous amount of material that had been collected, and of which very little had been thoroughly studied.

Several circumstances had contributed to this accumulation of unstudied material. In the first place, the forced field work occupied (including the preparations) almost half of the year. Also lack of funds hindered the working out and publication of the results.

The unsettled conditions during the Great War hampered international intercourse and seriously delayed the examination of the large collections of fossils which had been submitted to a number of foreign specialists.

However, in the spring of 1927 funds were secured for continued work on this material, the Storting, on the application of Mr. HOEL, allocating 250 000 Kr. for this work from the profits of the State Lottery (Pengelotteriet). This money, distributed over a period of five years, was to be devoted to the study of the material and to the printing of papers and maps.

Summary of Topographical Surveying.

The mapping of Svalbard has been carried out in a somewhat different way from the mapping of countries with established topographical surveys. In Svalbard it was always necessary to select a certain area which had to be surveyed during one or two seasons, as grants were never given for more than one or two summers' work at a time. For this reason our surveys had to be done in such a way that after a base line had been measured, triangulation and filling in of topographical details were done at the same time. Hence the computation of the triangles was carried out in reference to local co-ordinate systems. As these systems were not very extensive, and a small area of the earth can be treated as a plane, one had then the advantage of being able to work out the triangles quickly and cheaply by the methods of plane trigonometry.

Gradually these local systems have been connected, and linked up with the Swedish-Russian Arc-of-Meridian system on the east coast of Spitsbergen, and some few astronomical stations on the west coast (Fig. 18), enabling us to transform them to a common system. As this system must necessarily extend over a large area, the computations cannot be done without taking into account the curvature of earth. For the common system a conformal cylindrical projection with axis in the meridian 15° E. of Gr, has been used. The island of West-Spitsbergen has been referred to this axis, whereas the eastern islands will be referred to another axis.

In the geodetic computations the values for the International Ellipsoid adopted by the Congress in Madrid (1924) have been applied.

Topographical surveying in Svalbard falls naturally into four periods:

1906—1907. During these years a considerable part of the north-west corner of Spitsbergen was mapped. The survey methods employed were triangulation with theodolite from base lines measured with steel tape (tension estimated). As triangle points were used cairns, but also mountains with pointed summits. As datum point for the elevations estimated mean high water level (highwater-mark) was used. The topographical details were filled in partly with plane table surveying, but chiefly with photogrammetry according to the method of G. DE GEER (without photo-theodolite). In 1907 photogrammetric sea stations were used by the expeditions for the first time. The astronomical data for the orientation of the map were taken from PRINCE ALBERT OF MONACO's map of Red Bay, surveyed in 1899. Further, the azimuth of a triangle side on the east side of Cross Bay was determined by G. ISACHSEN in 1907.

1909—1910. The survey of the north-west corner of Spitsbergen was continued with improved methods, as the triangulation was founded

upon base lines accurately measured with an Invar tape (tension applied: 10 kgs). As triangle points only cairns and other built signals were used. The experience from the years 1906—1907 showed that plane table surveying was not suitable, and this method was therefore abandoned. The photogrammetric surveying was continued with an improved method, introducing a photo-theodolite. In 1909 direct "depression" measurements for the filling in of coast-lines were applied for the first time. Astronomical observations for the determination of the necessary geographical data for the maps were carried out by means of sextant and theodolite.

1911—1919. During these years the topographical surveying was proceeded with on the peninsula between Icefjord and Van Mijen Bay, and a strip along the coast, 25 km. broad, from Bell Sound to South Cape, applying the same methods, with the addition of tacheometry, as used in the years 1909—1910, but with a higher degree of accuracy.

Regular water level observations was started in 1916. In these years various auxiliary appliances for photogrammetric construction were introduced, making this work much more quick and accurate.

1920—1925. The same surveying methods as used before were applied with the addition of stereo-photogrammetry. Theodolites of a larger type were obtained. The theodolites previously used for the triangulation work had readings to $0^{\circ}.01$, but for the main triangulation after 1923 was exclusively used a larger type of theodolite with trommel-reading to $0^{\circ}.001$. Systematic water level observations were carried out in several fjords. In 1923 a first order astronomical point was fixed on Bear Island, and the Geographical Survey of Norway determined in 1920 and 1922 at our request a Laplace point at Green Harbour.

Our Spitsbergen maps are based on seven base lines accurately measured. From the general map on page 47 it will be seen where these lines are situated. All points are referred to a common co-ordinate system, whose X-axis is 15° long. E. of Gr. and Y-axis is the 76° parallel. We have succeeded in getting trigonometrical connection with five of the points of the Russian Arc of Meridian Survey on the east side of Spitsbergen, and with five astronomical and Laplace points of 1st order on the west side of Spitsbergen. In 1919 it became possible to make a comparison with the triangle side Mt. Hedgehog—Mt. Keilhau of the Russian Arc of Meridian Survey, which side had been included in our triangulation net. The sides agree with an accuracy of 1:20 000 of the length. About the same degree of accuracy has been obtained between the lengths of the common triangle sides of our own triangulation nets.

The topographical surveying in the period 1920—1925 covered the inner part of the peninsula between Icefjord and Van Mijen Bay, and the region around Van Mijen Bay, Van Keulen Bay, Sassen Bay, and Klaas Billen Bay.

The Expeditions and Government Departments.

As already mentioned, the expeditions were originally of an entirely private character. The first two, in 1906 and 1907, were fitted out and the expenses defrayed by PRINCE ALBERT I OF MONACO, and the cost of the third expedition in 1908, was covered by Oslo University and private subscribers. It was not until 1909 that the Norwegian Government started to give its support, partly in the form of grants and also by placing at the disposal of the expeditions one of the vessels of the Norwegian Navy through the Ministry of Defence. Up to and including 1921 these Government contributions were advanced through the Ministry of Church Affairs and Education. In 1918 a grant was also received through the Ministry of Agriculture for the purpose of investigating the phosphorite deposits in Spitsbergen, as the lack of phosphatic fertilisers during the War had become serious. From 1922 the grants were received through the Ministry of Trade. However, both in 1922 and 1923 grants for working out the collected material and publishing the results were also received through the Ministry of Church Affairs.

The reason for the transfer of the affairs of the expeditions to the Ministry of Trade was, in the first instance, that the expeditions had gradually more and more taken up tasks of a practical nature in connection with the coal and mineral deposits of Svalbard. This work consisted partly in preparing large scale maps, also geological, and partly in investigations of the deposits through deep drilling and excavations. As mining matters come within the province of the Ministry of Trade, it was reasonable that our expeditions also came under this Ministry.

Expedition Committees.

At the request of Captain STAXRUD and the author, the Norwegian Geographical Society appointed in 1911 a committee to deal with the affairs of the expeditions. It consisted of Messrs. Director HELGE ALME, Prof. Dr. JOHAN KIÆR, and Captain K. S. KLINGENBERG. The task of this committee was chiefly to deal with the accounts of the expeditions. Mr. ALME acted as their accountant from 1911 to 1917, and Prof. KIÆR and Captain KLINGENBERG gave their opinion upon various questions concerning the plans and work of the expeditions. The committee was in operation until 1917.

In 1918 the Ministry of Church Affairs and Education appointed a committee to act as advisers to the ministry on all Spitsbergen matters. The members were: Prof. JOHAN KIÆR, Mr. CARL LUNDH, Barrister, and chairman of the board of directors of *Store Norske Spitsbergen*

Kulkompani A/S, Colonel N. J. SEJERSTED, Director of the Geographical Survey (chairman). After the death of Colonel SEJERSTED, the new director of the survey, Major K. S. KLINGENBERG, was appointed a member and also succeeded Colonel SEJERSTED as chairman.

In 1920 Messrs. W. C. BRØGGER, JOHAN KIÆR, V. M. GOLDSCHMIDT, and JACOB SCHEDELIG, professors at Oslo University submitted, at my suggestion, to the Ministry of Church Affairs and Education an application for a grant of 20000 Kr. yearly for working out and publishing the results of the Norwegian Svalbard expeditions. For this purpose 17000 Kr. was voted that year, and the Ministry deputed the Spitsbergen Committee of 1918 to manage the funds and supervise the editing of the publication series with the author as editor. The name adopted for the series was "Resultater av de norske statsunderstøttede Spitsbergenekspeditioner". Through the committee was also obtained a grant in 1922 and 1923 for publishing the results of the expeditions. After the issue of No. 12 of the series in 1927, the committee ceased to deal with the publications, because all the work concerning the exploration of Svalbard and the publication of the results of the expeditions was transferred to a state institution, *Norges Svalbard- og Ishavsundersøkelser* (see page 60).

The third committee was the Spitsbergen Coal Committee, appointed by the Ministry of Trade in 1919. It consisted of Messrs. HJ. BATT, Director of the Industry Office in the Ministry of Trade, A. K. HILLESTAD, Under-Secretary of State in the Ministry of Trade, B. STUEVOLD-HANSEN, Barrister, Director-General of the Watercourse and Electricity Service, and formerly Secretary of State. The latter also acted as chairman of the committee. As secretary was appointed Mr. LUDV. FOLTMAR of the Ministry of Trade. The committee sat until 1926. Its task was to prepare for the Ministry all Svalbard matters handled by this office. When the expeditions were transferred in 1922 to the Ministry of Trade, the Coal Committee also came to deal with the grants for the exploration of Svalbard, which in this period were very considerable.

Co-operation between the Svalbard Expeditions and Government Institutions dealing with the same Kind of Work in Norway.

As it was naturally quite impossible for our institution to employ experts in every branch of its work, it has always co-operated with institutions doing similar work in Norway.

The *Geographical Survey of Norway* has at our request carried out the determination of latitude and longitude of a point in Green Harbour, and fixed the azimuth of a triangle side there (1920 and 1922). The geodesians of the survey have made a series of geodetic

and trigonometric computations for us, and the survey has also assisted in publishing our maps, which are printed by the Survey Office press. The *Hydrographic Office* of the Geographical Survey has lent us instruments and outfit necessary for hydrographic work. The Geographical Survey has also lent instruments to the expedition, and the Survey has compared our measuring-tapes and invar-wire.

The *Technical High School of Norway* has lent instruments to the expeditions.

The *Navigation Department of the Navy* ("Marinens Navigasjonsvesen") has placed at our disposal various instruments for navigation and hydrographic work.

The *Oslo Navigation School* has lent the expedition various instruments.

Determinations of the magnetic variation have been carried out with an instrument borrowed from the *University Astronomical Observatory*; this institute has also lent us a theodolite. The plans for the magnetic investigations have been worked out in co-operation with the *University Physical Institute*; the *University Geographical Institute* has lent us a theodolite. The oceanographic work has been planned by Professor B. HELLAND-HANSEN of the *Geophysical Institute of Bergen*, and Professor NANSEN, who are also working out the results. The institute in Bergen and Prof. NANSEN have also placed oceanographic instruments at our disposal. The meteorological work has been planned by the *Geophysical Institute of Tromsø*, and the working out of the results will be done by this institute, which has moreover, along with the *Meteorological Institute* in Oslo, furnished us with the necessary instruments.

Professor KLÆR has advised the expeditions on geological matters, and the working out of the results has been done in co-operation with Prof. KLÆR and the other professors of the *Geological institutions* of Oslo University, and has been carried out by our own scientists as well as by foreign specialists. The geological and paleontological collections have been presented to the Geological Museum of Oslo University. Following instructions by Prof. K. O. BJØRLYKKE of the *Agricultural High School of Norway*, the geologists of the expeditions have collected soil-profiles from various places in Svalbard and these have been examined at the Geological Institute of the High School.

The *Government Raw Materials Committee* ("*Statens raastoffkomite*"), through Prof. V. M. GOLDSCHMIDT, has carried out various analytical tests of material collected by the expeditions. Analytical work has also been done by Dr. J. GRAM, leader of the *State Railway Chemical Laboratory*. The *Pharmacological Institute* of Oslo University has made analysis of water from various mineral springs, and Prof. ELLEN GLEDITSCH of the *University Chemical Laboratory* has determined the radio-activity of the waters.

The botanical and zoological collections have been given to the *Botanical* and *Zoological Museums* of Oslo University, and the working out of the material will be carried out by the scientists attached to these institutions.

Offices and Rooms of the Expeditions.

From 1906 to 1915 our institution rented rooms in various parts of Oslo and in the district of Brandbu. As early as 1908 the Mineralogical Institute of Oslo University gave us rooms in the main building of the University, and from 1915, when the mineralogical collections were moved to the new building at Tøyen, we obtained more accommodation and the whole office was installed in the University main building. In 1922, when the work had greatly increased, another room was obtained in the building of the Historical Museum of the University. In 1926 the office was moved to 34 Bygdø Allé, Oslo, a Government building, and here we have 160 square metres of floor space.

Our collections and outfit have been stored at the Academy of Science, 78 Drammensveien, part of it also at the Geological Museum. In 1928 we obtained through the Ministry of Finance and Customs 250 square metres of floor space and two work and office rooms in the new building of the Railway Custom House, 14 Tomte Bryggen, Oslo and our collections will in future be kept there.

Future Norwegian Exploration of Svalbard and Polar Regions.

On Aug. 14, 1925 Norway took over the sovereignty of Svalbard and it then became all the more necessary to place the exploratory work on a more permanent footing. It should be borne in mind that no other country has anything like such great economic interests (hunting and fishing) in the Polar regions as Norway, both absolutely and relatively speaking, and this country has therefore every reason to take up polar exploration work also in areas outside Svalbard. The author consequently submitted in October 1925 and February 1927 a proposal to the Ministry of Trade for the organisation of the exploration of Svalbard and the Polar regions. The proposal, recommended by a number of persons and institutions, aimed at the establishment of a state institution for the exploration of Svalbard and the Polar regions, similar to those in other countries with Arctic interests. Under the new institution, co-operating with allied bodies in Norway, were to be placed all Norwegian topographical and hydrographic work and the scientific exploration of Svalbard and other Arctic regions, the institution thus becoming a central point for this kind of work, with its own series of publications.

Further, a "Svalbard and Polar Council" was to be set up, with members appointed by the Ministry of Trade on the recommendation of the following bodies: Geographical Survey of Norway, the Hydrographic Office of the Geographical Survey, Geological Survey, Geophysical Committee, Oslo University, Bergen Museum, Technical High School, Agricultural High School, the Scientific Committee in Tromsø, the Fishery Board, and the Geographical Society. The council was to act as an advisory committee for the Government on all questions concerning polar exploration. The proposal was in the main approved of by the Government, and in January 1928 a bill was introduced through the Ministry of Trade for the establishment of an institution for the exploration of Svalbard and the Arctic regions, and for the appointment of the mentioned council. The bill was dealt with by the "University and Special School Committee" of the Storting, and in its report the committee essentially followed the bill and recommended the foundation of an institution for the Exploration of Svalbard and the Polar regions. On March 7, 1928 the bill was passed unanimously by the Storting.

In July 1927 it was agreed by the Storting that 250 000 Kr. of the surplus of the State Lottery for the period 1928—1932 should be reserved for the working up and publishing of the results of the Svalbard expeditions; it was decided later that the new institution, which was given the name of "*Norges Svalbard- og Ishavs-undersøkelser*" (Norwegian Exploration of Svalbard and the Polar Regions), should have the disposal of this money. Its publication series was called "*Skrifter om Svalbard og Ishavet*" (Publications on Svalbard and the Arctic Sea). This series is a continuation of "*Resultater av de norske statsunderstøttede Spitsbergenekspeditioner*" (Results of the State-supported Norw. Spitsbergen Expeditions). Of the series, 24 numbers have been issued (Aug. 1929). From 1929 another series, "*Meddelelser*" (Communications), is being published by this institution, and is meant to contain smaller papers, and those of a more popular character. So far six numbers have been issued.

As already pointed out, the sovereignty of Svalbard was assigned to Norway by a treaty signed in Paris in 1920. According to this treaty, subjects of all powers who have recognised Norwegian sovereignty shall enjoy the same rights as Norwegian subjects and have the right to carry out exploration work on the islands. It was to be anticipated that this right would be availed of to a great extent. In order to bring about some measure of organisation in this exploration work, and ensure a certain amount of co-operation between the various expeditions, the Norwegian Government has sent to the Foreign Powers the following memorandum:

The Norwegian Government's Memorandum to Foreign Powers.

The Norwegian Government has established a central institution under the Ministry of Trade for the exploration of Svalbard and Polar regions. This institution, the name of which is *Norges Svalbard- og Ishavs-undersøkelser* (Norwegian Scientific Exploration of Svalbard and Polar Regions), 34 Bygdø Alle, Oslo, embraces, *inter alia*, all official survey and geological work, and other natural-historical and geophysical exploration in Svalbard, also the survey of adjacent waters. This does not, however, include meteorological observations, which remain under the Meteorological Institute in Oslo, or special fisheries research, which is attached to the Fisheries Board at Bergen.

In order to achieve the best possible results in the scientific exploration of Svalbard it is essential that all expeditions intending to carry on such work in those islands give notification thereof to the Norwegian Ministry of Foreign Affairs, and, in addition, send in particulars respecting the expedition to *Norges Svalbard- og Ishavs-undersøkelser*. These particulars should comprise a statement of plans — also of the scientific work to be undertaken — the territory to be covered, equipment, vessel, provisions, and personnel. *The Norges Svalbard- og Ishavs-undersøkelser* will then consider such plans. It will ascertain whether the work contemplated has already been wholly or partly done, and whether there should chance to be other expeditions already operating in the same tracts or contemplating doing so. This institution will, on request, supply information about literature and maps bearing upon the work contemplated, about scientific material in course of preparation and the making of maps that may be of value to the expedition; it can also give practical hints relating to natural conditions and equipment. In addition, this institution will be able to give advice as to the particular Norwegian port at which the expedition should call for equipment control (see below), and furnish any other information required about sailings to Svalbard and of the possibility of procuring housing accommodation for the members of the expedition at the settlements in the islands. It is also the duty of the *Norges Svalbard- og Ishavs-undersøkelser* to give expeditions the necessary information relating to such Norwegian laws and regulations, e. g., close time provisions, as expeditions may be brought into contact with.

The services thus rendered other expeditions by this institution are to be entirely free of charge, providing expeditions do not require reports of a nature involving a considerable amount of work or extra outlay. If, however, the institution is to fill its position efficiently as an inquiry office for Svalbard, the expeditions, on their part, must immediately on their return home submit a preliminary report on the

work done and the results achieved. Further, they must send in two copies of all papers, books, and maps that may be published as a result of their work.

With a view to getting out of the state of chaos that has prevailed so long in regard to geographical names in Svalbard, the Norwegian Government has initiated a comprehensive plan for the final determination of names for each locality. This work will be completed in about a year's time. To avoid further confusion in this direction each expedition desiring to give new geographical names must submit its proposals to the *Norges Svalbard- og Ishavs-undersøkelser* (foreign expeditions must send their proposals through the Norwegian Ministry of Foreign Affairs). This institution will consider such proposals and submit a recommendation. The final decision lies with the competent Norwegian authority.

Further, attention is called to the fact that, by Act of August 6, 1915 (see also Orders in Council of Dec. 15, 1917, Sept. 3, 1920, and Jan. 17, 1928), the equipment and provisioning of Norwegian expeditions to Arctic regions is subject to official control. This act primarily concerns hunting expeditions, but applies also to expeditions fitted out at Norwegian ports for purposes other than hunting when they state, or there is cause to believe, that they intend to spend part or the whole of the winter in those regions. It moreover embraces expeditions made under such conditions as may necessitate wintering even though this may not be intended. Then again, the provisions of this act are applicable to foreign expeditions engaging as members Norwegian subjects in Norwegian ports, when it is stated, or there is cause to believe, that such expeditions have the intention of wintering or are proceeding to such tracts or such conditions as may necessitate wintering.

Expeditions must be notified to the *Politimester* (Superintendent of Police) at the port where they are fitted out; but in respect of foreign expeditions such notification may be given through *Norges Svalbard- og Ishavs-undersøkelser*, in which event the Norwegian port from which the expedition intends to sail must be stated. Control is exercised by a committee comprising a government ship surveyor and a second member with experience of wintering conditions in Arctic regions; the latter shall be nominated by the president of the court.

It has been found necessary to exercise such control as this act establishes, for it happens not infrequently that expeditions and persons proceeding to Svalbard are so poorly equipped that they get into difficulties. If such an expedition is in distress some of its members may reach one of the settlements where there is a telegraph office and report that the remaining members are in peril and require immediate help. Should some time elapse without any news coming in about an expedition, demands for a search will very soon be heard. In such

instances the Norwegian Government has had to send out or cause to be sent out relief expeditions. Also out of consideration for the coal-mining companies in Svalbard the control of touring, hunting, and scientific expeditions is a necessity. It has happened that expeditions have arrived at Svalbard so deficiently fitted out that they have become a burden on the nearest mining community from the very first moment, and it is not always an easy matter for these mining companies to afford adequate help. In the summer months it does not matter so much, but it is a far more serious problem for these companies when members of some expedition or other that is in a helpless plight suddenly put in an appearance in mid-winter and have to be furnished with shelter, food, and medical aid, in addition to which an attempt may have to be made to send relief to those in distress.

As already mentioned, meteorological work in Svalbard is in charge of the Norwegian Meteorological Institute. The Norwegian Government has established two meteorological stations in Svalbard, one being at Tunheim on Bear Island and the other at Ankershamn, Green Harbour. The Norwegian Meteorological Institute will, on request, give scientific expeditions wishing to work in Svalbard all necessary information respecting climatic conditions and the meteorological work done there.

Further, it may be pointed out that *Norges Svalbard- og Ishavsundersøkelser* publishes *Skrifter om Svalbard og Ishavet* giving an account of all scientific results published in Norway from those regions. Foreigners will also be given the opportunity of having their papers printed in this publication series, on condition that they defray the cost of printing.

APPENDIX

Members and Collaborators of the Norwegian Svalbard Expeditions, 1906—1926.

The following list contains the names and professions of those who have been on the staff of any of the expeditions since 1906, and also of those who have collaborated in the examination of the material without actually being on the staff. Each person's year of birth (also year of death, if deceased) and years of participation in the expeditions are given.

Norwegian.

AASGAARD, GUNNAR, b. 1888, Mining Engineer. Assistant geologist 1924.

ALEXANDER, ANTON, b. 1870, Head-Master of the Lillehammer School.

Computation of astronomical observations.

- BARLAG, Captain THORLEIF, Norwegian Army, b. 1879, Topographer, Geographical Survey of Norway. Preparation of maps.
- BERGE, PAUL, b. 1891, Photographer. Cinematographic operator 1924.
- BJØRLYKKE, KNUT OLAV, b. 1860, Ph. D., Professor of geology at the Agricultural High School of Norway. Examination of soil profiles.
- BJØRSET, Captain EYVIND SOLBERG, Norwegian Navy, b. 1866, Chief of the Hydrographic Office of the Geographical Survey of Norway. Preparation of charts.
- BLEKUM, SVERRE, b. 1886, Mining Engineer. Geologist 1922.
- BRAASTAD, JOHAN, b. 1888, Dr. Ing., Mining Engineer, Norges Svalbard- og Ishavs-undersøkelser Geologist. 1914, 1916, 1918, 1924, 1925.
- BREDSORFF, Captain MORTEN PETER, Norwegian Navy, b. 1888. Hydrographer 1925.
- BRYN, NILS, b. 1854, d. 1916, Physician and Botanist. Examination of botanical material (mosses).
- BØHMER, Captain ALF, Norwegian Navy, b. 1878, Hydrographer, Hydrographic Office of Norway. Preparation of charts.
- CHRISTENSEN, HAAKEN, b. 1886, Civil Engineer, see "Kartkontoret Stereografik A/S", Oslo.
- DAHL, Captain CHRISTIAN, Norwegian Navy, b. 1878, d. 1918, Hydrographer, Hydrographic Office of Norway. Preparation of charts.
- DAHL, JOHAN JAKOB, Civil Engineer, b. 1872, Director of Ing. Dahls Opmåling, Oslo. Consultant on geodetic and topographical matters.
- DEVIK, OLAF MARTIN, b. 1886, Lecturer in physics, Technical High School of Norway. Oceanographer 1922.
- DIESET, HANNA, see Resvoll-Holmsen.
- ELLINGSEN, JAKOB, b. 1886, Mining Engineer. Assistant geologist 1912, 1913.
- EVENSEN, RICHARD, b. 1881, Skipper of M/C "Blomstersæl" 1924.
- FÜRST, CARL ARMIN, b. 1897, Civil Engineer, see "Kartkontoret Stereografik A/S", Oslo.
- FØNHUS, MIKKJEL, b. 1894, Author. Expedition 1921.
- GJERTSEN, Captain HJALMAR FREDRIK, Norwegian Navy, b. 1885. Hydrographer 1920, 1921.
- GLEDITSCH, ELLEN, b. 1879, D. Sc., Professor of chemistry at Oslo University. Chemical investigations.
- GLEDITSCH, Lieutenant-Colonel KRISTEN GRAN, b. 1867, Chief of the Topographical Office of the Geographical Survey of Norway. Preparation of maps.
- GLEDITSCH, KÅRE STENERSEN, b. 1900, d. 1927, Civil Engineer. Topographer 1923, 1924.
- GLØRSEN, JØRGEN, b. 1895, Civil Engineer. Topographer 1918.
- GOLDSCHMIDT, VICTOR MORITZ, b. 1888, Ph. D., Professor of mineralogy at Oslo University. Examination of petrographical material.

- GRAARUD, AAGE, b. 1861, Meteorologist at the Meteorological Institute, Oslo. Preparation of meteorological material.
- GRAM, JOHAN FREDRIK, b. 1868, Ph. D., Leader of the State Railway Chemical Laboratory. Chemical analyses and investigations.
- GRINAKEK, Captain PEDER ANTON, Norwegian Army, b. 1883, Geodesian, Geographical Survey of Norway. Geodetic computations.
- GUDMUNDSEN, GUSTAV ALFRED, b. 1887, Skipper of M/C "Ringsæl" 1922.
- HAAVIMB, KARL JACOB, b. 1884, Civil Engineer. Topographer 1910.
- HAGEN, INGEBRIGT, b. 1852, d. 1917, Physician, Botanist. Examination of botanical material.
- HAGERUP, JOHAN, b. 1846, d. 1918, Skipper of M/C "Bellsund" 1911.
- HAGERUP, Captain LEIF SARINIUS THORALF, Norwegian Navy, b. 1880. Captain of H. M. S. "Farm" and Hydrographer 1923.
- HANSEN, ERLING, b. 1901, Taxidermist at the Zoological Museum of Oslo University. Zoological collector 1923.
- HEINTZ, ANATOL, b. 1898, Assistant at the Paleontological Museum of Oslo University. Examination of fish fossils.
- HELLAND-HANSEN, BJØRN, b. 1877, Professor of oceanography at Bergens Museum. Preparation of oceanographical material.
- HENDRIKSEN, O., b. 1886, Civil Engineer. Construction of maps.
- HENIE, HANS, b. 1887, Ph. D., Lecturer at Trondhjem Cathedral School. Astronomer 1923.
- HERMANSEN, Captain ANDREAS KRISTIAN JOHAN ENCKE, Norwegian Navy, b. 1876. Captain of H. M. S. "Farm" and Hydrographer 1909, 1910, 1919, 1920, 1921, 1925, Hydrographer 1923, 1924,
- HERTZBERG, Captain HANS KNAGENHJELM, Norwegian Army, b. 1882, Topographer, Geographical Survey of Norway. Preparation of maps.
- HOEL, ADOLF, b. 1879, Lecturer in geology at Oslo University. Leader of Norges Svalbard- og Ishavs-undersøkelser. Geologist 1907, 1909, 1910; joint leader and geologist 1911, 1912, 1913, 1914, 1917, 1918; leader and geologist 1908, 1915, 1916, 1919, 1920, 1921, 1922, 1923, 1924, 1925.
- HOLMESLET, HANS, b. 1881, Skipper of M/C "Laila" 1910.
- HOLMSEN, GUNNAR, b. 1880, Ph. D., Government Geologist, Geological Survey of Norway. Geologist 1908.
- HOLTEDAHL, OLAF, b. 1885, Ph. D., Professor of geology at Oslo University. Geologist 1909, 1910, 1911.
- HORNEMAN, HANS HENRIK, b. 1878, Mining Engineer. Geologist 1906.
- HORN, GUNNAR, b. 1894, Dr. Ing., Mining Engineer, Norges Svalbard- og Ishavs-undersøkelser. Geologist 1924, 1925, 1926.
- HOVDENAK, Lieutenant GUNNAR, Norwegian Navy, b. 1892. Hydrographer 1919.
- HØEG, OVE ARBO, b. 1898, Curator, Trondhjem Museum. Paleontologist 1924.

- INDREBØ, GUSTAV LUDVIG, b. 1889, Ph. D., Lecturer in nordic philology at Oslo University. Adviser on questions concerning place names.
- ISACHSEN, Major GUNNERIUS (GUNNAR) INGVALD, Norwegian Army, b. 1868. Leader and topographer 1906, 1907, 1909, 1910.
- ISAKSEN, ISAK, b. 1877, Skipper of M/C "Enigheden" 1912.
- IVERSEN, EILIF, b. 1888, Civil Engineer. Hydrographer 1922.
- IVERSEN, JOHN BERG, b. 1879, Captain of S/S "Holmengraa" 1908.
- JAKOBSEN, KRISTIAN, b. 1864, Skipper of S/S "Kvedfjord" 1906, 1907.
- JOHANSEN, Captain FREDRIK HJALMAR, Norwegian Army, b. 1867, d. 1913. Expedition 1908, 1909.
- JØRGEN, Captain JØRGEN, Norwegian Navy, b. 1880, d. 1921. Hydrographer 1909, 1910.
- JØRGENSEN, EUGEN HONORATUS, b. 1862, Lecturer at Bergen School. Examination of mosses.
- Kartkontoret Stereografik A/S, Oslo. Haaken Christensen, Civil Engineer. Carl Armin Fürst, Civil Engineer. Otto Lacmann, Dr. Ing. O. M. Riis, Engineer. Construction of maps.
- KIÆR, JOHAN ASCHEHOUG, b. 1869, Ph. D., Professor of Paleontology at Oslo University. Examination of fish fossils.
- KJÆR, Lieutenant ERLING, Norwegian Navy, b. 1895. Hydrographer 1923.
- KLINGENBERG, Major KAARE SVERRESSØN, Norwegian Army, b. 1872, Director of the Geographical Survey of Norway. Computations of trigonometrical observations.
- KOLLER, ALFRED, b. 1878, Civil Engineer, Norges Svalbard- og Ishavsundersøkelser. Topographer 1906, 1909, 1910, 1911, 1912, 1913, 1914, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925.
- KROGH, Commander ROLF VON, Norwegian Navy, b. 1872. Hydrographer 1923, Captain of H. M. S. "Farm" and Hydrographer 1924.
- KROSS, Captain FINN, Norwegian Army, b. 1874, d. 1912, topographer, Geographical Survey of Norway. Preparation of maps.
- KVALHEIM, ABRAHAM, b. 1880, Mining Engineer. Mining expert 1915.
- LAURANTZON, Colonel JACOB AGER, Norwegian Army, b. 1878. Topographer 1909.
- LID, JOHANNES, b. 1886, Assistant at the Botanical Museum of Oslo University. Botanist 1920, 1924.
- LOUS, KRISTIAN, b. 1875, Astronomer, University Astronomical Observatory, Oslo. Computation of magnetic observations.
- LUNCKE, BERNHARD, b. 1894, Civil Engineer, Norges Svalbard- og Ishavsundersøkelser. Topographer 1923, 1924, 1925.
- LUNDTVEDT, TORGRIM, b. 1857, d. 1929, Draughtsman, Geographical Survey of Norway. Preparation of maps.
- LYNGE, BERNT ARNE, b. 1884, Lecturer in botany at Oslo University. Examination of botanical material.

- MARSTRANDER, HENNING, b. 1892, Mining Engineer. Assistant geologist 1924, 1925.
- MARSTRANDER, ROLF, b. 1885, Mining Geologist. Assistant geologist 1909.
- MERCKOLL, HANS, b. 1884, Mining Inspector of Svalbard. Drilling engineer 1924.
- NANSEN, FRIDTJOF, b. 1861, Ph. D., Professor of oceanography at Oslo University. Preparation of oceanographical results.
- NATRUD, JOHAN, b. 1855, d. 1921, Draughtsman, Geographical Survey of Norway. Preparation of maps.
- NORDBYE, MARIE, b. 1888, Oslo. Computation of trigonometrical measurements.
- NØIS HILMAR, b. 1891, Skipper of M/C "Snadden" 1919.
- OFTEDAL, IVAR WERNER, b. 1894, Assistant at the Geological Museum of Oslo University. Examination of mineralogical material.
- OLSEN, A. K., see Orvin.
- OLSEN, OLUF LEONHART, b. 1862, Skipper of M/C "Svalbard" 1916.
- ORVIN, ANDERS KRISTIAN, b. 1889, Mining Engineer, Norges Svalbard- og Ishavs-undersøkelser. Geologist 1913, 1917, 1921, 1922, 1923, 1924, 1925, 1926.
- PEDERSØN, HJALMAR, b. 1891, Landscape Painter. Paintings and drawings 1920, 1921.
- PETTERSEN-HANSEN, JØRGEN, see JØRGEN.
- RESVOLL-HOLMSEN, HANNA MARIE, b. 1873, Lecturer in phytogeography at Oslo University. Botanist 1907.
- RIIS, O. M., b. 1898, Engineer, see "Kartkontoret Stereografik A/S", Oslo.
- RUUD, SCOTT, b. 1897, Draughtsman, Geographical Survey of Norway. Preparation of maps.
- RÆDER, Captain NICOLAY CASPARY, Norwegian Army, b. 1870, d. 1921. Chief of the Topographical Office of the Geographical Survey of Norway. Preparation of maps.
- RØVIG, Captain SVERRE, Norwegian Navy, b. 1878, Senior Teacher at Oslo Navigation School. Hydrographer 1913, 1914; joint leader and hydrographer 1917, 1918.
- SCHETELIG, JAKOB GRUBBE COCK, b. 1875, Professor of geology at Oslo University. Examination of rocks and minerals.
- SCHIVE, CLAUDIUS, b. 1877, Civil Engineer. Soundings and survey work 1916.
- SCHIVE, Lieutenant JAKOB HENRIK, Norwegian Army, b. 1897, Geodesian, Geographical Survey of Norway. Geodetic computations.
- SCHULZ, Captain FREDRIK, Norwegian Navy, b. 1877. Hydrographer 1925.
- SIRE, Lieutenant NIELS, Norwegian Army, b. 1889, Topographer, Geographical Survey of Norway. Preparation of maps.
- SOLHEIM, WILHELM, b. 1890, Engineer, Norges Svalbard- og Ishavs-undersøkelser. Topographer 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925.

- STAXRUD, Captain ARVE, Norwegian Army, b. 1881. Topographer 1906, 1910, 1919, 1920; joint leader and topographer 1911, 1912, 1913, 1914.
- STAXRUD, OLAV, b. 1892, Engineer. Assistant topographer 1920.
- STRØM, KAARE MÜNSTER, b. 1902, Ph. D., Botanist. Examination of botanical material.
- SVERDRUP, OTTO NEUMANN, b. 1855, Captain, LL. D. Expedition 1923.
- SØRLI, KRISTIAN, b. 1887, d. 1929. Assistant geologist 1910.
- THORKELSEN, Lieutenant HAGBART KNUT GISLE, Norwegian Navy, b. 1894. Hydrographer 1921, 1923, 1924, 1925.
- TOLSTAD, BERNHARD, b. 1879, Draughtsman, Geographical Survey of Norway. Preparation of maps.
- VEGARD, LARS, b. 1880, Ph. D., Professor of physics at Oslo University. Examination of the heat conductivity of rocks.
- WATNELIE, GUNNAR ANDERSEN, b. 1871, Lecturer at Sarpsborg School. Assistant geologist 1909, 1910, 1911, 1912.
- WEEN, Captain THOROLF INGAR, Norwegian Army, b. 1885, Topographer, Geographical Survey of Norway. Preparation of maps.
- WERENSKIOLD, WERNER, b. 1883, Ph. D., Professor of geography at Oslo University. Geologist and topographer 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924.
- WIGDEHL, MICHALOFF, b. 1857, d. 1921, Landscape Painter. Landscape painting 1910, 1919.
- WILLE, JOHAN NORDAHL FISCHER, b. 1858, d. 1924, Professor of botany at Oslo University. Examination of botanical material.
- WOLD, Captain ARTHUR KARSTEN MIKAL, Norwegian Army, b. 1883, Chief of the Geodetic Section of the Geographical Survey of Norway. Compared measuring wire of the expedition.
- WOLLEBÆK, ALF, b. 1879, Superintendent of the Zoological Museum of Oslo University. Examination of zoological material.

Foreign.

- BACKLUND, HELGE, b. 1878, Professor of geology at the University of Uppsala, Sweden. Examination of rocks.
- BODYLEWSKY, W. J., b. 1898, Mining Engineer, Assistant at the Geological Faculty of the Mining Institute of Leningrad. Examination of paleontological material.
- BORGE, OSKAR FREDRIK, b. 1862, Ph. D., Archivist, Stockholm. Examination of botanical material.
- FREBOLD, HANS, b. 1899, Ph. D., Lecturer in geology and paleontology at Greifswald University. Examination of paleontological material.
- JAEKEL, OTTO, b. 1863, d. 1929, Ph. D., Professor at Greifswald University. Examination of fossil fishes.
- LACMANN, OTTO, b. 1887, Dr. Ing., see "Kartkontoret Stereografik A/S" Oslo. (Now Berlin.)

- LIND, JENS, b. 1874, Chemist, Viborg, Denmark. Examination of botanical material.
- LOÛET FERD., b. 1877, Paris. Physician 1906.
- NATHORST, ALFRED GABRIEL, b. 1850, d. 1921, Ph. D., Professor, Superintendent of the Paleobotanical Department of Naturhistoriska Riksmuseet, Stockholm. Examination of paleontological material.
- OLSSON, E., Photographer. Cinematographic operator 1914.
- QUENSTEDT, WERNER, b. 1893, Ph. D., Assistant at the Geological-paleontological Institute of the Berlin University. Examination of paleontological material.
- RABOT, CHARLES, b. 1856, Ph. D., Geographer, Paris. Bibliographical work.
- RAVN, JESPER PETER JOHANSEN, b. 1866, Lecturer at Copenhagen University. Examination of paleontological material.
- SARTORIUS, JAKOB, b. 1897, Dipl.-Ing., Norges Svalbard- og Ishavsundersøkelser. (Now Herzbruck bei Nürnberg.) Topographer 1923, 1924, 1925.
- SOKOLOV, D. N., b. 1867, d. 1919, Paleontologist, Orenburg, Russia. Examination of paleontological material.
- STENSIÖ, ERIK A:SON, b. 1891, Ph. D., Professor, Superintendent of the Paleozoological Department of Naturhistoriska Riksmuseet, Stockholm. Examination of fish fossils.
- WITTENBURG, PAUL WLADIMIROWITSCH, b. 1884, Ph. D., Professor at Leningrad University. Examination of paleontological material.

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Marinen. Militært opsynskib på Finmarkskysten m. v. (bl. a. om „Heimdal“ og „Farm“s tokter). — St. Forh. 1924, 1 d. St. prp. nr. 1, hovedp. XII B, tit. 12; 6 d. Innst. S. II; beh. 7 d. Forh. i St., s. 2521.

Bev. til bearbeidelse av det på de norske Spitsbergen- og Bjørnøyekspedisjoner 1909—1921 innsamlede topografiske hydrografiske og geologiske materiale. — St. Forh. 1925, 1 d. St. prp. nr. 1 kap. 535; 6 d. budgетt-innst. S. nr. 85; beh. 7 d. Forh. i St., s. 1251.

Marinen. Om bev. til å stille Marinens transportfartøi „Farm“ til disposisjon for Amundsen-Ellsworths Nordpolekspedisjon samt dosent Hoels Svalbardekspedisjon. — St. Forh. 1925, 2 d. St. prp. nr. 23, ref. 7 d. s. 91; 6 d. budgетtinnst. S. nr. 122 b; beh. 7 d. Forh. i St., s. 642—659.

Bev. til bearbeidelse av det på de norske Spitsbergen- og Bjørnøyekspedisjoner 1909—1921 innsamlede topografiske, hydrografiske og geologiske materiale. — St. Forh. 1926, 1 d. St. prp. nr. 1, kap. 535; 6 d. budgett-innst. S. nr. 82; beh. 7 d. Forh. i St., s. 1205.

Regjeringsprotokoller. I. Kongl. resolusjoner. K. Avgjørelse vedkommende Svalbard. — St. Forh. 1926, 3 d. Ot. prp. nr. 3; 6 d. Innst. O. IV; beh. 8 d. Forh. i O., s. 1063—1077.

Bev. til bearbeidelse av det på de norske Spitsbergen- og Bjørnøyekspedisjoner 1909—1921 innsamlede topografiske, hydrografiske og geologiske materiale. — St. Forh. 1927, 1 d. St. prp. nr. 1, kap. 535; 6 d. budgett-innst. S. nr. 78; beh. 7 d. Forh. i St., s. 1173.

Om fordelingen av overskuddet i Det norske pengelotteri for årene 1928—1932. — St. Forh. 1927, 2 d. St. prp. nr. 69; ref. 7 d. s. 1893; 6 d. S. nr. 179; beh. 7 d. forh. i St., s. 2681—2693.

Bev. til Svalbardundersøkelser. — St. Forh. 1928, 1 d. St. prp. nr. 1, kap. 535; 6 d. budgett inst. S. nr. 79; beh. 7 d. Forh. i St., s. 1002.

Om opprettelse av en institusjon for Svalbard- og Ishavs-undersøkelser og av et Svalbard- og Ishavsråd, begge for tidsrummet inntil 31. desember 1932. — St. Forh. 1928, 2 d. St. prp. nr. 29, ref. 7 d. s. 23; 6 d. S. nr. 45; beh. 7 d. Forh. i St., s. 424—428.

Norges Svalbard- og Ishavs-undersøkelser. I. Ekspedisjon til Svalbard. II. Videnskapelige arbeider på Grønland. — St. Forh. 1929, d. St. prp. Nr. 1, kap. 535; 6 d. budgett-innst. S. nr. 83; beh. 7 d. Forh. i St., s. 655—656, 668, 711—726.

Om ytterligere bevilgning til videnskapelige og andre arbeider i de arktiske egner. — St. Forh. 1929, St.prp. nr. 1. Tillegg nr. 14; 6 d. Tillegg til budgett-innst. S. nr. 83 beh. 7 d. Forh. i St., s. 1979.

Tables.

I.
Vessels and Members.

Year	Leaders of expeditions	Vessels	Members											Number of members				
			Astronomers	Topographers	Hydrographers, oceanographers	Geologists	Botanists	Zoologic. preparator	Polar expert	Artists (painters)	Writers	Film photographer	Assistants		Drilling engineer	Drilling gang	Men for prospecting work	Men on the vessels
1906	Equipped by Prince Albert of Monaco and conducted by Isachsen	S/Y "Princesse Alice"	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	} 15
		S/S "Kvedfjord"	-	-	-	-	-	-	-	-	-	4 ¹	-	-	-	-	7 ²	
1907	Equipped by Prince Albert of Monaco and conducted by Isachsen	S/Y "Princesse Alice"	-	1	-	1	1	-	-	-	-	-	-	-	-	-	-	} 12
		S/S "Kvedfjord"	-	-	-	-	-	-	-	-	-	-	2	-	-	-	7 ²	
1908	Hoel	S/S "Holmengraa"	-	-	-	2	-	-	-	-	-	-	1	-	-	-	6	9
1909	Isachsen	H. M. S. "Farm"	-	3	2	4	-	-	-	-	-	8	-	-	-	-	20 ³	37
1910	Isachsen	H. M. S. "Farm"	-	4	2	4	-	-	-	1	-	7	-	-	-	-	21 ³	} 43
		M/C "Laila"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
1911	Hoel and Staxrud	M/C "Bellsund"	-	2	-	3	-	-	-	-	-	7	-	-	-	-	4	16
1912	Hoel and Staxrud	M/C "Enigheden"	-	2	-	3	-	-	-	-	-	4	-	-	-	-	4	13
1913	Hoel and Staxrud	M/C "Jenny"	-	1	1	3	-	-	-	-	-	3	-	-	-	-	3 ⁴	} 12
		M/B "Isbjørn"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
1914	Hoel and Staxrud	M/C "Vaarsol"	-	2	1	2	-	-	-	-	1	4	-	-	-	-	4 ⁴	14
1915	Hoel	Coal steamers	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
1916	Hoel	M/C "Svalbard"	-	1	-	2	-	-	-	-	-	10	-	-	-	-	4	17
1917	Hoel and Røvig	M/C "Dyrstad"	-	1	1	3	-	-	-	-	-	8	-	-	-	-	5 ⁴	18
1918	Hoel and Røvig	M/C "Lancing"	-	3	1	2	-	-	-	-	-	8	-	-	-	-	5 ⁴	19
1919	Hoel	H. M. S. "Farm"	-	3	2	2	-	-	-	1	-	10	-	-	-	-	27 ³	} 46
		M/S "Snadden"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
1920	Hoel	H. M. S. "Farm"	-	4	2	2	1	-	1	-	-	9	-	-	-	-	28 ³	47
1921	Hoel	H. M. S. "Farm"	-	2	3	3	-	-	1	1	-	9	-	-	-	-	28 ⁵	} 48
		M/C "Jan Mayen"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
1922	Hoel	M/C "Ringsæl"	-	2	2	4	-	-	-	-	-	11	-	-	5	8	32	
1923	Hoel	H. M. S. "Farm"	1	6	5	2	-	1	1	-	-	13	-	-	-	-	31 ⁵	} 66
		M/C "Blomstersæl"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6 ⁶	
1924	Hoel	H. M. S. "Farm"	-	6	3	7	1	-	-	-	1	17	1	9	8	29 ⁵	} 90	
		M/C "Blomstersæl"	-	-	-	-	-	-	-	-	-	-	-	-	-	8		
1925	Hoel	H. M. S. "Farm"	-	4	4	5	-	-	-	-	-	16	-	5	7	28 ¹⁵	69	
1926	Hoel	Coal steamers	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	4

S/S denotes steam ship, M/C motor cutter, S/Y steam yacht, M/B small motor boat, H. M. S. vessel of the Norwegian Navy.

¹ Including one physician. ² The crew of the "Princesse Alice" is not listed among the members of the Norwegian Svalbard Expeditions. ³ + 2 officers. ⁴ Captain. ⁵ + 3 officers. ⁶ + Captain and mate. — These Officers and captains are listed as hydrographers and oceanographers and therefore not included in the crews of the vessels.

II.
Particulars of Vessels.

Name	When built, Material	Length	Breadth	Draught	Reg. Tonnage		Engine
					in feet		
Princesse Alice	1898, steel	251	34.8	18.7	1042.12	611.02	Stream 1000 I. H. P.
Kvedfjord	1902, steel	84.7	17.1	8.3	76.60	20.80	Stream 150 I. H. P.
Holmengraa	1885, iron	73.1	13	8	55.14	18.06	Stream 18 Norm. H. P.
Farm 1	1901, steel	41.3	6.1	2.5—3			Stream 300 I. H. P.
Laila	1906, wood	46.3	16.6	6.6	abt. 20	abt. 9	Motor (Bolinder) 15 H. P.
Bellsund	1909, wood	48	16	7	— 20	— 9	Motor (Grei) 20 H. P.
Enigheden	1874, wood	66.3	19.4	8.4	56.77	48.47	Motor
Jenny	wood	36	11	5	abt. 15		Motor
Vaarsol	1907, wood	47.7	16.3	6.6	25.8	8.89	Motor
Svalbard	wood	47.	16			10	Motor 20 H. P.
Dyrstad	1914, wood	46.4	16.2	7.65	32.19	9	Motor 32 H. P.
Lancing	1912, wood	50.9	18.6	8.5	37	13	Motor 31 H. P.
Snadden	wood	47.5	15	6	20	9	Motor 20 H. P.
Jan Mayen	1911, wood	47.1	15.9	6.3	20	9—10	Motor (Skandia) 16 H. P.
Ringsæl	1912, wood	76.5	19.8	8.5	66	37	Motor 80 H. P.
Blomstersæl	1875, wood	72.7	20.1	9.6	81	41	Motor 70 H. P.

¹ Dimensions in metres. Displacement 450 tons.

III.
Office Personnel.

Personnel	Topo- graphers	Geologists	Draftsmen	Assistants	Clerks	Total
1906—1907.....	3	1	1	1	-	6
1907—1908.....	3	1	-	1	-	5
1908—1909.....	1	1	-	-	-	2
1909—1910.....	4	2	-	1	-	7
1910—1911.....	6	2	-	1	-	9
1911—1912.....	2	2	1	1	-	6
1912—1913.....	2	1	-	1	-	4
1913—1914.....	2	1	-	1	-	4
1914—1915.....	2	1	-	1	-	4
1915—1916.....	-	1	-	1	-	2
1916—1917.....	-	1	-	2	-	3
1917—1918.....	1	1	-	-	-	2
1918—1919.....	2	1	-	-	1	4
1919—1920.....	2	1	-	-	1	4
1920—1921.....	2	1	-	-	1	4
1921—1922.....	2	2	-	-	1	5
1922—1923.....	3	2	1	-	1	7
1923—1924.....	4	3	-	-	1	8
1924—1925.....	4	4	-	-	2	10
1925—1926.....	4	4	-	-	2	10
1926—1927.....	4	4	-	-	2	10
1927—1928.....	3	3	-	-	2	8
1928—1929.....	3	4	-	-	3	10

IV.
Committees.

Appointed by	Period	Members
The Norwegian Geographical Society	1911—1917	ALME, HELGE, Director of Oslo Municipal Pensions Office. KIÆR, JOHAN, Professor of paleontology at Oslo University. KLINGENBERG, K. S., Captain (later Major) Norwegian Army.
Ministry of Church Affairs and Education.....	1918—1929	LUNDH, CARL, Barrister. KIÆR, JOHAN, Professor. SEJERSTED, N. J., Colonel, Norwegian Army, Director of the Geographical Survey of Norway, chairman of the committee, d. 1921 and succeeded by the new director of the survey, Major K. S. KLINGENBERG.
Ministry of Trade	1920—1926	BATT, HJ., Director of the Industry Office, Ministry of Trade. HILLESTAD, A. K., Under-Secretary of State in the Ministry of Trade. STUEVOLD-HANSEN, B., Barrister and Director-General of the Watercourse and Electricity Board, chairman. FOLTMAR, LUDV., of the Ministry of Trade, acted as secretary.

V.

Instruments.

Topographical Surveying.

Invar Wire for Base Line Measurement.

Year of purchase	Firm	Length
1909	Gottschalk, Stockholm	24 Metres

Theodolites.

Year of purchase	Firm	No.	Magnification ×	Diameter in cm		Reading to (abt.)	
				Hor. circle	Vert. circle	Hor. circle	Vert. circle
1906	Erthel & Reichenbach, München ¹	2	28	22	15	10"	20"
1906	C. H. G. Olsen & Co., Oslo		10	12	12	30"	30"
1907	— ²		7	10	10	30"	30"
1909	Otto Fennel Söhne, Cassel	IV		12,5	6,5	1'	1'
1909	Sigurd Baalsrud, Oslo	I	20	12	9	1 ^c	1 ^c
1910	—	II	20	12	12	1 ^c	1 ^c
1910	— ²	III	27	14	12	20 ^{cc}	1 ^c
1911	—		23	13	9	1 ^c	1 ^c
1911	— ³		27	14	12	20 ^{cc}	20 ^{cc}
1918	—	535	24	13	9	1 ^c	1 ^c
1918	—	537	24	13	9	1 ^c	1 ^c
1918	—	539	24	13	9	1 ^c	1 ^c
1920	Otto Fennel Söhne, Cassel ⁴	11904	17	13	10	1 ^c	1 ^c
1920	Carl Zeiss, Jena ⁵	14800	24	12	11	12"	12"
1922	Sigurd Baalsrud, Oslo	901	28	15	14	10 ^{cc}	50 ^{cc}
1923	—	981	28	14	9	10 ^{cc}	1 ^c
1923	C. H. G. Olsen & Co., Oslo ²		37	21	21	1"	10"
1923	Carl Zeiss, Jena ⁶	R. I	24	12	11	20 ^{cc}	20 ^{cc}
1924	— ⁷	I. 15904	24	7,5	5	10 ^{cc}	10 ^{cc}
1929	A.-G. Heinrich Wild, Heerbrugg	148	24, 30, 40	14	9,5	1 ^{cc}	1 ^{cc}

Cameras.

Year of purchase	Firm	Camera		Size cm	Objective		Focal length cm
		Type	No.		Type	Aperture	
1906	A. Stegemann, Berlin		IV	13 × 18	Voigtländer	1 : 7.5	20.37
1906	Hasselblad, Göteborg	Svea		9 × 12	Rapid-Paraplanat	1 : 8	13.62
1906	Gaumont, Paris	Spido	6490	9 × 12	Zeiss Protar	1 : 8	13.72
1906	Kodak, Rochester			8 × 14			
1909	Gaumont, Paris	Spido	7792	9 × 12	Zeiss Tessar	1 : 6.3	13.45
1909	—	Spido	7793	9 × 12	Zeiss Tessar	1 : 6.3	13.36
1918	C. P. Goerz, Berlin			13 × 18	Goerz Doub. anastigmat	1 : 4.8	18.25
1920	Contessa-Nettel A/G, Stuttgart	Taxo		9 × 12	Doub. anastigmat Citonar	1 : 6.3	13.98
1920	Carl Zeiss, Jena ⁵		14800	13 × 18	Ortho-Protar	1 : 12.5	19.528
1923	— ⁶		19895	13 × 18	Ortho-Protar	1 : 25	19.382
1924	— ⁸		4783	13 × 18	Zeiss Tessar	1 : 4.5	18.342

¹ Borrowed 1906, 1909, 1910. — ² Borrowed. — ³ Borrowed 1911, 1912, 1913, 1914.
 — ⁴ Borrowed 1920, 1922, 1923, 1924. — ⁵ Belongs to Zeiss Field Outfit. Hired 1920, 1921, 1922, 1923. — ⁶ Belongs to Zeiss Field Outfit Model C 3 b. — ⁷ As used for Zeiss Field Outfit Model C 3 b. — ⁸ Camera for Aerial Photography.

Stereo-plotting Machine.

Zeiss- von Orel Stereo-autograph; Model 1914, No. 11309. Hired from 1920.

Hydrographic Surveying.

Theodolite	180° Angle-Prism
Plane Table	Telemeter (Zeiss)
Telescopic Alidade	Station Pointer
Sextant	Sounding Machine (Lucas)
Quintant	Common Lead
Chronometer	Snapper Lead
Wireless Telegraph	Submarine Sentry
Direction Finder	Buoys
Electric Log (Chernikeeff)	

Oceanographic Work.

Reversing Thermometers
 Reversing Water Bottles (Nansen)
 Current Meter (Ekman; Smaller Model, for single Observations, No. 49).

Magnetic Observations.

Declinatorium Bamberg 9631 belongs to the University Observatory. It has a horizontal circle which moves with the telescope and is read to 0'.5 by two fixed verniers. The needle placed on a pin in the box carries a mirror with a mark on it, and the telescope has a vertical wire. Both telescope and needle are reversed between readings. The azimuth is determined by observations of the sun's passage.

VI.

Astronomical Stations.

(Map. p. 47).

Year	Location	Observer	Lat. North	Long. East	Det. of azimuth
1909	Observation I., Kings Bay	Hermansen Jørgen	78 55 18	0 49 16	
1909	Cairn Bruce, Red Bay	Hermansen Jørgen	79 44 20	0 48 51	
1909	Ebeltoft Haven	Hermansen	79 8 51	[0 47 0]	
1909/1910	Prince Charles Foreland, eastern end point of the base line	Hermansen Jørgen	78 21 2	0 47 54	Isachsen 1909 Koller 1910
1909/1910	Welcome Pt. Reindeer Peninsula	Hermansen Jørgen	79 50 8	0 53 27	Koller 1910
1910	Ekholm Pt., Virgo Bay	Hermansen	79 43 19	[0 44 30]	
1009	Sabine Pt.	Hermansen	79 50 27	[0 47 20]	
1920 ¹	Finneset, Green Harbour	Henie		0 56 56,27	
1922 ¹	—	H. S. Jelstrup	78 2 45,75	0 56 56,86	Jelstrup
1923	Tunheim, Bear Island	Henie	74 28 57	1 16 54,22	Henie

¹ By the Geographical Survey of Norway at the request of the Norwegian Svalbard Expeditions.

VII.

Base Lines.

(Map p. 47).

I. Base lines measured with Invar wire under a tension of 10 kilogrammes, measured with spring balance.

A. Base lines for topographical maps constructed on the scale of 1:50 000.

Year	Situation	Measured by	Length in m.	Average error of two measurements
1909	Foreland Plain	A. Koller, J. Laurantzson	1946.8810	± 0.004
1909	Reindeer Peninsula	A. Koller, J. Laurantzson	1757.2497	± 0.004
1911	At Coles Bay	A. Koller, A. Staxrud	1079.0408	± 0.0035
1918	At Goose Haven on the south side of Horn Sound	A. Koller, W. Solheim	1343.5964	± 0.0009
1918	At the west side of Recherche Bay	A. Koller, W. Solheim	1122.4171	± 0.002
1921	At Hiorthamn on the east side of Advent Bay	A. Koller, W. Solheim	1065.3316	± 0.0035

6 base lines

B. Base lines for special large-scale maps, viz. Kings Bay, scale: 1:1000, Bear Island, scale: 1:1000, 1:2000, and 1:10 000.

1921	At Ny-Ålesund, Kings Bay	A. Koller, W. Solheim	569.4546	± 0.0015
1922	Sørliå, Bear Island	A. Koller, W. Solheim	982.3580	± 0.0041

2 base lines

II. Base lines measured with steel tape.

A. Base lines for topographical map constructed on the scale of 1:25 000, 1:50 000, and 1:100 000.

1906	N. of Cape Guisseez	A. Koller, A. Staxrud	1500.0	± ca. 0.1 m
1906	Danes Island	A. Koller, A. Staxrud	1500.0	± ca. 0.1 m
1906	Staxruds Plateau	A. Koller	1000.0	± ca. 0.1 m
1906	At the head of Møller Bay	A. Koller	1000.0	± ca. 0.1 m

4 base lines

VII (continued).

B. Base lines for special maps, and check base lines.

Year	Situation	Measured by	Length in m.	Average error of two measurements
1906	Burial Ground at Magdalena Bay.....	A. Koller	400.0	\pm ca. 0.05 m
1906	At the inner end of Smeerenburg Bay	A. Koller	400.0	\pm ca. 0.05 m
1906	At Ebeltoft Haven.....	A. Koller	630.0	\pm ca. 0.05 m
1906	In front of the 14th July Glacier east of Cross Bay	A. Koller	350.0	\pm ca. 0.05 m
1907	At the west side of Lilliehöök Bay	G. Isachsen, A. Hoel	440.0	\pm ca. 0.02 m
1907	West of Blomstrand Harbour	A. Hoel, K. Haavimb	805.0	\pm ca. 0.12 m
1910	At the west side of Dickson Bay	A. Koller, A. Staxrud	1497.1 ¹	\pm ca. 0.1 m
1912	N. of Cold Harbour	A. Koller	1149.0 ¹	\pm ca. 0.2 m
1917	At Hiorthamn on the east side of Advent Bay ...	A. Koller	980.776 ¹	\pm ca. 0.004 m

9 base lines.

¹ Check base lines. Base line at Hiorthamn was measured with a tested steel tape, and a tension of 10 kilogrammes on the tape. Line prolonged and re-measured with Invar wire by A. Koller and W. Solheim in 1921.

III. Base line measured by angle measurement, with an horizontally placed staff (3 metres) of Invar metal from Carl Zeiss.

1925	At Braganza Bay	A. Koller	941.792	\pm ca. 0.1 m
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VIII.

Datum Points for the Computation of Altitudes.

Year	Place	Method of measurement	Observer
1906	Southern end point of the base line on the east side of Cross Bay	Levelling from estimated mean high water level found from observations of high water mark	A. Koller
1906	Western end point of base line on the southeast side of Danes Island	—, —	—
1906	Southern end point of the base line at the head of Møller Bay	—, —	—
1906	Trigonometric point, cairn 15 on the west side of Lilliehöök Bay	—, —	A. Staxrud

VIII (continued).

Year	Place	Method of measurement	Observer
1909	Eastern end point of the base line on Foreland Plain	Levelling from estimated mean high water level found from observations of high water mark	A. Koller
1909	Trigonometric point to the north of the base line on Reindeer Peninsula astronomical station	— „ —	—
1911	Trigonometric point, signal D, Cape Laila at Coles Bay	— „ —	—
1912	Trigonometric point, K 26, on the north side of Cold Harbour	— „ —	—
1913	Trigonometric point, K 19, on the west side of Dames Moraine (north side of Van Mijen Bay)	— „ —	—
1916	Spirit level station at Hiorthamn on the east side of Advent Bay	Levelling from mean water level found by reading a tide gauge every hour during 4 weeks	C. Schive
1917	New spirit level station at Hiorthamn	Levelling from mean water level found by reading a tide gauge every hour during 20 days	A/S De Norske Kulfelter Spitsbergen at the request of Koller
1918	Spirit level station at Goose Haven on the south side of Horn Sound. (Astronomical station of the Russian Arc of Meridian Expedition)	Levelling from mean water level found by reading a tide gauge every hour during 18 hours	W. Solheim
1918	The northern end point of the base line on the west side of Recherche Bay	Estimated mean high water	—
1920	Trigonometric point, cairn on Eders Island	— „ —	—
1921	Trigonometric point, K 1, at Ingvald Bay, Van Keulen Bay	Levelling from mean water level found by reading a tide gauge every hour during 18 hours	A. Koller
1921	Trigonometric point, K 14 a, at Cape Blix on the south side of Van Mijen Bay	— „ — 6 „	A. Koller W. Werenskiold
1921	Trigonometric point, A', at Ny-Ålesund on the south side of Kings Bay	— „ — 12 „	A. Koller
1922	Spirit level station at the head of South Haven, Bear Island	— „ — 14 days	E. Iversen
1923	Trigonometric point, W 31, at Bjona Haven	— „ — 23 hours	W. Werenskiold
1923	Trigonometric point, Ss 36, at Skans Bay, Klaas Billen Bay	— „ — 24 „	J. Sartorius
1924	Spirit level station at Mt. Pyramid, Klaas Billen Bay	— „ — 24 „	W. Solheim

VIII (continued).

Year	Place	Method of measurement	Observer
1924	Spirit level station on Boheman Peninsula, north side of Ice Fiord	Levelling from mean water level found by reading a tide gauge every hour during 6 hours	W. Solheim
1924	Spirit level station, Ss 6, Gips Bay	— „ — 24 „	J. Sartorius
1925	Spirit level station at Sveagruvan, Braganza Bay	— „ — 24 „	A. Koller

IX.

Methods used by the Topographical Survey.

Year	Methods
1906	Plane table and photogrammetry (camera in connection with plane table); a few of the stations were determined trigonometrically.
1907	Photogrammetry (camera in connection with plane table) and a few plane table stations; most of the stations determined trigonometrically; also photogrammetric sea stations.
1909—1910	Photogrammetry (photo-theodolite), most stations determined trigonometrically; also sea stations and „depression“-measurements.
1911—1919	Photogrammetry (photo-theodolite), all stations determined trigonometrically; also sea stations, “depression”-survey, and tacheometry.
1920—1925	Photogrammetry (photo-theodolite) and stereo-photogrammetry, all stations determined trigonometrically; also sea stations, „depression“-survey, and tacheometry.

The determinations of elevations have, as a rule, been made trigonometrically. Besides the levelling carried out in connection with the base measurements, levellings have also been carried from each water level observation to bench marks and trigonometrical points. A number of raised beaches and terraces have also been levelled.

X a.
Details of Topographical Field Work.
 (Map p. 49).

Year	Topographers	Assistants	Trig. stations with photo-grams		Trig. stations with-out photo-grams	Tacheometer stations	Photogr. stations determined graphically		Photogr. sea stations		Calms built	Area in sq. km.
			Number of				Sta-tions	Photo-grams	Sta-tions	Photo-grams		
1906	Isachsen	3	-	-	-	-	34	256	-	-	5	1930
	Koller	1	-	-	-	-	2	6	50	-	-	
	A. Staxrud	2	5	28	-	-	1	9	53	-	-	
	<i>Total</i>		5	28	-	-	37	271	103	-	-	
1907	Hoel	1	23	96	20	-	4	36	-	-	3	1596
	Haavimb	1	-	-	-	-	-	-	20	-	-	
	Isachsen	2	16	137	2	-	9	53	18	9	35	
	<i>Total</i>		39	233	22	-	13	89	38	9	35	
1909	Hoel	2	5	40	22	-	-	-	-	-	-	805
	Isachsen	2	12	107	-	-	2	18	-	6	24	
	Koller	2	23	190	18	-	2	16	-	2	3	
	Laurantzon	2	4	30	8	-	3	27	-	-	-	
	<i>Total</i>		44	367	48	-	7	61	-	8	27	
1910	Haavimb	1	11	102	-	-	-	-	-	-	8	5348
	Isachsen	2	13	111	-	-	5	42	-	20	90	
	Koller	2	22	180	4	-	-	-	-	2	7	
	A. Staxrud	2	31	307	-	-	2	20	-	1	2	
	<i>Total</i>		77	700	4	-	7	62	-	23	99	
1911	Hoel	2	5	28	2	29	-	-	-	-	-	805
	Koller	2	23	168	8	5	-	-	-	-	13	
	A. Staxrud	2	27	187	5	7	-	-	-	-	15	
	<i>Total</i>		55	383	15	41	-	-	-	-	28	
1912	Hoel	2	6	34	1	40	-	-	-	-	2	620
	Koller	2	28	248	5	2	-	-	-	5	24	
	A. Staxrud	2	22	152	4	-	-	-	-	7	26	
	<i>Total</i>		56	434	10	42	-	-	-	12	50	
1913	Hoel	2	2	5	3	28	-	-	-	2	7	202
	Koller	2	29	205	5	5	-	-	-	3	6	
	<i>Total</i>		31	210	8	33	-	-	-	5	13	
1914	Hoel	2	6	29	25	20	-	-	-	-	1	302
	Koller	1	17	117	-	5	-	-	-	2	10	
	A. Staxrud	1	8	58	-	-	-	-	-	6	30	
	<i>Total</i>		31	204	25	25	-	-	-	8	40	
1916	Hoel	2	8	55	3	17	-	-	-	-	2	
1917	Hoel	1	4	31	3	9	-	-	-	-	4	115
	Koller	2	37	229	6	14	-	-	-	3	8	
	<i>Total</i>		41	260	9	23	-	-	-	3	8	
1918	Gløersen	2	14	109	-	-	-	-	-	-	8	1530
	Hoel	1	19	137	1	-	-	-	-	5	7	
	Holst	1	3	21	-	-	-	-	-	-	3	
	Koller	2	19	141	13	1	-	-	-	-	10	
	Solheim	2	24	163	1	6	-	-	-	-	12	
	Werenskiold	2	14	97	2	19	-	-	-	-	13	
	<i>Total</i>		93	668	17	26	-	-	-	5	7	

X a (continued).

Year	Topographers	Assistants	Trig. stations with photographs Number of		Trig. stations without photographs	Tacheometer stations	Photogr. stations determined graphically Number of		Plane table stations determined graphically	Photogr. sea stations Number of		Cairns built	Area in sq. km.
			Trig. st.	Photograms			Stations	Photograms		Stations	Photograms		
1919	Hoel	1	2	13	4	-	-	-	-	10	25	3	995
	Koller	2	26	178	1	-	-	-	-	-	-	18	
	Solheim	2	14	89	3	5	-	-	-	1	3	8	
	A. Staxrud	2	27	202	2	-	-	-	-	11	30	16	
	Werenskiold	2	7	46	7	51	-	-	-	-	-	4	
	<i>Total</i>		76	528	17	56	-	-	-	22	58	49	
1920	Hoel	1	2	22	-	-	-	-	-	4	8	2	1487
	Koller	2	34	139	1	-	-	-	-	-	-	9	
	Solheim	2	26	208	1	-	-	-	-	3	6	17	
	A. Staxrud	2	48	343	3	-	-	-	-	-	-	18	
	O. Staxrud	1	19	132	8	-	-	-	-	-	-	7	
	Werenskiold	2	10	64	2	29	-	-	-	-	-	8	
		<i>Total</i>		139	908	15	29	-	-	-	7	14	
1921	Hoel	1	-	-	-	5	-	-	-	-	-	-	502
	Koller	2	20	133	4	6	-	-	-	-	-	6	
	Solheim	2	29	164	6	2	-	-	-	4	8	17	
	Werenskiold	2	13	86	-	-	-	-	-	1	4	7	
	<i>Total</i>		62	383	10	13	-	-	-	5	12	30	
1922	Koller	1	8	38	8	-	-	-	-	-	-	1	67
	Solheim	1	9	49	4	-	-	-	-	-	-	1	
		<i>Total</i>		17	87	12	-	-	-	-	-	2	
1923	Gleditsch	1	8	43	3	18	-	-	-	-	-	10	335
	Hoel	1	-	-	2	-	-	-	-	20	38	-	
	Sartorius	2	23	128	10	5	-	-	-	-	-	23	
	Werenskiold	2	27	185	10	9	-	-	-	-	-	17	
		<i>Total</i>		58	356	25	32	-	-	-	20	38	
1924	Hoel	1	-	-	2	6	-	-	-	-	-	-	785
	Koller	3	34	104	1	-	-	-	-	-	-	2	
	Sartorius	2	36	261	7	2	-	-	-	-	-	17	
	Solheim	2	43	207	9	3	-	-	-	-	-	15	
	Werenskiold	2	21	126	13	24	-	-	-	-	-	14	
		<i>Total</i>		134	698	32	35	-	-	-	-	48	
1925	Askheim	1	-	-	6	9	-	-	-	-	-	-	1274
	Koller	3	18	71	10	1	-	-	-	-	-	5	
	Luncke	2	29	247	1	-	-	-	-	-	-	18	
	Sartorius	2	36	274	-	-	-	-	-	-	-	19	
	Solheim	3	33	162	3	-	-	-	-	-	-	13	
		<i>Total</i>		116	754	20	10	-	-	-	-	55	
	Total		1082	7256	292	392	64	483	141	127	401	511	17893
<i>Ny-Ålesund</i>													
<i>1:1000</i>													
1921	Koller	3	138	374	-	-	-	-	-	-	-	-	
	Solheim	1	-	-	26	67	-	-	-	-	-	-	
		<i>Total</i>		138	374	26	67	-	-	-	-	-	
1923	Gleditsch	1	-	-	2	9	-	-	-	-	-	-	12
		Total		138	374	28	66						12

X a (continued).

Year	Topographers	Assistants	Trig. stations with photograms		Trig. stations without photograms	Tacheometer stations	Photogr. stations determined graphically		Plane table stations determ. graphically	Photogr. sea stations		Cairns built	Area in sq. km.
			Number of				Number of			Number of			
			Trig. st.	Photograms			Sta-tions	Photo-grams		Sta-tions	Photo-grams		
1922	<i>Bear-Island</i> <i>1:2000 and</i> <i>1:10000.</i>												
	Koller	3	154	414	2	-	-	-	-	-	-	-	
	Solheim	1	-	-	59	12	-	-	-	-	-	-	
	Werenskiold	1	-	-	14	12	-	-	-	-	-	-	
	<i>Total</i>		<i>154</i>	<i>414</i>	<i>75</i>	<i>24</i>	-	-	-	-	-	-	<i>12.64¹</i>
1923	Koller	4	126	368	-	-	-	-	-	-	-	4	
	Luncke	2	4	-	-	106	-	-	-	-	-	-	
	Solheim	1	-	-	68	35	-	-	-	-	-	4	
	<i>Total</i>		<i>130</i>	<i>368</i>	<i>68</i>	<i>141</i>	-	-	-	-	-	<i>8</i>	<i>120.76</i>
1924	Koller	-	-	-	-	-	-	-	-	8	24	-	
	Gleditsch	1	-	-	1	58	-	-	-	-	-	1	
	Luncke	1	3	9	9	58	-	-	-	3	11	1	
	<i>Total</i>		<i>3</i>	<i>9</i>	<i>10</i>	<i>116</i>	-	-	-	<i>11</i>	<i>35</i>	<i>2</i>	<i>44.67</i>
	Total		287	791	153	281	-	-	-	11	35	10	178.07

¹ Maps 1:2000.

X b.

Summary of Topographical Field Work.

Year	Expeditions	Trig. stations with photograms		Trig. stations without photograms	Tacheometer stations	Photogr. stations determined graphically		Plane table stations determ. graphically	Photogr. sea stations		Cairns built	Area in sq. km.
		Number of				Number of			Number of			
		Trig. st.	Photograms			Sta-tions	Photo-grams		Sta-tions	Photo-grams		
1906—07	Prince Albert of Monaco and Isachsen	44	261	22		50	360	141	9	35	20	3526
1909—10	Isachsen	121	1067	52		14	123		31	126	65	5348
1911—14	Hoel and Staxrud	173	1231	58	141				25	103	64	1929
1916	Hoel	8	55	3	17						2	-
1917—18	Hoel and Røvig	134	928	26	49				8	15	65	1645
1919—25	Hoel	1027	4879	312	532				65	157	305	5635
	Total	1507	8421	473	739	64	483	141	138	436	521	18083

XI.
Topographically Surveyed Areas.

(Map pag. 49).

The map were constructed on the scale of 1: 50 000 and 1: 25 000.

Year	Expeditions	Area	Topographers	Area in sq. km.
1906	Prince Albert of Monaco and Isachsen	North and east of Cross Bay and south of Smeerenburg Bay and Liefde Bay	Isachsen A. Staxrud Koller	1930
1907	—, —	Around Seven Ice Mountains Around Kings Bay The northern part of Prince Charles Foreland	Isachsen Isachsen Isachsen	411 1058 127
1909/ 1910	Isachsen	Reindeer Peninsula and country on either side of Red Bay West and south of Wood Bay Country north of Ice Fjord as far east as Dickson Bay and as far north as the Bar Prince Charles Foreland	Isachsen Koller Laurantzon Isachsen Koller Haavimb Isachsen Koller A. Staxrud Laurantzon Haavimb Isachsen Koller Laurantzon	772 836 3218
1911	Hoel and Staxrud	Country between Ice Fjord and Bell Sound (Coles Bay, Green Harbour and Fridtjof Glacier)	A. Staxrud Koller Hoel	522 5348
1912	—, —	Country around Conway Valley and Coal Mountain on the north side of Lowe Sound Northwards to Mt. Nordenskiöld	A. Staxrud Koller	805 620
1913	—, —	Coastal country between Coles Bay and Advent Bay	Koller	74
1913	—, —	Country north of the inner part of Van Mijen Bay	Koller	128 202
1914	—, —	Country on either side of Advent Valley	A. Staxrud Koller	302
				10 803

XI (continued).

Year	Expeditions	Area	Topographers	Area in sq. km.
1917	Hoel and Røvig	Country east of Advent Bay	Koller	B/F 10803 115
1918	—, —	South and east of Horn Sound and the greater part of the country between Horn Sound and Bell Sound	Koller Solheim Gløersen Hoel Werenskiold Holst	1530
1919	Hoel	Country between South Cape and Horn Sound including supplementary surveys in 1920	Koller A. Staxrud Solheim Hoel Werenskiold	788
		Between Cape Lyell and Cape Klaveness	Koller A. Staxrud Solheim Werenskiold	207
1920	—, —	Country around the upper part of Conway Valley	Koller Olav Staxrud	345
		Country around Van Keulen Bay	Koller Solheim Olav Staxrud Hoel Werenskiold	892
1921	—, —	Country south of Sassen Bay	A. Staxrud Koller Solheim Werenskiold	250
		South of Van Mijen Bay	Koller Solheim Werenskiold	427
		Area on the north side of the same fjord east of Blue Hoek	Koller Werenskiold	35
		At Cape Ahlstrand	Solheim	40
1922	—, —	Country south of the inner part of Advent Bay, including some survey work from 1916	Koller Solheim	67
1923	—, —	West coast of the country between Bell Sound and Ice Fjord. Including some survey work from 1913 and 1917	Sartorius Gleditsch	260
		Two small valleys between Coles Bay and Bear Valley	Sartorius Gleditsch	7
		Area on the west coast at Cape Klaveness	Werenskiold	68
1924	—, —	Country around Temple Bay and Klaas Billen Bay	Koller Sartorius Solheim Werenskiold	335
1925	—, —	Country north and east of Braganza Bay towards the upper parts of Advent Valley and Sassen Valley	Koller Luncke Sartorius Solheim	785
1921)	—, —	Ny-Ålesund 1:1000	Koller	1274
1923)			Solheim Gleditsch	12
1922)	—, —	Bear Island 1:10000. (In this area is also included maps 1:2000 in all. 14.26 sq. km. whereof 12.64 sq. km. were surveyed in 1922)	Koller Luncke Solheim Gleditsch Werenskiold	178
				Total 18 083

XII a.

Hydrographically Surveyed Areas and Lengths of Danger Line.

When not specially mentioned the scale is 1:100 000.

(Map p. 50).

Year	Field	Hydrographers	Danger line in km			Surveyed area in sq. km.
			6 m.	10 m.	20 m.	
1907	Hamburger Bay 1:12 500	Isachsen	-	-	-	0.8
1909	Kings Bay and Foreland Sound north of The Bar, 1:200 000	Hermansen Jørgen	-	-	-	673
1909	Blomstrand Harbour 1:25 000	Jørgen	9	-	-	8.4
1909	Ferrier Haven 1:25 000	Hermansen	10	-	-	10.8
1909	Farm Haven 1:25 000	Hermansen	7	-	-	7.4
1910	Foreland Sound south of The Bar, 1:200 000	Hermansen Jørgen	-	-	-	649
1910	Vulkan Haven 1:25 000	Hermansen	2	-	-	0.8
1910	Green Harbour	Hermansen Jørgen	-	-	-	28.0
1910	Hecla Haven 1:25 000	Jørgen	1.5	-	-	0.9
1910	Finnes Haven 1:25 000	Jørgen	1.5	-	-	1.0
1910	Norske Haven, Bear Island 1:25 000	Hermansen	6	-	-	2.6
1913	Røvig Shoal and northward to Festningen	Røvig	-	-	49	682.3 228
1914	Entrance to Ice Fiord	Røvig	-	16.5	26	293
1914	Along the coasts of Green Harbour	Røvig	-	41	-	28
1917	On and around Sentinelle Bank	Røvig	-	-	-	321 953
1917	Off St. Hans Islets	Røvig	-	-	17	
1918	The south side of Ice Fiord between Green Harbour and Advent Bay	Røvig	-	59	-	255
1918	The north side of Bell Sound	Røvig	-	-	24	96
1919	From Horn Sound to Bell Sound. Deep soundings	Hermansen Hovdenak	-	10.5	151	351 3329
1920	From Cape Keilhau to Hovdenak Shoal	Hermansen Gjertsen	-	-	100	1566
1920	Horn Sound	Hermansen	-	-	-	130
1920	At St. Hans Islets	Gjertsen	-	-	-	33
1920	From Cape Daudmann to Gudrun Islet and the Southern entrance to Fore- land Sound	Hermansen Gjertsen	-	-	15.5	112
1921	West and south of Prince Charles Foreland	Hermansen Gjertsen Thorkelsen	-	-	127	2767
1921	Inner parts of Ice Fiord	Hermansen	-	53.5	-	664
1921	At Loweness and Reinius Islands	Gjertsen Thorkelsen	-	-	-	41
1922	South Haven, Bear Island 1:1000	Iversen	-	-	-	3472
1923	East, south and west of South Cape.	Hermansen Hagerup E. Kjær	-	-	-	528
			37	180.5	509.5	11 878.46

XII a (continued).

Year	Field	Hydrographers	Danger line in km.			Surveyed area in sq. km.
			6 m.	10 m.	20 m.	
1923	From South Cape to Bell Sound, mostly within the danger line	Hermansen R. v. Krogh Hagerup Thorkelsen E. Kjær	37 -	180.5 10	509.5 19	11 878.46 623
1923	At Cape Martin and Røvig Shoal within the danger line	Hermansen Hagerup E. Kjær	-	-	-	59
1923	At Tundra Bay mostly within the danger line	R. v. Krogh Thorkelsen	-	3	-	44
1923	South of Finnes Haven, Green Harbour	Hermansen Hagerup E. Kjær	-	-	-	2
1923	South of Prince Charles Foreland	Hermansen Hagerup E. Kjær	-	-	-	55
1923	West of Prince Charles Foreland	Hermansen Hagerup E. Kjær	-	-	-	314
1923	West and north of Prince Charles Foreland, mostly within the danger line	Hermansen Hagerup E. Kjær	-	-	14.5	139
1923	From Cape Mitra to Hamburg Bay, mostly deep soundings	Hermansen Hagerup E. Kjær	-	-	33	410
1923	Around Quade Hoek	Hermansen Hagerup E. Kjær	-	6.5	15	40
1923	Ny-Ålesund, plan of the harbour, 1 : 25 000	Hermansen Hagerup E. Kjær	-	4.5	-	4.1
1923	St. John's Bay and southward to Small Skerries	R. v. Krogh Thorkelsen	-	50.5	-	60
1923	The west side of Foreland Sound southwards from Point Poole	R. v. Krogh Thorkelsen	-	18.5	-	30
1924	Van Keulen Bay	Hermansen R. v. Krogh Thorkelsen	-	82.5	9.5	243
1924	At Loweness	Hermansen	-	-	-	3
1924	From Eidem Bay to Small Skerries	Hermansen R. v. Krogh Thorkelsen	-	15	-	15
1924	On either side of Foreland Sound between St. Johns Bay and The Bar	Hermansen R. v. Krogh Thorkelsen	-	96.5	-	266
1924	On either side of Foreland Sound north of The Bar	Hermansen R. v. Krogh Thorkelsen	-	59	1	131
1924	Head and north side of Kings Bay	Hermansen R. v. Krogh	-	69.5	-	68
1924	Sassen Bay and Temple Bay	Hermansen R. v. Krogh Thorkelsen	-	83.5	-	331
						1057
			37	679.5	601.5	15243.56

XII a (continued).

Year	Field	Hydrographers	Danger line in km.			Surveyed area in sq. km.
			6 m.	10 m.	20 m.	
1925	Klaas Billen Bay	Hermansen Schulz	37	679.5	601.5	15243.56
		Thorkelsen Bredsdorff	-	86	-	218
1925	Ekman Bay, Dickson Bay and North Fjord	Hermansen Schulz	-	184	-	601
		Thorkelsen Bredsdorff	-			
1925	Cold Harbour	Hermansen Schulz	-	24	-	59
		Thorkelsen Bredsdorff	-			
1925	North of Cape Mitra	Hermansen	-	-	-	75
						953
		Total	37	973.5	601.5	16196.56
			1612.0			
1917	Sentinel Bank 40 m. danger line	Røvig	32.5			
	<i>Total length of danger line 1644.5 km</i>					
1918	At Tunheim, Bear Island 1:500	Schive (for Bjørnøen A.S.)				0.12

Total of area 16196.68 sq. km.

XII b.

Summary of hydrographically Surveyed Areas and Lengths of Danger Line.

Year	Expeditions	Danger line in km.				Surveyed area in sq. km.
		6 m.	10 m.	20 m.	40 m.	
1907	Prince Albert of Monaco and Isachsen	-	-	-	-	0.8
1909—1910	Isachsen	37.0	-	-	-	1381.9
1913—1914	Hoel and Staxrud	-	57.5	75.0	-	549.0
1917—1918	Hoel and Røvig	-	59.0	41.0	32.5	1304.0
1919—1925	Hoel	-	857.0	485.5	-	12960.98
	Total	37.0	973.5	601.5	32.5	16196.68
		<i>1644.5 km.</i>				

XIII.

Beacons Erected.

Year	Location	Erected by
1912	On C. Daudmann	A. Staxrud
1912	" C. Linné	{ A. Staxrud Røvig
1913		
1923		
1923	" Sars Pt.	Hermansen
1923	" Murray Pt.	Hermansen
1923	" Brandal Pt.	Hermansen
1923	" Vogel Hoek	R. v. Krogh
1924	" Poole Pt.	R. v. Krogh

XIV.

**Hydrographic Surveying carried out in Svalbard by Foreign Expeditions
with about the same Amount of Details as the Norwegian
Hydrographic Surveying.**

Year	Expedition	Field	Scale	Hydrographers	Area sq. km.
1807	H. M. S. "Shannon"	Magdalena Bay	1 : 24 400	Captain P. B. V. Broke	} 20
1818	H. M. S. "Trent"	—, —	1 : 73 300	Lieuts. J. Franklin and F. W. Beechey	
1818	—, —	South Gat	1 : 73 300	—, —	18
1818	—, —	Foul Pt.	1 : 73 300	—, —	2
1895	Training Squadron	Recherche Bay	1 : 36 900	Lieut. J. P. Rolleston and other officers	40
1897	Andrée's Expedition	Danes Gat	1 : 19 800	Lieut. G. Norselius	23
1898	The Swedish Arc Measurement Expedition	Beverly Sound	1 : 30 000	Mr. Harald Palme	2
1899	Prince Albert of Monaco	Red Bay	1 : 30 000	Lieutenant Guissez	62
1900	The Swedish Arc Measurement Expedition	Norway Sound and Sweden Sound	1 : 19 800	Lieutenant E. Arnelius	9
1906/7	Prince Albert of Monaco	Cross Bay	1 : 100 000	Lieutenant H. Bourée	166
1906/7	—, —	Port Møller	1 : 12 500	—, —	8
1906/7	—, —	Ebeltoft Haven	1 : 12 500	—, —	3
1906/7	—, —	Port Signe	1 : 12 500	—, —	4
1920	The Swedish Spits- bergen Expedition 1920	Van Mijen Bay	1 : 120 000	Commander G. Reinius and other officers	477
1920	—, —	Axel Sound	1 : 50 000	—, —	22
1920	—, —	Maria Sound	1 : 50 000	—, —	30
1920	—, —	Svea Bay	1 : 20 000	—, —	9
Total					895

Of this area about 700 sq. km (Cross Bay and Van Mijen Bay) have been surveyed on the basis of Norwegian geodetic work.

The results of the surveys in 1818, 1897 and 1900 will be found on British Admiralty chart 3203; of the surveys in 1895, 1898 on British Admiralty chart 300, and the results of the survey in 1920 on Swedish chart 301.

XV.
Oceanographic Work.

(Map p. 51).

Year	Expeditions, observer, vessel	Section	Station	Sets of observations
1910	Isachsen Observer: A. Hermansen and J. Jørgen H. M. S. "Farm"	From 74° 40' N, 16° 10' E (west of Bear Island) towards WNW to 75° 45' N, 4° 20' E	6	53
		From 75° 45' N, 4° 20' E towards ENE to 76° 20' N, 13° 45' E	5	42
		From 76° 56' N, 11° 0' E to the coast north of Dunder Bay	3	28
		From the coast north of Cross Bay towards WSW to 78° 8' N, 0° 35' W	7	91
		From 78° 8' N, 0° 35' W southwards to 77° 15' N, 0° 35' W	2	34
		From 77° 15' N, 0° 35' W towards ENE, south point of Prince Charles Foreland	8	117
		From Danskøya towards NW to 80° 0' N, 8° 55' E	2	24
		From Magdalena Bay towards west to 79° 33' N, 8° 10' E	2	21
		Single stations	11	113
				46
1922	Hoel Observer: Olaf Devik M/C "Ringsæl"	Westwards from Bear Island 92.5 n. m.	6	41
		Back to Bear Island	1	8
		From Bear Island to South Cape	3	12
		Verlegen Hoek due north 56 n. m. thence towards NE to 81° 29' N, 19° 20' E	4	42
			2	25
		From Ice Fjord due west 65 n. m.	5	52
		Single stations	8	52
		29	232	
1923	Hoel Observer: L. Hagerup, A. Hermansen, E. Kjær H. M. S. "Farm"	From Red Bay northwards to 80° 44' N, 11° 18' E	5	35
		From the ice edge 80° 51' N, 15° 25' E toward SSE to Hinlopen Strait	5	33
		From Amsterdam Island due west to 79° 48' N, 6° 15' E	4	41
		From the mouth of Ice Fjord westwards to 77° 54' N, 9° 47' E	4	32
		Single stations	9	73
	Observers: R. v. Krogh, K. Thorkelsen, A. Hoel M/C "Blomstersæl"			
		27	214	

XV (continued).

Year	Leader, observers, vessel	Section	Station	Sets of observa- tions	
1924	Hoel Observer: R. v. Krogh, A. Hermansen and K. Thorkelsen H. M. S. "Farm"	From Bear Island westwards to 76° 3' N, 15° 18' E	6	44	
		Single stations	2	12	
	Observer: K. Thorkelsen M/C "Blomstersæl"	From Norway Island due west to 79° 48' N, 6° 15' E	5	57	
		From Norway Island northwards to 80° 19' N, 12° 0' E	3	20	
		From Ice Fjord westwards to 77° 55' N 8° 17' E	6	57	
		Single stations	5	50	
		27	240		
1925	Hoel Observer: K. Thorkelsen H. M. S. "Farm"	From the north coast of Spitsbergen in 79° 58' N, 12° 0' E northwards to 80° 28' N, 12° 0' E	7	50	
		From 80° 28' N, 11° 5' E westwards to 80° 25' N, 9° 10' E	3	37	
	Observer: P. Bredsdorff and K. Thorkelsen H. M. S. "Farm"	Bear Island—South Cape	10	62	
		Amsterdam Island westwards to 79° 45' N, 60° 0' E	5	58	
		From 79° 45' N, 6° 0' E northwards to the ice edge 80° 25' N, 9° 8' E	2	26	
		From the ice edge 80° 54' N, 12° 0' E to Norway Island	6	53	
		From Hinlopen Strait to the ice edge 80° 43' N, 17° 10' E	6	43	
		From 80° 43' N, 17° 10' E to Norway Island	3	25	
		From Ice Fjord westwards to 77° 54' N, 8° 12' E	8	83	
		Single stations	5	42	
				55	479

XVI.
**Number of Photographs in the Records of Norges Svalbard- og
 Ishavs-undersøkelser (1926).**

Year	Photos for surveying	Photos for other purposes	Year	Photos for surveying	Photos for other purposes
1906	299	26	1917	268	329
1907	357	127	1918	675	132
1908		70	1919	586	141
1909	455	485	1920	922	161
1910	861	345	1921	769	202
1911	383	88	1922	501	202
1912	484	216	1923	762	279
1913	223	91	1924	742	431
1914	244	63	1925	754	170
1915		61	1926		54
1916	55	56	Total	9340	3729

13069

XVII.
Summary of Papers and Maps Published in 1911—1929.

	Pages	Plates	Maps	Text figs.
<i>In</i> Résultats des Campagnes scientifiques accomplies sur son yacht par Albert I ^{er} Prince Souverain de Monaco.....	381	88	3	
<i>In</i> Expédition Isachsen au Spitsberg 1909—1910, Résultats scientifiques	369	60	12	57
<i>In</i> Publications des Expéditions Norvégiennes au Spitsberg 1911—1914 sous la direction de Arve Staxrud et de Adolf Hoel	33	13	4	3
<i>In</i> Resultater av de Norske Statsunderstøttede Spitsbergenekspeditioner and Skrifter om Svalbard og Ishavet	1387	205	32	276

Giving a total of 37 papers with 2170 pages, 366 plates, 51 maps and 336 text figures.

XVIII a.

Contributions (in Norw. kroner).

Year		The Norwegian Government	Scientific funds and institutions	Private subscribers	Total		
1906-1907	<i>Expeditions fitted out by Prince Albert of Monaco and led by Captain G. Isachsen, 1906 and 1907:</i>						
	Prince Albert of Monaco	-	-	90 000.00	90 000.00		
				90 000.00			
1908	<i>Hoel's expedition 1908:</i>						
	Mineralogical Institute of the University, Oslo	-	500.00		3 000.00		
	Det Norske Kulkompagnie Ltd, Green Harbour, through Mr. F. Hiorth, Director, Oslo	-	-	2 000.00			
	Mr. Elias Kiær, Merchant, Fredrikstad	-	-	500.00			
	-	500.00	2 500.00				
1909 1910	<i>Isachsen's expeditions 1909 and 1910:</i>						
	Government grant for the expedition (Ministry of Church Affairs and Education)...	25 000.00			93 000.00		
	Government grant for the vessel ("Farm") (Ministry of Defence)	9 254.10					
	Mr. Carl Løvenskiold, ex-Prime Minister, Vækerø	-	-	5 000.00			
	Mr. Alfred Larsen, Merchant, Oslo	-	-	5 000.00			
	Mr. Haaken Mathiesen, Landowner, Eidsvoll Verk	-	-	5 000.00			
	Mr. A. J. Jacobsen, Merchant, Fredrikstad..	-	-	5 000.00			
	Mr. P. M. Anker, Landowner, Halden	-	-	2 500.00			
	Det Norske Kulkompagnie Ltd, Green Harbour, through Mr. F. Hiorth, Director, Oslo	-	-	1 000.00			
	Mr. Chr. Anker, Merchant, Halden	-	-	414.00			
	Government grant for vessel ("Farm") (Ministry of Defence)	8 741.58					
	Nansen Fund	-	2 500.00				
	H. M. King Haakon VII and H. M. Queen Maud	-	-	1 000.00			
	Mr. Carl Løvenskiold, ex-Prime Minister, Vækerø	-	-	5 000.00			
	Mr. Alfred Larsen, Merchant, Oslo	-	-	1 000.00			
	Mr. Arthur Mathiesen, Merchant, Fredrikstad	-	-	1 000.00			
	Det Nordenfjeldske Dampskibsselskab, Trondhjem	-	-	1 000.00			
	Mr. Th. Schjelderup, Merchant, Oslo	-	-	1 000.00			
	Lieutenant-Colonel H. Hofgaard, Lier	-	-	1 500.00			
	Mr. Fred. Olsen, Shipowner, Oslo	-	-	1 000.00			
	Mr. H. Olsen, Consul-General, Oslo	-	-	1 000.00			
	Mr. Rasmus Meyer, Merchant, Bergen	-	-	1 000.00			
	Mr. Thor Dahl, Shipowner, Sandefjord	-	-	500.00			
	O. A. H., Oslo	-	-	500.00			
	Mr. O. H. Holta, Merchant, Notodden	-	-	500.00			
		C/F	42 995.68	2 500.00		39 914.00	93 000.00

XVIII a (continued).

Year		The Norwegian Government	Scientific funds and institutions	Private subscribers	Total
	B/F	42 995.68	2 500.00	39 914.00	93 000.00
1910	Mr. W. Nygaard, Publisher, Oslo	-	-	1 000.00	
	Mr. C. Neufeldt, Consul-General, Wien ...	-	-	250.00	
	Mr. C. Robertson, Consul, Hammerfest ...	-	-	250.00	
	Mr. Andreas Løvlie, Merchant, Oslo	-	-	250.00	
	Anonymus, Sandefjord	-	-	200.00	
	Mr. H. H. Holta, Merchant, Skien	-	-	200.00	
	Mr. Hans A. Meyer, Merchant, Mo in Ranen	-	-	100.00	
1911	Nansen Fund	-	600.00		
1913	Mr. Carl Løvenskiold, ex-Prime Minister, and Mrs. Løvenskiold	-	-	4 500.00	
1916	The Norw. Government: Supplementary grant (Ministry of Church Affairs and Education)	10 507.55			
1916	Univ. Jubilee Fund: For filing photographic material	-	800.00		
1911/ 1916	Nansen Fund: For printing publications ..	-	12 442.90		
1914	Mr. I. N. Seligman, Banker, New-York: For binding publications	-	-	190.00	
1916	Mr. H. Holta, Merchant, Skien: For binding publications	-	-	500.00	
		53 502.23	16 342.90	47 354.00	117 200.13
	<i>Hoel and Staxrud's expedition 1911:</i>				
1911	Government grant for the expedition (Mini- stry of Church Affairs)	15 000.00			
	Mr. Carl Løvenskiold, ex-Prime Minister, and Mrs. Løvenskiold	-	-	5 000.00	
	Lieutenant-Colonel H. Hofgaard, Lier	-	-	1 000.00	
	Miss Harriet Wedel Jarlsberg, Bærums Verk	-	-	1 000.00	
	Mr. Chr. Anker, Merchant, Halden	-	-	1 000.00	
	Mr. D. Cappelen, Chamberlain, Ulefoss....	-	-	500.00	
	Messrs. Chr. Nielsen & Co., Larvik	-	-	400.00	
	Mr. Lars Christensen, Shipowner, Sandefjord	-	-	200.00	
	Mr. Gunnar Knudsen, ex-Prime Minister, Borgestad	-	-	200.00	
	A/S Framnæs mek. Verksted, through Mr. O. Wegger, Manager, Sandefjord	-	-	200.00	
	Mr. Joachim Grieg, Consul, Bergen	-	-	200.00	
	Dr. Wilhelm Holst, Tromsø	-	-	200.00	
	Mr. W. Nygaard, Publisher, Oslo	-	-	200.00	
	Mr. Jørgen C. Knudsen, Shipowner, Eidanger	-	-	200.00	
	Mr. Johan Bryde, Consul, Sandefjord	-	-	200.00	
	Mr. Thor Dahl, Shipowner, Sandefjord	-	-	200.00	
	Tønsberg Hvalfangerselskap, Tønsberg	-	-	200.00	
	Mr. F. Bugge, Consul, Tønsberg	-	-	200.00	
	Mr. C. Robertson, Consul, Hammerfest....	-	-	100.00	
		15 000.00	-	11 200.00	26 200.00
	<i>Hoel and Staxrud's expedition 1912:</i>				
1912	Government grant for the expedition (Mini- stry of Church Affairs)	10 000.00	-		
	Nansen Fund	-	1 000.00		
	C/F	10 000.00	1 000.00	-	236 400.13

XVIII a (continued).

Year		The Norwegian Government	Scientific funds and institutions	Private subscribers	Total
1912	B/F Mr. Carl Løvenskiold, ex-Prime Minister, and Mrs. Løvenskiold	10 000.00	1 000.00	-	236 400.13
	Mr. Elias Kiær, Merchant, Fredrikstad	-	-	5 000.00	
	Miss Harriet Wedel Jarlsberg, Bærums Verk	-	-	1 000.00	
	Lieutenant-Colonel H. Hofgaard, Lier	-	-	1 000.00	
	Mr. Chr. Anker, Merchant, Halden	-	-	1 000.00	
	Professor Dr. Johan Kiær, Oslo	-	-	500.00	
1913	Supplement to State grant for the expeditions 1911—1912	5 000.00			
		15 000.00	1 000.00	9 500.00	25 500.00
	<i>Hoel and Staxrud's expedition 1913:</i>				
1913	Government grant for the expedition (Ministry of Church Affairs)	10 000.00			
	Det Nordenfjeldske Dampskibsselskab, Trondhjem	-	-	1 000.00	
	Estate of the late Mr. Chr. Anker, Halden ...	-	-	1 000.00	
	Miss Harriet Wedel Jarlsberg, Bærums Verk	-	-	1 000.00	
	Anonymus, Oslo	-	-	250.00	
	Mr. W. Nygaard, Publisher, Oslo	-	-	200.00	
		10 000.00	-	3 450.00	13 450.00
	<i>Hoel and Staxrud's expedition 1914:</i>				
1914	Government grant for the expedition (Ministry of Church Affairs)	15 000.00			
	Nansen Fund	-	1 000.00		
		15 000.00	1 000.00	-	16 000.00
	<i>Hoel's expedition 1915:</i>				
1915	Nansen Fund	-	1 000.00	-	1 000.00
	<i>Grant for working up the material and for publishing results:</i>				
1916	Government grant for the working up of the material from the expeditions 1911—1914 (Ministry of Church Affairs)	5 000.00			
1914	Nansen Fund: For publishing a paper dealing with the results of the expedition in 1912	-	1 305.80		
1917	Government grant for the working up of the material from the expeditions 1911—1914	3 000.00			
1918	Univ. Jubilee Fund: Filing photographic material from the expeditions 1911—1916 ..	-	500.00		
		8 000.00	1 805.80	-	9 805.80
	<i>Hoel's expedition 1916:</i>				
1916	I/S Advent Bay Kulfelt and A/S Svalbard Kulgruber, Oslo	-	-	5 000.00	
		-	-	5000.00	5 000.00
	C/F	-	-	-	307 155.93

XVIII a (continued).

Year		The Norwegian Government	Scientific funds and institutions	Private subscribers	Total
	B/F	-	-	-	307 155.93
1917	<i>Hoel and Røvig's expedition 1917:</i>				
	Government grant for the expedition (Ministry of Church Affairs).....	10 000.00			
	I/S Spitsbergen Mineral, Tønsberg, through the following members:				
	Mr. Harry Borthen, Shipowner, Oslo	kr. 4457.00			
	Mr. Gullik Jensen, Shipowner, Tønsberg	„ 4457.00			
	Mr. Joh. Gmeiner, Director, Tønsb. „	5842.70			
	Mr. Hans M. Vik, Merchant, „	5842.70			
	Messrs. N. Bugge, „	4457.00			
	Captain Harald Berg, „	4457.00			
	Mr. Lorentz Bruun, Shipowner, Tønsberg	„ 4457.00			
	Mr. Thorvald Berg, Shipowner, Tønsberg	„ 3610.10			
	Mr. Johan Gullichsen, Director, Tønsberg	„ 2685.90			
	Mr. Carl Bjørnskau, Merchant, Tønsberg	„ 1805.70			
	Mr. A. Thorbjørnsen, Shipowner, Tønsberg	„ 888.50			
	Mr. Birger Rafen, Office Manager, Tønsberg	„ 888.53			
	Mr. J. J. Thaulow, Engineer, Tnsb. „	888.50			
	A/S Kulspids, Oslo	-	-	44 737.13	
	A/S De Norske Kulfelter Spitsbergen, Bergen	-	-	6 000.00	
		-	-	3 000.00	
		10 000.00	-	53 737.13	63 737.13
1918	<i>Hoel and Røvig's expedition 1918:</i>				
	Government grant for the expedition (Ministry of Church Affairs).....	10 000.00			
	Government grant for the expedition (Ministry of Agriculture).....	10 000.00			
	Nansen Fund	-	1 000.00		
	Store Norske Spitsbergen Kulkompani Aktieselskap, Oslo	-	-	15 000.00	
	Kings Bay Kul Comp. A/S, Ålesund	-	-	10 000.00	
	Mr. Louis Hannevig, Shipowner, Oslo	-	-	5 000.00	
	Mr. Chr. Castberg, Shipowner, Oslo	-	-	1 000.00	
	Mr. Haldor Virik, Shipowner, Sandefjord ..	-	-	1 000.00	
	Mrs. Thrine Grøn, Sandefjord	-	-	1 000.00	
	Mr. W. Gulbrandsen, Director, Oslo	-	-	1 000.00	
	Mr. Lars Thorsen, Shipowner, Sandefjord...	-	-	1 000.00	
	Mr. N. T. Nielsen-Alonso, Shipowner, Sandefjord	-	-	1 000.00	
1920	Mr. Gustav B. Bull, Shipowner, Oslo	-	-	500.00	
	Government grant, supplementary (Ministry of Church Affairs)	25 000.00			
		45 000.00	1 000.00	36 500.00	82 500.00
	C/F	-	-	-	453 393.06

XVIII a (continued).

Year		The Norwegian Government	Scientific funds and institutions	Private subscribers	Total	
1919	B/F <i>Hoel's expedition 1919:</i>	-	-	-	453 393.06	
	Government grant for the expedition (Ministry of Church Affairs).....	15 000.00				
	Government grant for vessel ("Farm") (Ministry of Defence)	15 748.41				
	Nansen Fund	-	1 000.00			
	Store Norske Spitsbergen Kulkompani Aktieselskap, Oslo	-	-	20 000.00		
	Kings Bay Kul Comp. A/S, Ålesund	-	-	10 000.00		
	Mr. A. F. Klaveness, Shipowner, Oslo	-	-	5 000.00		
	Forsikrings-A.S. Globus, Oslo	-	-	2 500.00		
	A/S Kulspids, Oslo	-	-	1 000.00		
	Mr. Louis Hannevig, Shipowner, Oslo	-	-	1 000.00		
Mr. Johan Hagerup, Merchant, Tromsø	-	-	500.00			
		30 748.41	1 000.00	40 000.00	71 748.41	
1920	<i>Hoel's expedition 1920:</i>					
	Government grant for the expedition (Ministry of Church Affairs).....	40 000.00				
	Government grant for the vessel ("Farm") (Ministry of Defence).....	36 937.12				
	Nansen Fund	-	1 000.00			
	Store Norske Spitsbergen Kulkompani Aktieselskap, Oslo	-	-	15 000.00		
	Kings Bay Kul Comp. A/S, Ålesund	-	-	10 000.00		
	Bjørnøen A.S., Stavanger	-	-	4 900.00		
	Forsikrings-A.S. Norske Globus, Oslo	-	-	2 500.00		
			76 937.12	1 000.00	32 400.00	110 337.12
	<i>Hoel's expedition 1921:</i>					
Government grant for the expedition (Ministry of Church Affairs).....	50 000.00					
Government grant for the vessel ("Farm") (Ministry of Defence).....	26 377.59					
Nansen Fund	-	1 000.00				
Store Norske Spitsbergen Kulkompani Aktieselskap, Oslo	-	-	16 000.00			
Kings Bay Kul Comp. A/S, Ålesund	-	-	6 680.00			
Norges Rederforbund, Oslo	-	-	5 000.00			
N. V. Nederlandsche Spitsbergen Compagnie, Rotterdam	-	-	4 250.00			
		76 377.59	1 000.00	31 930.00	109 307.59	
1922	<i>Hoel's expedition 1922:</i>					
	Government grant for the expedition (Ministry of Trade):					
	Bear Island: Large-scale mapping, soundings, geological survey	33 000.00				
	Kings Bay Coal Field:					
	a. Large-scale mapping 1921	23 000.00				
	b. Geologic. survey 1922	8 000.00				
	C/F 64 000.00	-	-	-	744 786.18	

XVIII a (continued).

Year		The Norwegian Government	Scientific funds and institutions	Private subscribers	Total
1922	B/F 64 000.00 Area of A/S De norske Kulfelter Spitsbergen:	-	-	-	744 786.18
	Examination of coal-seams 8 000.00				
	Vessel 5 000.00	77 000.00			
1923	Nansen Fund	-	1 000.00		
	Government grant, supplementary (Ministry of Trade)	11 322.90			
	Government grant for the working up of material from the expedition 1922 (Ministry of Trade)	31 200.00			
		119 522.90	1 000.00	-	120 522.90
1923	<i>Hoel's expedition 1923:</i> Government grant for the expedition (Ministry of Trade):				
	Bear Island: Large-scale mapping 65 000.00				
	Kings Bay Coal Field: Geological survey 15 000.00				
	Construction of large-scale map: 1: 5000 1 600.00				
	Spitsbergen expedition 1923 65 000.00	146 600.00			
	Government grant for vessel ("Farm") (Mi- nistry of Defence)	22 603.86			
	Further Government grants (Ministry of Trade):				
	Working up material	24 000.00			
	Collecting Arctic log-books	8 500.00			
	Nansen Fund	-	1 000.00		
		201 703.86	1 000.00	-	202 703.86
1924	<i>Hoel's expedition 1924:</i> Government grant for the expedition (Ministry of Trade):				
	Bear Island: Deep drilling, geologi- cal survey 161 500.00				
	Spitsbergen 177 500.00	339 000.00			
	Government grant for vessel ("Farm") (Mi- nistry of Defence)	23 088.18			
	Nansen Fund	-	1 000.00		
		362 088.81	1 000.00	-	363 088.18
1925	<i>Hoel's expedition 1925:</i> Government grant for the expe- dition (Ministry of Trade):				
	Bear Island: Deep drilling, geo- logical survey 95 000.00				
	Spitsbergen 148 000.00	243 000.00			
	Government grant for vessel ("Farm") (Mi- nistry of Defence)	24 128.91			
	Nansen Fund	-	1 000.00	-	
		267 128.91	1 000.00	-	268 128.91
					1699 230.03

C/F

XVIII a (continued).

Year		The Norwegian Government	Scientific funds and institutions	Private subscribers	Total
	B/F	-	-	-	1 699 230.03
1926	<i>Hoel's expedition 1926:</i> Nansen Fund	-	1 000.00	-	1 000.00
	<i>The Svalbard Expeditions 1908—1921 through Mr. Hoel:</i> For working up the collected material:		1 000.00	-	
1922	Government grant (Ministry of Church Affairs)	25 000.00			
1923	— " —	15 000.00			
1924	— (Ministry of Trade)	15 000.00			
1925	— " —	25 000.00			
1926	— " —	20 000.00			
1927	— " —	20 000.00			
		120 000.00	-	-	120 000.00
	<i>The Svalbard Expeditions 1909—1912 through Messrs. Holtedahl and Hoel:</i> For a paper on the geology of Northwest-Spitsbergen:				
1919	Nansen Fund	-	500.00	-	500.00
	<i>The Svalbard Expeditions through the Spitsbergen Committee of 1918 of the Ministry of Church Affairs:</i> For working up, printing, and publishing papers dealing with the collected material:				
1921	Nansen Fund	-	2 000.00		
	Government grant	17 000.00			
1922	— " —	15 000.00			
	State Research Fund	-	5 000.00		
1923	— " —	-	5 000.00		
1926	— " —	-	10 000.00		
		32 000.00	22 000.00	-	54 000.00
	<i>The Svalbard Expeditions 1906—1926 for working up collected material through Mr. Hoel:</i> 1927 Nansen Fund	-	1 000.00	-	1 000.00
			1 000.00	-	
1927	From the surplus of the State Lottery for the years 1928—1932 (Ministry of Finance)	250 000.00			2 125 730.03

XVIII b.
Summary of Cash Contributions.

Year		The Norwegian Government	Scientific funds and institutions	Private subscribers	Total
1906/14	Expeditions fitted out by Prince Albert of Monaco and led by Captain G. Isachsen 1906 and 1907	-	-	90 000.00	90 000.00
1908	Hoel's expedition 1908	-	500.00	2 500.00	2 500.00
1909/16	Captain G. Isachsen's expedition 1909 and 1910	53 503.23	16 342.90	47 354.00	117 200.13
1911	Hoel and Staxrud's expedition 1911....	15 000.00	-	11 200.00	26 200.00
1912/13	Hoel and Staxrud's expedition 1912....	15 000.00	1 000.00	9 500.00	25 500.00
1913	Hoel's expedition 1913	10 000.00	-	3 450.00	13 450.00
1914	Hoel and Staxrud's expedition 1914....	15 000.00	1 000.00	-	16 000.00
1915	Hoel's expedition 1915	-	1 000.00	-	1 000.00
1914/18	The Svalbard expeditions 1911/14; Grant for the working up of the collected material and printing through Mr. Hoel and Mr. Staxrud	8 000.00	1 805.80	-	9 805.80
1916	Hoel's expedition 1916	-	-	5 000.00	5 000.00
1917	Hoel and Røvig's expedition 1917	10 000.00	-	53 737.13	63 737.13
1918/20	Hoel and Røvig's expedition 1918	45 000.00	1 000.00	36 500.00	82 500.00
1919	Hoel's expedition 1919	30 748.41	1 000.00	40 000.00	71 748.41
1920	Hoel's expedition 1920	76 937.12	1 000.00	32 400.00	110 337.12
1921	Hoel's expedition 1921	76 377.59	1 000.00	31 930.00	109 307.59
1922/23	Hoel's expedition 1922	119 522.90	1 000.00	-	120 522.90
1923	Hoel's expedition 1923	201 703.86	1 000.00	-	202 703.86
1924	Hoel's expedition 1924	362 088.18	1 000.00	-	363 088.18
1925	Hoel's expedition 1925	267 128.91	1 000.00	-	268 128.91
1926	Hoel's expedition 1926	-	1 000.00	-	1 000.00
1922/27	The Svalbard expeditions 1908/21; Grant for the working up of the collected material through Mr. Hoel	120 000.00	-	-	120 000.00
1919	The Svalbard expeditions 1909/12; paper on the geology of Northwest-Spitsbergen through Mr. Holtedahl and Mr. Hoel..	-	500.00	-	500.00
1921/27	The Svalbard expeditions 1908/26; working up material and printing papers through the Spitsbergen Committee of 1918 of the Ministry of Church Affairs.....	32 000.00	22 000.00	-	54 000.00
1927	The Svalbard expeditions 1906/26; working up collected material through Mr. Hoel.....	-	1 000.00	-	1 000.00
1928/32	From the surplus of the State Lottery for working up and publishing the topographical, geological, and other material collected on the expeditions, through Mr. Hoel	250 000.00	-	-	250 000.00
		1 708 010.20	54 148.70	363 571.13	2 125 730.03

XVIII c.

Contributions in Kind, Free Fares and Freights.

Year		The Norwegian Government	Scientific funds and institutions	Private subscribers	Total
1908—1926	Goods	-	-	10 000.00	
1909—1920	Free fares and freights on railways	6 000.00			
1911—1917) 1923—1926)	Free fares and freights on steamers	-	-	9 200.00	
1917—1923	—, —	8 800.00			
		14 800.00	-	19 200.00	34 000.00
					34 000.00

XVIII d.

General Summary of Contributions.

From 1906 to 1928 the Norwegian Svalbard Expeditions have received:

Cash contributions	1 708 010.20	54 148.70	363 571.13	2 125 730.03
Contributions in kind	-	-	10 000.00	10 000.00
Free fares and freights	14 800.00	-	9 200.00	24 000.00
	1 722 810.20	54 148.70	382 771.13	2 159 730.03

Contributors in Kind.

The following persons and firms have contributed goods, provisions, and services. Unless otherwise stated the persons and firms are of Oslo.

P. Aanonsen	Chr. Bjelland & Co., Stavanger, canned food
A/S Olaf I. Aas, free transport	Bjørnøen A/S., Stavanger, coal, fares on steamers, freights
Adamsen & Laurantzou	A. Christensen, (Einar Christensen), provisions
J. Amundsen, dried milk	Christiania Glasmagasinet, glass, etc.
Chr. Andresen A/S, paints	A/S Coward & Thowsen, hardware
Rich. Andvord, paper	A/S De Norske Kulfelter Spitsbergen, Bergen, coal
Arctic Coal Co., Trondhjem, coal	Det Norske Kulkompagnie Ltd. Green Harbour, vessel for the expedition
Armeens Arsenal, lent rifles	A/S Freia Chokolade Fabrik, chocolate
Armeens og Marinens Intendantur, lent tents and other outfit	Frydenlunds Bryggeri, beer
H. Aschehoug & Co., books	Fussel & Co., Holmestrand, milk
A. Backer, fruit-juice	
Det Bergenske Dampskibsselskab, Bergen, steamship fares	

C. Geijer & Co., iron, steel, and tools	Det Nordenfjeldske Dampskibsselskab,
Grøndahl & Søn, books	Trondhjem, steamship fares
A. Hansen, bread	Norges Statsbaner, free travel
Brødrene Hansen, clothing	Harald Ohlsen & Co., provisions
Helly J. Hansen, canvas	Aug. Pellerin Fils & Co., margarine
L. H. Hagen & Co., skis, etc.	Gunnerius Pettersen, clothing
A/S Halvorsen & Larsen Ltd., paper, etc.	H. Poulsen & Co., wine and liquor
Haugesund Preserving Co., Haugesund, canned food	A/S Ringnes Bryggeri, beer
F. W. Henriksen, wooden boxes,	Wilh. Scheel & Co., clichés, dies, etc.
Hjort & Riser A/S, glass	Scheller & Co., cordage
C. Houge Thiis, Stavanger, canned food	Store Norske Spitsbergen Kulkompani
Jensen & Co., provisions	Aktieselskap, coal, fares on steamers, freights
Joh. Johannson, provisions	Lars Swanstrøm, books
A/S Brødrene Johnsen, drawing material	A/S Sætre Kjeksfabrik, biscuits
Kings Bay Kul Comp. A/S, Ålesund, coal, fares on steamers, freights	Jul. B. Thomassen, coffee
Jacob Kjøde A/S, Bergen, steamship fares	A/S Thunes mek. Verksted, engineering work
A/S Knudsen & Bommen, office material	Toftedahl & Co., bacon
Conrad Langaard, tobacco	Tønsberg Smørfabrik, Tønsberg, margarine
P. A. Larsen, wine and liquor	United Sardines Factories, Stavanger, through Schou-Hansen & Co., canned foods
Peter Larsen & Co., flour	Vesteraalens Dampskibsselskab, Stokmark- nes, steamship fares
A/S Lilleborg Fabriker, soap	Vestlandske Petroleumscopagni, Bergen, petroleum
Andr. R. Lind, petroleum	Westberg & Schjærve
A/S Fr. Meyer, biscuits	Ørens Meieri, Værdalsøren, butter
O. Mustad & Søn, margarine	A/S Østlandske Petroleumscopagni, petroleum.
W. C. Møller, Drammen, life-saving jackets	
N. V. Nederlandsche Spitsbergen Com- pagnie, Rotterdam, coal	
Nestlé & Anglo Swiss Condensed Milk Co., condensed milk	
Ingwald Nielsen, hard-ware	

SKRIFTER
OM SVALBARD OG ISHAVET
RESULTATER AV DE NORSKE STATSUNDERSTØTTEDE
SPITSBERGENEKSPEDITIONER

(RESULTS OF THE NORWEGIAN STATE-SUPPORTED
SPITSBERGEN EXPEDITIONS)

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