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SURVEY OF NORTH GREENLAND

BY

LAUGE KOCH

WITH 56 FIGURES IN THE TEXT AND AN ATLAS
WITH 21 PLATES

KØBENHAVN
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PREFACE

The present paper deals with the cartography of North Greenland, here denoting the part of Greenland situated north of Etah (c. 78°20′ N. lat.) in the west and Norske Øer off Lamberts Land (c. 79° N. lat.) in the east.

To the west this is a natural limit, for during the last century Etah has formed the northern boundary of Eskimo settlements and from 1616 to 1852 it marked the limit of our geographical knowledge, while it is still usually the limit of navigation.

To the east the limit has been drawn in about 79° N. lat. near Norske Øer, reached in 1933 by s.s. *Gustav Holm*; before that time no ship had ever pushed so far northward along the east coast of Greenland.

Thus, on looking back on the exploration history of the regions north of 79° N. lat., we shall find that they were principally discovered on sledge-journeys.

Geographically also the northern portion of Greenland forms a unit, the regions north of a line from Etah to Lamberts Land being built up of large sediment plateaus. Only to the north and east the beds are folded, but usually they form uniform plateaus frequently intersected by narrow canyons up to 2000 m deep.

These mostly ice-free plateau lands are especially characteristic of North Greenland, and are only found north of about 79° N. lat. They have a climate of their own; we are here, so to speak, north of the ice age.

In 1916 the present author commenced his cartographical, geological, and glaciological work in North Greenland.

As regards the geology, only preliminary reports have appeared so far, among other things because the determination of the fossils brought home by me in 1917 and 1922 has not yet been completed.

The glaciology is treated in "Glaciology of North Greenland" (M. o. G. Bd. 65, 1928) with supplemental remarks on the east coast in "A Day in North Greenland" (Geografiska Annaler, Stockholm, 1935).

My mapping of Melville Bugt in 1916 (cf. M. o. G. Bd. 64, Nr. 2, 1922) and of the Thule district from Kap York to Etah in 1916, 1920,

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1922, and especially in 1923 (cf. sheets 15, 16, 17, 18 of Map of North Greenland, Scale 1:300000 m, published by the Geodetic Institute of Copenhagen) will, I hope, be dealt with in a future paper in connection with a treatment of the numerous earlier maps of the area.

As the mapping of Kronprins Christians Land formed part of more extensive survey work, I have found it appropriate to give a brief summary of the more recent mapping of the east coast of Greenland from c. 68° N. lat. as far as Peary Land, both of the mapping done on other expeditions and of that (chiefly geological) done on the various expeditions under my leadership (1926—27, 1929, 1930, 1931—34, and 1936—38). On the expedition 1931—34 the main cartographic object was a mapping both from the ground and from the air of the area between 72° and 76° N. lat. as well as of the region round the settlement of Scoresby Sund, executed by the personnel of the Geodetic Institute of Copenhagen, while personally I made a reconnaissance mapping from the air of the area between 68° and 82° N. lat. in 1932 and 1933. Finally, on the expedition in 1936—38 the topographical maps resulting from the aforementioned expedition (1931—34) were utilised for a geological mapping of the area.

During the first twenty-five years of the present century the mapping of Greenland was based on the same methods as at the end of last century though the sextant had largely been replaced by the theodolite. On sledge-journeys the determinations of longitude had to be made by means of watches, the whole set of instruments had to be primitive and robust. The compass is practically inapplicable in these regions owing to the slight horizontal intensity.

A turning point occurred at the beginning of the next quarter of the century, when the wireless made its appearance, and in the course of a very few years attained a perfection which rendered it possible to obtain much more reliable determinations of time than on the early expeditions. A few years later aircraft, and at the same time electrically worked cameras, reached such a degree of perfection that they quite revolutionised the mapping of the polar countries. From being in a high degree personal, mapping has in recent years become impersonal machine-work. Yet it is not till the last few years that aircrafts have come to the fore which have so large a radius of operation that the northernmost part of Greenland can be mapped from the air in the course of a few days; so far, however, this has not taken place.

The present paper deals with the mapping of Greenland north of the aforementioned line from Etah to Lamberts Land, executed by the present author on:

The Second Thule Expedition, Leader KNUD RASMUSSEN (sledge-journey in 1917). On this and the Bicentenary Jubilee Expedition (cf. below) the mapping was done by means of theodolites; in the summer a fairly great degree of accuracy is attainable, whereas on spring and autumn journeys the work is much impeded by cold and darkness.

Further, on the following expeditions under my leadership: The Bicentenary Jubilee Expedition 1921—23 (sledge-journeys in 1920, 1921, and 1922), the Danish Three-Year Expedition to Kong Christian den X's Land 1931—34 (Reconnaissance mapping from the air (from open sea-planes) on the east coast of Greenland from Kangerdlugssuak in the south to Peary Land), and the Air Expedition to Peary Land 1938 (mapping from a closed aircraft with support of numerous photographs).

The paper is accompanied by an atlas containing copies of the most important maps of all expeditions to North Greenland, re-drawn in the same projection and on a scale of 1:1000000, so that a direct comparison of the maps will be possible.

As regards the lists of literature I have not endeavoured to make them as copious as possible, but have only cited the most important works, numerous less important articles, chiefly published in geographical periodicals and of no interest for the mapping work, having been omitted.

The present work has chiefly been written during the war, and as a consequence various papers referring to the subject dealt with here, which I should have wished to consider, have not been available to me.

As a result of the war, also, the accompanying maps have been drawn at great intervals, a fact of which they must inevitably show some evidence; nor was it possible for me to superintend the preparation of Pl. 13, executed in Switzerland, to the extent that I should have desired. Finally it has been impossible, owing to the war, to obtain the most suitable sorts of paper for the maps, which has likewise affected the accuracy of these copies.

The place names (cape, island, etc.) are written in Danish, in compliance with a wish expressed by the Editorial Committe of the Meddelelser om Grønland (in the present paper abbreviated to M. o. G.).

During the years I have been engaged in the mapping of Greenland I have received help and advice from many quarters, for which I here wish to express my grateful acknowledgment. My special thanks are due to the following persons:

The following members of the early expeditions to North Greenland: The late Admiral LOUIS BEAUMONT (NARES' expedition) for correspondence concerning his mapping of Sherard Osborn Fjord. The leader of

the U. S. Lady Franklin Bay Expedition, General A. GREELY, and General BRAINARD, the only surviving participator in LOCKWOOD's journey, for several discussions concerning LOCKWOOD's journey along the north coast of Greenland.

R. E. PEARY's wife and daughter, Mrs. JOSEPHINE DIEBITSCH-PEARY and Mrs. MARIE ANIGHITO PEARY-STAFFORD, and further Professor WM. H. HOBBS, Captain ROBERT BARTLETT, and Professor DONALD B. MACMILLAN for various discussions and information about PEARY.

The late Colonel J. P. KOCH, who taught me survey work on the basis of the material of the Danmark Expedition. The artist painter Mr. AAGE BERTELSEN, J. P. KOCH's companion on the journey to Kap Bridgman, for reading the section on the Danmark Expedition. The third participator in that journey, the Greenlander TOBIAS GABRIELSEN, my companion on several long sledge journeys in 1916, 1926, and 1927, for discussions of the sledge journeys of the Danmark Expedition.

Vice-Admiral G. C. AMDRUP for reading through the section on the Danmark Expedition and for much good advice concerning this section.

Captain EJNAR MIKKELSEN, for reading the section on the Alabama Expedition.

Mr. PETER FREUCHEN, with whom I often discussed the First Thule Expedition during our sledge journeys in North Greenland, for reading the section on that expedition.

The late Dr. KNUD RASMUSSEN for good cooperation during the two years of the Second Thule Expedition; as also the other members of the expedition, the late Dr. THORILD WULFF, whose observations of Lemming Fjord on the north coast of Greenland I have used in the preparation of my map from the Second Thule Expedition, and my Eskimo companions on that expedition.

My three Eskimo companions on the journey around the north of Greenland in 1921, Etukussuk, Nugapinguak, and Inuiterk, for the excellent assistance rendered me in my cartographic work during the expedition; further Nugapinguak and Alakratiak as well as the other Eskimos, by whose help the journey in 1922 was made possible.

The pilot VICTOR PETERSEN and the radio operator VIGGO KRAMME, my two companions on the East Greenland flights in 1932 and 1933, and the pilots Lieutenant ERIK OVERBYE and R. MAYR and the radio operator C. PREUSCHOFF, my companions on the Peary Land flight in 1938, for their great interest in the work and their willingness to take a risk in order that the results might be as good as possible.

The leader of the Danish Arctic Station on Disko, m. sc. M. PORSILD, for giving me my first training in arctic travelling, and for many years' friendship.

Professor FRIDTJOF NANSEN for many wise suggestions concerning the most suitable provisions on sledge journeys.

Captain OTTO SVERDRUP for information about ice navigation in Smith Sund.

Captain ROALD AMUNDSEN for good advise as to flying in the Arctic.

Colonel P. A. HEIBERG-JÜRGENSEN, my teacher and collaborator in the preparation of the maps from the Second Thule Expedition.

Director of the American Geographical Society, Professor ISAIAH BOWMAN, through whose assistance I received copies of many early American expedition charts.

Secretary of the Royal Geographical Society, London, Mr. A. HINKS, by whose courtesy and aid I gained access to the early expedition charts in the possession partly of his Society and partly of the Admiralty.

The following gentlemen for taking part in the preparations for the publication of the cartographical material of the Jubilee Expedition: My father-in-law, the late Professor GUNNAR ANDERSSON, Stockholm, Mr. A. LAGRELIUS, chief of the "Generalstabens litografiska Anstalt", Stockholm, Professor G. DE GEER, Stockholm, and especially Dr. SVEN HEDIN, who examined my cartographic material with me and gave a written statement on it.

The leader of the Topographical Department of the General Staff, Copenhagen, Colonel N. P. JOHANSEN, who made the preparatory arrangements for and started the printing of the "Map of North Greenland" (18 sheets). Messrs. H. RØHLING, TH. PEDERSEN, and J. M. DANBO, of the General Staff, for drawing the maps. The chief of the Geodetic Institute of Copenhagen, Professor N. E. NØRLUND, for his permission to reproduce these maps in the present paper.

Mr. G. SEIDENFADEN for assistance in the projecting of the maps from 1933 and 1938.

My cooperator during many years, Dr. E. WEGMANN, Schaffhausen, for assistance during the printing of the map of Peary Land (Pl. 13), and the cartographer Dr. A. BLUMER, Bern, who prepared Pl. 13 and with great patience made use of the photographs of Peary Land.

Of the many persons who have supported me and my expeditions special mention should be made of Vice-Admiral C. F. WANDEL, Chairman of the Committee for the Bicentenary Jubilee Expedition; Mr. J. DAUGAARD-JENSEN, Director of the Administration of Greenland, chairman of the Committee of the Danish Three-Year Expedition 1931—34, who from my first visit to Greenland in 1913 to his death in the autumn of 1938 took the greatest interest in my work and gave me much valuable support.

The Danish Prime Minister, J. C. CHRISTENSEN, for supporting the Jubilee Expedition 1920—23, Prime Minister TH. STAUNING for sup-

porting my recent expeditions, Ministers of the Interior O. KRAGH and N. C. HAUGE for their support of my Greenland expeditions during their term of office, and ALSING ANDERSEN, Minister of the Defence, for his support of the air expedition in 1938.

Vice-Admiral H. RECHNITZER and Commodore A. GRANDJEAN, Chief of the Royal Naval Air Service, for their support in the preparations for and carrying out of the air-work in East and North Greenland, during the years 1932—38.

Copenhagen, Maj 1940.

I.

THE SMITH SUND ROUTE AND THE FIRST JOURNEYS ALONG THE NORTH COAST OF GREENLAND

A SUMMER SEARCH FOR SIR JOHN FRANKLIN 1852

Leader: E. A. INGLEFIELD, Great Britain.

Literature.

1) INGLEFIELD, E. A.: A Summer Search for Sir John Franklin; with a peep into the polar basin. Pp. I—XXI + 1—232. London **1853**.
With short notices, by Professor DICKIE, on the botany, and by Dr. SUTHERLAND, on the meteorology and geology; and a new chart of the Arctic Sea.

2) — Report on the return of the Isabel from the Arctic Regions. (1852). Journ. R. G. S. **1853**, pp. 136—145. With 1 map.

3) MARKHAM, CLEMENTS R.: The Threshold of the Unknown Region. Pp. i—xvi + 1—357. With several maps. London **1873**.

The memory of the great expeditions of the seventeenth century which set out to find the northern sea route to India still lives in the name of Smith Sund, named after the first governor of the East India Company, Sir THOMAS SMITH (cf. MARKHAM, 1873, p. 181). On July 6th, 1616, BAFFIN, on his voyage up through Baffin Bay, discovered the entrance of Smith Sund, "the greatest and largest sound in all this bay".

Two hundred years were to elapse before a new expedition ventured to these regions. It was the British expedition in 1818 under the leadership of Ross and PARRY. Curiously enough Ross on his chart closed Smith Sund to the north, indicating it as a small bay.

During the great rescue expeditions in search of Sir JOHN FRANKLIN and his men about the middle of the last century a ship happened to come to these waters. In 1852 E. A. INGLEFIELD on a small screw-steamer made a voyage up through Baffin Bay lasting from July 4th to November 10th. Ice-conditions were apparently favourable that year, for on August 20th he reached Kap York without difficulty, visited a couple of the Eskimo settlements there, and during a few days' stay in the district displayed an intense energy, making important discoveries and doing survey work. On August 26th he passed Kap Alexander, and on

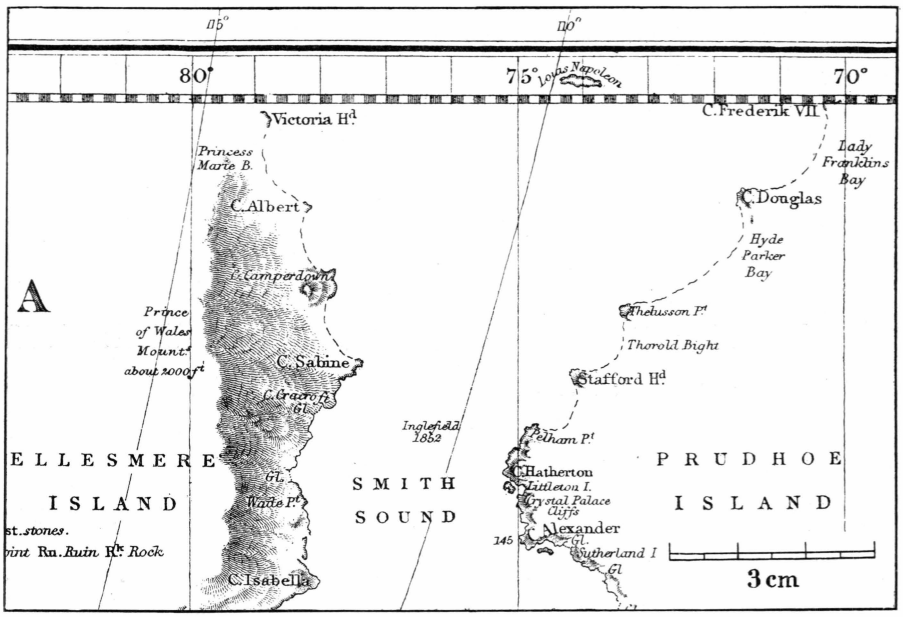

Fig. 1. Part of INGLEFIELD's Map (London 1853).

August 27th he reached latitude 78°28′21″ N., whence he looked northward across an ice-free sea, which extended as far as his eye could reach. Thus Smith Sund was re-opened to the north. The weather had hitherto been fine, but now an increasing gale from the north prevented him from pushing farther northward, and considering also the advanced season, he dared not await better weather, but returned southward.

INGLEFIELD has given a description of his voyage in a charming little book entitled "A Summer Search for Sir John Franklin; with a peep into the polar basin" (London 1853). The book is artistically illustrated. The frontispice, printed in colour, shows his ship, the "Isabel", passing Kap Alexander. Facing p. 70 is a beautiful and on the whole astonishingly well executed landscape sketch, showing, to the right, the coast of Greenland northward from Kap Alexander, to the left the coast of Ellesmere Land, and in the middle Smith Sund free of ice. P. 125 INGLEFIELD says as follows:

"For myself, I wish no better fortune than to be allowed next year to follow up the discoveries we have made, and should I be lucky enough to reach these new shores, at the beginning, instead of at the close of the navigable season, I have little or no doubt that the pole of the earth might easily be attained and passed, or a direct course shaped towards Behring Strait; . . ."

In a letter to the Secretary of the Admiralty Commander INGLEFIELD writes (p. 220): "We had no sooner fairly opened the Sound than

I involuntarily exclaimed, this must lead into the great Polynia of the Russians; and as the eye strained forward into the clear expanse of apparently open water, which now occupied from seven to eight points of the compass due north of our position, I could not but admit to my own mind that a great sea was beyond."

INGLEFIELD mapped the coast of Greenland from Kap York to Kap Alexander with the greatest care. However, owing to the aforementioned northerly gales he had to content himself with taking some few not very accurate bearings north of Kap Alexander, and his coast-line north of this point is therefore rather inaccurate (see Fig. 1).

INGLEFIELD was not himself to follow up his discoveries northward through Smith Sund, but his description naturally had the greatest influence on KANE, who decided to take advantage of the re-opened Smith Sund for making a dash towards the pole.

THE SECOND GRINNELL EXPEDITION IN SEARCH OF SIR JOHN FRANKLIN

Leader: E. K. KANE, U. S. A.

Cf. Pl. 2.

Literature.

1) BESSELS, EMIL: Die amerikanische Nordpol-Expedition. Pp. I—XX + 1—647, illustrated. With 1 map. Leipzig **1879**.

2) ELDER, WILLIAM: Biography of Elisha Kent Kane. Pp. 1—416. Philadelphia **1858**.

3) GODFREY, WM. C.: Godfrey's Narrative of the Last Grinnell Arctic Exploring Expedition in search of Sir John Franklin, 1853—4—5. With a biography of Dr. Elisha K. Kane, from the cradle to the grave. Pp. 1—267, illustrated. Philadelphia **1857**.

4) HAYES, ISAAC I.: An Arctic Boat-Journey in the autumn of 1854. Edited, with an introduction and notes, by Dr. NORTON SHAW. Pp. I—xliii + 1—379. With 1 chart. London **1860**.

5) KANE, ELISHA KENT: Arctic Explorations in the Years 1853, '54, '55. Vols. I—II, pp. 1—464 + 1—467. Illustrated by upwards of three hundred engravings from sketches by the author. With 4 charts and sketch-map. Philadelphia **1856**.

6) KANE, E. K.: Preliminary Report of Passed Assistant Surgeon Kane to the Secretary of the Navy. App. No. II in Op. cit. **1856**, pp. 300—319.

7) — Report to the Secretary of the United States Navy, at Washington, of the Expedition in search of Sir John Franklin, during the years 1853—4—5, with a Chart, showing the Discoveries made in the Arctic Regions. Journ. R. G. S. Vol. XXVI, **1856**.

8) KOCH, LAUGE: Contributions to the Glaciology of North Greenland. M. o. G. Bd. LXV, Nr. 15, pp. 181—464. With 6 pls. and 140 figs. **1928**.

9) PETERMANN, A.: Dr. E. K. Kanes Expedition nach dem Nordpol Maj 1853—Oktober 1855. Peterm. Mitt. **1855**, pp. 291—302.

10) — Die amerikanische Entdeckungen im Polar-Meere nebst einigen Notizen über die physikalische Geographie des nördlichen Grönlands. Peterm. Mitt. **1856**, pp. 46—52. With a map (Tafel 2).

11) — Das nördlichste Land der Erde. Mit 6 Karten, s. Tafel 6 und 7. Peterm. Mitt. **1867**, pp. 176—200.

12) PETERSEN, CARL: Erindringer fra Polarlandene. With 1 map. Pp. 1—162. Kjøbenhavn **1857**.

13) RINK, HENRY: On the supposed Discovery, by Dr. E. K. Kane, U.S.N., of the North Coast of Greenland, and of an Open Polar Sea, &c.; as described in "Arctic Explorations in the years 1853, 1854, 1855". Condensed from the Danish by Dr. SHAW. Journ. R. G. S. **1858**, pp. 272—287. With 1 map.

14) SCHOTT, CHARLES A.: Meteorological Observations in the Arctic Seas. By ELISHA KENT KANE, etc. Reduced and discussed. Smithson. Contr. Knowl. Vol. XL, **1858**, pp. 1—112.

15) — Astronomical Observations in the Arctic Seas. By ELISHA KENT KANE, M.D., U.S.N. Reduced and discussed by Charles A. Scott. Smithson. Contr. Knowl. Vol. XII, **1860**, pp. 56, and one plate.

16) SONNTAG, AUGUST: Professor Sonntag's Thrilling Narrative of the Grinnell Exploring Expedition to the Arctic Ocean, in the years 1853, 1854, and 1855, in search of Sir John Franklin, under the command of Dr. E. K. Kane, U.S.N., etc. With nearly one hundred splendid engravings. Pp. 1—176. Philadelphia **1857**.

KANE (cf. ELDER 1858) was born on February 3rd, 1820. At an age of 22 years he finished his medical education, and according to the wish of his father became a surgeon in the Navy. In the years 1843—1850 he participated in several long voyages, visiting many parts of the globe. When in 1850, at the request of Lady FRANKLIN, America equipped two vessels, KANE volunteered to take part in the search; however, his offer was not accepted. Shortly afterwards he was called back from the Gulf of Mexico in order to join DE HAVEN's expedition (First Grinnell Expedition) as physician. The expedition spent the winter 1850—51 on Beechey Island in Lancaster Sound.

After his return, KANE wrote the report on the expedition, and made preparations for an expedition of his own (1853—55).

KANE was short of stature and of delicate health, and was often taken ill. This is perhaps the reason why he did not take part in any of the long sledge journeys made by various members of the expedition during their stay in Greenland. However, he possessed an immense will-power and energy, he was exceedingly vital, interested, charming, and exerted a great influence on everybody with whom he came into touch. As leader of the expedition he gained authority by means of his mental superiority.

KANE's book (1856), which is now considered dull owing to the diffuseness of its style, has more than any other book given the general public an impression of the mystery of the Polar countries. It is highly romantic, and special emphasis is given to dangers and sufferings. The book scored a great success; in the first year after its publication 65,000 copies were sold, and subsequently several new editions have appeared at home and abroad, even up to the present time; perhaps it is the most extensively read of all books dealing with the Arctic. The numerous romantic illustrations likewise contributed greatly to the

success of the book. The first edition of the book appeared in September, 1856. At that time KANE was ill and overworked. He paid a visit to London, but as the climate was too humid for his health, he went to the West-Indies, where he died at Havannah on February 16th, 1857.

The Aims and Progress of the Expedition.

After his return from the First Grinnell Expedition 1850 KANE, as stated above, set about preparing for a new expedition. He was supported in his efforts both by the government and by private persons, and on May 30th, 1853, the expedition left New York on board the small brig the "Advance". The expedition numbered 17 persons besides KANE himself.

KANE in his Preliminary Report to the Secretary of the Navy (1856, vol. 2, p. 300) defines the aims of the expedition as follows: "Our destination was to the highest penetrable point of Baffin's Bay, from which, according to instructions from the Department, we were to attempt a search for the missing vessels of Sir John Franklin. This region was then entirely unexplored, and it was selected on that account."

On July 1st, 1853, the "Advance" called at Fiskernæsset, South Greenland, to take onboard the Greenlander HANS, who was to serve as a seal-hunter and dog-driver on the expedition. On its way northward the ship called at various points along the west coast of Greenland, finally at Upernavik to take on board the Dane CARL PETERSEN, who was engaged as interpreter.

The expedition, which now numbered 20 persons, reached Melville Bugt on July 27th. In about a week the ship reached the North Water, and on August 7th Kap Hatherton, without having been obstructed by ice. However, as Kane Basin proved to be entirely filled with ice and it was impossible to go north along the west side of Smith Sund, the ice extending right in to the shore, KANE made a hazardous attempt to push northward along the coast of Greenland. On August 15th the vessel reached a kind of harbour. After being storm-bound for some days, a part ytravelled by boat to Kap Russell, where KANE ascended a mountain, and realised that farther advance northward by ship was impossible. It was therefore decided that the expedition was to spend the winter at the place where the ship had anchored, Rensselaer Bugt.

The members of the expedition now prepared for the winter; an observatory was built on the shore, etc. On September 8th—16th WILSON, HAYES, and the Greenlander HANS made a journey across Inglefield Land to the edge of the inland ice and back to Rensselaer Bugt (cf. 1856, vol. 2, pp. 342—345, and HAYES, 1860, pp. 7—12).

On September 20th Messrs. BONSALL and McGARRY started on a journey for the purpose of establishing provision depots along the Greenland coast north of the ship. They reached Humboldt Gl. and continued along its front to about halfway to Washington Land (1856, vol. 2, pp. 333—341). On October 16th the party was back at Rensselaer Bugt.

At the end of November various small trips were made towards Littleton Ø in order to establish communication with the Eskimos; they seemed, however, to have left the coast.

The winter passed without any notable happenings. However, the crew apparently grew weaker in the course of the winter.

The journeys were commenced again in March, which, however, was too early and caused the death of one of the crew on April 7th. Two days afterwards some Eskimos arrived at the ship, and a connection was established with these people, which subsequently was of the greatest help to the expedition, since the Eskimos supplied its members with fresh meat.

KANE had planned a long journey to Humboldt Gl. and onwards along its front to the land north of the glacier, whence he intended to go across to Grinnell Land and southward along that coast. He started out on April 27th, but only reached Dallas Bugt, where he was taken ill and carried back to the ship. At the beginning of May a second man of the crew died.

On May 20th HAYES set out on a significant journey with GODFREY, a man of the crew, as his sole companion. He returned on June 1st, having reached the coast of Grinnell Land (KANE, 1856, vol. 2, pp. 365—373), and having been stopped by open water in the southern part of Kennedy Kanal.

The most important journey of the expedition was started on June 3rd. For a second time McGARRY and BONSALL travelled to Humboldt Gl. in order to ascend it, in which, however, they did not succeed (KANE, 1856, vol. 2, pp. 357—363) and returned to the ship on June 26th.

On June 18th MORTON, who started out on June 4th, parted from the two aforementioned members near Humboldt Gl., continuing, accompanied by the Greenlander HANS, along its front to the coast of Washington Land and onwards along the coast to Kap Constitution, when open water prevented their farther advance. Kap Constitution was the "farthest north" of the expedition (KANE, 1856, vol. 2, pp. 373—380). MORTON returned to the ship on July 4th.

As the sledge journeys northward had now come to an end, KANE conceived the fantastic plan of going by boat southward to Beechey Island in Lancaster Sound, which he knew from the First Grinnell Expedition. He started from the ship on July 11th and left the Greenland coast on July 19th in order to sail across Smith Sund to Cape

Isabella. However, a storm forced him towards Hakluyt Ø, whence he continued to a place near Kap Parry, when large ice-masses southward compelled him to give up the journey. Having been ashore on Northumberland Ø, he set out on the return voyage, reaching the ship in the first days of August.

This unsuccessful voyage (KANE, 1856, vol. 1, pp. 313—337) had been very beneficial to the people who took part in it, the exercise and abundant fresh game, especially birds, having cured them of every trace of scurvy.

The ice still packed at the mouth of Rensselaer Bugt. About the middle of August an attempt was made to get the ship southward along the coast. However, the attempt had to be given up, and the men realised that they would have to prepare for another wintering. On August 24th a council was held on the ship. It proved that about half of the members of the expedition wished to stay with KANE on the ship, while the remaining members under the leadership of HAYES wished to go south by boat to reach the Danish settlements. KANE agreed to this, and on August 28th HAYES and his companions started southwards. A few days afterwards one of his men returned to the ship, while HAYES with the remaining party pushed as far as Booth Sund a little south of Kap Parry. Four months later they returned to the ship after very great sufferings (cf. HAYES, 1860).

The second wintering was very troublesome; the expedition suffered great hardships, being greatly in want of fresh provisions and fuel, and the majority of the men suffered more or less from scurvy and frostbite. The Eskimos supplied them with some meat, but for the Eskimos, too, conditions were difficult that winter. The members of the expedition often made trips to the Eskimos at Etah, and in the spring their meat supplies became more plentiful; thus in February some hares and a reindeer were secured. In April KANE went with some Eskimo bear-hunters across Kane Basin to near Humboldt Gl. No doubt he had been hoping to make some geographical discoveries during the journey; he was, however, disappointed, the Eskimos being only interested in hunting bears.

On May 20th it was decided that the members of the expedition should leave the ship and try to reach the Danish settlements by boat. On June 16th the boats struck open water, and on June 18th the expedition took leave of the Eskimos at Etah, who had rendered the expedition such great services. One man had died in the course of the spring, and the Greenlander HANS left the expedition in order to remain with the Eskimos.

On July 21st the three boats reached Kap York; but soon after one of the boats had to be used as fuel. On August 1st the party had

crossed Melville Bugt and sighted Djævelens Tommelfinger (Devil's Thumb), and some few days afterwards they were in touch with the Danish officials at Upernavik. They continued by the Danish ship "Marianne" to Godhavn, arriving there on August 11th. Some days afterwards the American rescue expedition under the leadership of Lieutenant HARTSTENE on board the vessels the "Release" and the "Arctic" arrived at Upernavik; about the middle of August they had reached Etah, where they learned from the Eskimos that KANE and his fellows had gone southward by boat, so they went southward, too. On board these two vessels KANE's expedition now returned to America.

Though KANE had been in good health during both winterings, he did not take part in any of the journeys on which geographical discoveries were made. His descriptions of the results gained by his companions are in many respects fanciful and exaggerated and contrast strongly with the brief and terse reports written by the men who made the journeys (published in Appendix V).

In his preliminary report to the Secretary of the Navy KANE summarises the geographical results of the expedition as follows (1856, vol. 2, p. 310):

"1. The survey and delineation of the north coast of Greenland to its termination by a great glacier.

"2. The survey of this glacial mass and its extension northward into the new land named Washington.

"3. The discovery of a large channel to the northwest, free from ice, and leading into an open and expanding area equally free. The whole embraces an iceless area of four thousand two hundred miles.

"4. The discovery and delineation of a large tract of land forming the extension northward of the American continent.

"5. The completed survey of the American coast to the south and west as far as Cape Sabine, thus connecting our survey with the last-determined position of Captain Inglefield, and completing the circuit of the straits and bay heretofore known at their southernmost opening as Smith's Sound."

It must be admitted that KANE's expedition, the first expedition that wintered north of Smith Sund, gained a great amount of experience from which subsequent expeditions pushing north along the Smith Sund route have benefited. To the reader of to-day KANE's report, in many respects naive and highly romantic both as regards his descriptions of nature, the treatment of the Eskimos, and the travelling methods, remains as a memory of bygone times.

KANE's Geographical Ideas and his Maps.

KANE's many fantastic ideas soon caused objections to be raised. His strong advocation of the existence of an "open polar sea" will be mentioned below. It may be pointed out, however, that even members of KANE's expedition (PETERSEN, pp. 156—157, and GODFREY, pp. 58—59) were sceptical towards KANE's supposition as to an open polar sea. His very peculiar view of the Humboldt Gl. as an iceblocked sound between "the Greenland of the Scandinavian Vikings" and Washington Land, which according to KANE belonged to the America of Columbus (1856, vol. 2, p. 153), was soon contradicted from various quarters. Thus PETERMANN (1856, p. 47) is rather sarcastic about this theory. It is criticised in more detail by RINK (1858), who had a correct conception of the Humboldt Gl. He rightly complains that KANE apparently did not know RINK's works on the nature of the inland ice. RINK points out (pp. 279—280) that KANE's opinion that the icebergs in front of the glacier do not fall into the sea, but rise from the sea—agrees entirely with the theory set forth by RINK in his work on North Greenland. It is all the more peculiar since the aforementioned paper by Dr. RINK is cited in Appendix XIII to KANE's own work, viz. by his assistant CHARLES SCHOTT (KANE, 1856, vol. 2, p. 426). However, KANE did not pay attention to RINK's investigations concerning the inland ice.

KANE's maps.

1) Manuscript chart (stamped by the Hydrographic Office 14 Jan. 56, and marked D 1731—Shelf Ai. 2). The chart bears the following inscription in KANE's handwriting: "Chart exhibiting the discoveries of the American Arctic Expedition in search of Sir John Franklin —unrevised[1]) from the original material and projected on the spot. E. K. Kane. Deposited Nov. 15, 1855. Forwarded Dec. 1. 1855. E. K. K." The map is on a scale of 1:1,200,000. The headquarters of the expedition, the coast lines, travelling routes, a few ice limits, some few names, and some caches are shown on it. A copy of the map is found in the Royal Library of Copenhagen.

2) Manuscript map, dated 27th December, 1855, in Mercator's projection, sent to the English Admiralty, lent to PETERMANN, re-drawn by him into another projection and used as the basis of his Tafel 2 (Peterm. Mitt. 1856).

3) Map published in the Journal of the Royal Geographical Society, London, (Vol. 26, 1856) illustrating a paper read to the Society on January 14th, 1856. This map gives the same as map 1, but in addition various indications of the relief. The front of Humboldt Gl. is marked, but the edge of the inland ice is not indicated (see Fig. 2).

[1]) Indistinctly written on the map.

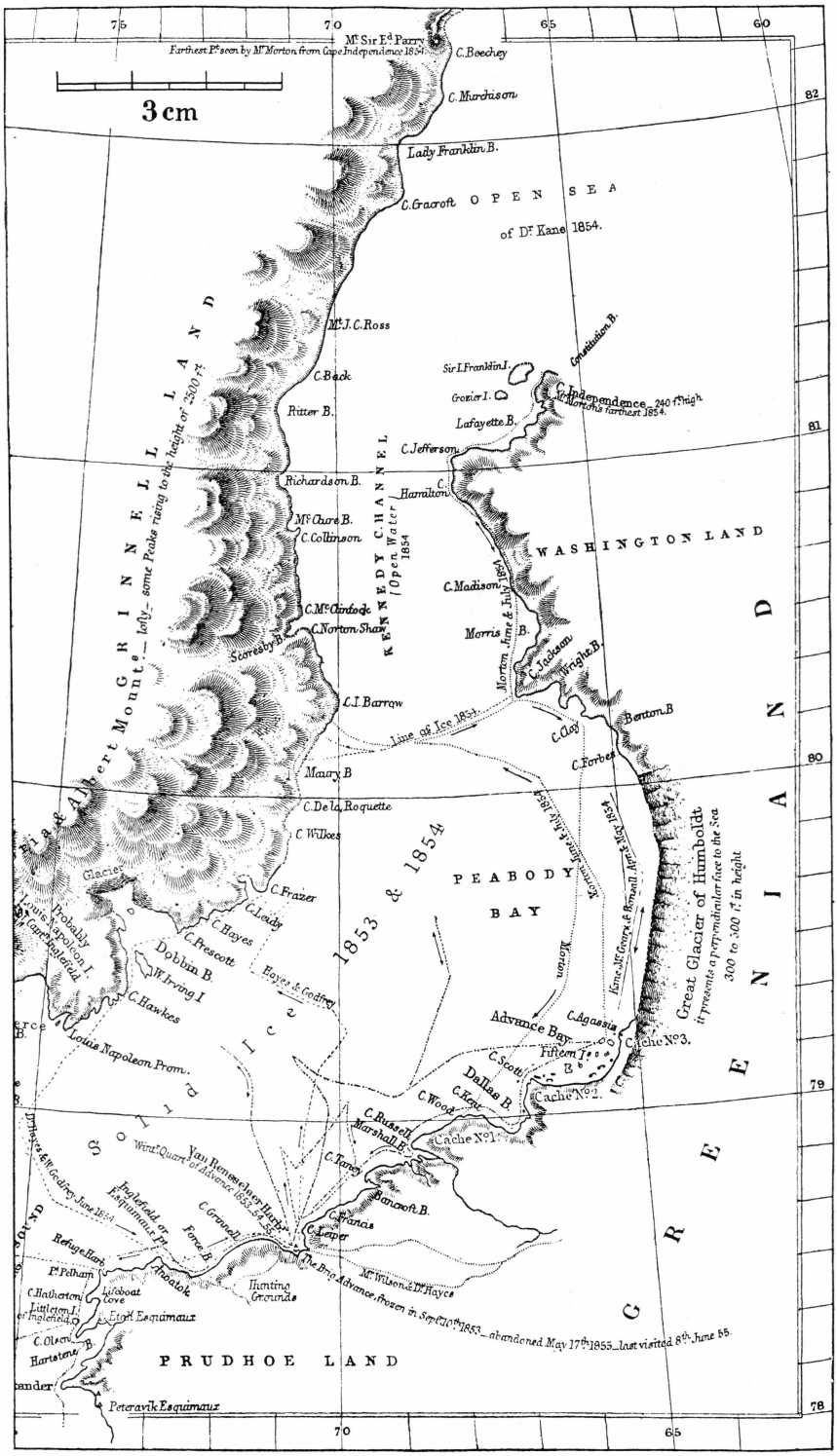

Fig. 2. KANE's map (London 1856).

4) KANE's map in "Arctic Explorations" (Philadelphia 1856). The map is in all essentials identical with Map 1, but shows no travelling-routes; there is some representation of the relief deviating somewhat from that indicated on Map 3. The edge of the Humboldt Gl. is given in more detail. As a result of HAYES's journey across Inglefield Land some relief is represented but no route. Furthermore, the edge of the inland ice is indicated from Humboldt Gl. to about 69° W. long. south of Marshall Bugt. In addition an ice-edge is indicated south of Marshall Bugt and southeast of Dallas Bugt, but these indications are very vague and have no doubt given rise to obscurities on later maps and errors as to the edge of the inland ice on Inglefield Land.

It appears from this map that KANE's ideas regarding the inland ice and the boundary of Inglefield Land towards it were very vague. In Vol. I, where the map is found, KANE says (p. 93) in his account of the journey in the autumn of 1853 northward to Kap Russell that on the 1st of September, travelling along the coast, "we reached a low fiord, and a glacier blocked our way across it". On p. 95 a figure is found, entitled "Crossing the glacier", and representing a fairly large and complicated glacier descending into the sea; two nunataks project from its surface and three persons are seen on the glacier. Pp. 95—96 KANE says: "To cross this glacier gave us much trouble. Its sides were steep, and a slip at any time might have sent us into the water below. Our shoes were smooth, unfortunately; but, by using cords, and lying at full length upon the ice, we got over without accident."

This glacier is not indicated on KANE's map, and no such glacier exists along the coast. Possibly the drawing and description have reference to a summering snow-fan, but if so, the "glacier" can only have been very small.

5) The reduced maps. RINK's sharp criticism (Geogr. Journ. 1858) is accompanied by a map which in all essentials is identical with Map 3. The map bears, however, the following inscription: "Note. In this Map, the extent of Mr. Morton's Outline of Kennedy Channel, & the Open Sea to the North of it (as originally laid down), has, after examination, been much modified. I. A."

While on the earlier maps Washington Land extended from about 80° N. lat. to about 81°20′ N. lat., on this map it only extends to 81° N. lat., Kap Constitution being indicated a little south of this latitude. The northernmost latitude measured by MORTON (cf. RINK, 1858, p. 283) was only 80°20′2″ N. lat. MORTON states that he walked 20 miles farther northward; his northernmost point should accordingly be 80°40′2″ N. lat.

6) Finally, in 1860 CHAS. A. SCHOTT's work on the astronomical observations made on KANE's expedition appeared (Smiths. Contr., 1860).

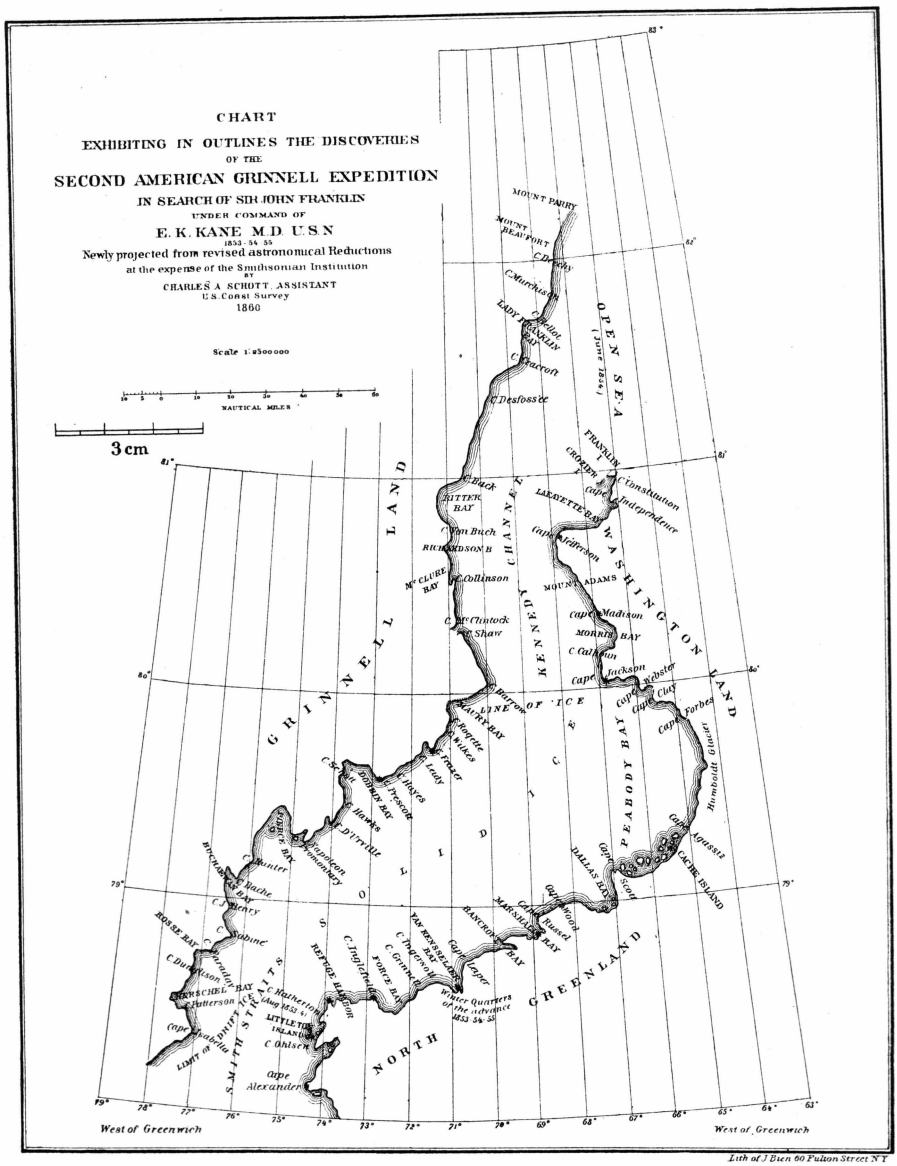

Fig. 3. CHAS. A. SCHOTT's map (1860).

On the accompanying map (see Fig. 3) Kap Constitution is indicated a little south of 81° N. lat. The map only contains the coast in outline, but no representation of relief.

It will appear from the maps dealt with above that the mapping done by KANE's expedition must as a whole be regarded as very primitive. As a consequence it has later been much criticised, notably by PETERMANN (Peterm. Mitt. 1867, pp. 176—200), who points out (p. 180)

that the whole coast north of 79° N. lat. is "mangelhaft under unsicher auf der Karte niedergelegt". Further, he points out that the map (in KANE's two-volume work) "ist aber auch so wenig genau und vollständig, dass sie besonders zur Orientierung der nächsten Umgebung von Rensselaer-Bai und der vielen topographischen Details im Werke nicht ausreicht", and it is a special drawback that the same points have different names in the text and on the map. Finally, PETERMANN points out that the travelling routes are lacking; however, they are indicated on the two maps published in the Geographical Journal (Maps 3 and 5).

BESSELS (1879, p. 110) criticises the position of Kap Constitution on KANE's original map, saying: "Anstatt die astronomisch festgelegten Punkte als massgebend zu betrachten, basirte er die Construction der von ihm veröffentlichten Karte unbegreiflicher Weise auf das Mittel, erhalten aus der Schätzung der zurückgelegten Distanzen und der astronomischen Ortsbestimmungen."

KANE's view of Humboldt Gl. is discussed at length by the present author (1928, pp. 281—285).

As regards KANE's expedition-charts as a whole it must be said that the coast outline is very primitive and on Washington Land quite erroneous. The edge of the inland ice on part of Inglefield Land is vaguely indicated and has later given rise to misunderstandings.

Despite all, however, KANE's expedition was rich in results. Thus the expedition discovered (and indicated approximately the boundaries of) Kane Basin and the southern part of Kennedy Kanal. Further, the expedition discovered and mapped the coast of Inglefield Land, Humboldt Gl., and the southern part of Washington Land, and KANE extended the Greenland coast from about 78°20′ northward to about 80°30′ N. lat. Strangely enough these regions, discovered and mapped in 1853—55, remained almost unnoticed during the succeeding years, since the later expeditions travelling through Smith Sund-Robeson Kanal did not practically touch these regions until 1917, when they were visited by the Second Thule Expedition, and in 1921—22, by the Bicentenary Jubilee Expedition.

AMERICAN ARCTIC EXPEDITION 1860

Leader: I. I. HAYES

Literature.

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5) — The Open Polar Sea. A narrative of a voyage of discovery towards the the North Pole, in the schooner "United States". Pp.i-xxiv + 1—454. With 3 maps and 5 figures. New York **1867**.

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9) HENRY, JOSEPH. Cf. 11) below.

10) PETERMANN, A.: Das nördlichste Land der Erde. Mit 6 Karten, s. Tafel 6 und 7. Peterm. Mitt. **1867**, pp. 176—200.

11) SCHOTT, CHARLES A.: Physical Observations in the Arctic Seas. By Isaac I. Hayes, M.D., Commanding Expedition. Reduced and discussed at the expense of the Smithsonian Institution by Charles A. Schott. Smiths. Contr. Knowl., Vol. XV, **1867**. Article V. pp. 1—270. With six plates and fourteen wood-cuts. JOSEPH HENRY: Introduction to same, pp. vii—xl.

ISAAC I. HAYES was born on March 5th, 1832. He completed his medical education a few days before KANE started on his Greenland expedition in 1853 and was engaged to join the expedition as physician.

During this expedition HAYES made a journey from the winter quarters of the expedition across Inglefield Land to the edge of the inland ice in September 1853. In May, 1854, he made a sledge journey to Grinnell Land, reaching Cape Frazer in latitude 79°45′ N. In August,

1854, after realising that the expedition was forced to spend a second winter in Greenland, HAYES went southward by boat accompanied by about half the members of the expedition in order to try and reach the Danish settlements of West Greenland. In this he did not succeed, and the party returned to the ship in December.

Immediately after the return of the expedition to America in 1855 HAYES made preparations for a new expedition. He succeeded in securing the necessary funds, and in 1860 he set out in his own ship, hoping to reach "the open polar sea", in whose existence he fully believed until his death.

However, HAYES only reached as far as a little north of Etah, and the ship had to remain in the neighbourhood during the winter. The expedition mapped the coast between Sutherland Ø and Littleton Ø, and HAYES made an ascent of Brother John's Gl. and a journey on to the inland ice in October, 1860. Next spring he made a journey across Kane Bassin to Kennedy Kanal, and claimed to have reached Cape Lieber; this last part of his journey has been much criticised and doubted, i. a. by BESSELS (1879, pp. 192—193).

The ship returned next summer without having been able to push beyond Smith Sund. In the meantime the American civil war had broken out, and HAYES was engaged in hospital work and for the time being had to give up his plans about continuing the exploration northward of Smith Sund.

After the end of the war HAYES attempted to organise another expedition to the Arctic, but in this he failed. However, in 1869, as a guest on board the s.s. "Panther", he made a voyage along the west coast of Greenland to Melville Bay.

It would seem that when HALL made efforts to induce the United States to start an expedition up through Smith Sund, HAYES attempted to become the leader of the expedition; at any rate he was recommended for the command by the council of the American Geographical Society (1881, p. 122).

During his later years HAYES was a much appreciated member of the American Geographical Society and even a member of the council. He died in 1881.

The Aims of the Expedition.

HAYES (The Open Polar Sea, p. 1) says as follows about the object of his expedition: "The proposed route was that by Smith's Sound. My object was to complete the survey of the north coasts of Greenland and Grinnell Land, and to make such explorations as I might find practicable in the direction of the North Pole.

"My proposed base of operations was Grinnell Land, which I had discovered on my former voyage, and had personally traced beyond lat. 80°, far enough to satisfy me that it was available for my design."

In an excellent introduction to a report on HAYES's scientific results (Smithson. Contr. vol. XV, 1867) the Secretary of the Institution JOSEPH HENRY defines the objects of the expedition as follows (p. vii): "The principal objects of this expedition were to extend the exploration of Dr. Kane towards the north, and to make such observations of a scientific character as might tend to increase the existing knowledge of the Physical Geography, Meteorology, and Natural History of the region within the Arctic circle including the coasts and islands on either side of Smith's Straits."

HAYES's popular report on the expedition, "The Open Polar Sea", came out in 1867, simultaneously with the scientific report in the periodical of the Smithsonian Institution (1867). The popular report contains (p. 72) a map, which is reproduced here in Fig. 4. In his Preface to the book HAYES says as follows about the map (pp. vii—viii): "The Chart exhibiting the track and discoveries of my voyage, and of my various sledge journeys, was claimed, in like manner, as the exclusive property of the Smithsonian Institution, and, like the papers, was to be published immediately. Hence it is that the small map which illustrates this volume is but a copy (reduced ten diameters) of my field chart, projected on the spot from my unrevised materials. It is perhaps needless for me to observe that entire accuracy was not attainable in the field, inasmuch as I had neither the leisure nor the facilities for reducing the magnetic variation, nor for obtaining the absolute time. I am happy to say, however, that no greater discrepancy exists than the one which places my highest latitude two minutes too far south on the field chart; but the reductions having been made, and a chart projected therefrom, I had confidently relied upon this source for the correct information which the Smithsonian Institution now alone possessed. This failing me, I was obliged to fall back upon my original resources, as the time was too short for a new reduction. I am glad to say, however, that the field chart is sufficiently accurate for every practical purpose, and differs chiefly from the one prepared, with greater carefulness, and of large size, for the Smithsonian "Contributions to Knowledge", in the unimportant feature of the names applied to newly discovered places, some of which were changed after my return."

In addition to the physical observations published by the Smithsonian Institution, the expedition made botanical, zoological, paleontological, and ethnographical collections (HAYES, 1867, p. ix). The main working field of the expedition was Grinnell Land, and apart from observations made during the wintering at Port Foulke, the inland

ice journey, and the mapping of the coast between Sutherland Ø and Littleton Ø, HAYES's expedition did not contribute to the geographical exploration of Greenland. As regards Washington Land, however, HAYES makes some interesting remarks (1867, p. 375):

"In plotting my survey I have been a little puzzled with the Washington Land of Dr. Kane's map, and I am much tempted to switch it off twenty miles to the eastward; for it is not possible that Kennedy Channel can be less than fifty miles wide; and, since I believe that Smith Sound expands into the Polar Basin, I must look upon Washington Land merely as an island in its centre,—Kennedy Channel lying between it and Grinnell Land on the west, and Humboldt Glacier filling up what was once a channel on the right."

As to the results of the expedition HAYES says as follows (1867, p. 419):

"1. I have brought my party through without sickness, and have thus shown that the Arctic winter of itself breeds neither scurvy nor discontent.

"2. I have shown that men may subsist themselves in Smith Sound independent of support from home.

"3. That a self-sustaining colony may be established at Port Foulke, and be made the basis of an extended exploration.

"4. That the exploration of this entire region is practicable from Port Foulke,—having from that starting-point pushed my discoveries much beyond those of my predecessors, without any second party in the field to cooperate with me, and under the most adverse circumstances.

"5. That, with a reasonable degree of certainty, it is shown that, with a strong vessel, Smith Sound may be navigated and the open sea reached beyond it.

"6. I have shown that the open sea exists."

The Progress of the Expedition.

The expedition left Boston on July 9th, 1860, on board the schooner the "United States". Besides HAYES the expedition numbered 14 persons, among whom the astronomer AUGUST SONNTAG deserves mention.

The ship called at Prøven and Upernavik, where one of the members died and six new men were engaged, viz. an interpreter, two sailors, and three Greenlandish hunters and dog-drivers. On August 22nd the expedition left Tasiusak, where some dogs had been bought, and set out across Melville Bugt, which did not cause any great difficulties. Subsequently HAYES visited the Eskimo settlement at Kap York, where

he engaged the West-Greenlander HANS, who had been living there since KANE's expedition.

During the last days of August an attempt was made to push northward through Smith Sund; however, a strong north wind sprang up, and the ship was stopped by ice both to the east and west. As it had suffered some damage, HAYES, on September 6th, decided to stay for the winter in a small harbour in 78°17′39″ N. lat., called Port Foulke, which was situated a little south of Etah and 10 miles northeast of Kap Alexander. The members of the expedition immediately set about to build a house and an observatory ashore, and in the course of the autumn a vast number of game were secured, especially reindeer, so that the expedition was well provided with fresh meat during the winter.

On October 22nd HAYES started on his inland ice journey, recorded in his book, Chapter X (1867, pp. 127—136). The chapter opens with the following words: "Notwithstanding that we had no actual daylight even at noontime, yet it was light enough for travelling; and the moon being full, and adding its brightness to that of the retiring sun, I felt no hesitation in carrying into execution my contemplated journey upon the glacier. The severe gales appeared to have subsided, and I thought that the undertaking might be made with safety."

On the first day's journey HAYES reached the foot of the glacier, and the next journey carried the party "to the top of the glacier" (p. 130). After ascending the inland ice HAYES says as follows (p. 132):

"On the following day we travelled thirty miles; and the ascent, which, during the last march, had been at an angle of about 6°, diminished gradually to about one third of that angle of elevation; and from a surface of hard ice we had come upon an even plain of compacted snow, through which no true ice could be found after digging down to the depth of three feet."

The following day the party covered 25 miles. The temperature had now fallen to 30° below zero, falling to 34° during the night, and the party was faced by a fierce headwind. Carrying provisions for eight days only, HAYES decided to return. He says as follows (p. 134): "We had attained an altitude of five thousand feet above the level of the sea, and we were seventy miles from the coast, in the midst of a vast frozen sahara, immeasurable to the human eye. There was neither hill, mountain, nor gorge anywhere in view. We had completely sunk the strip of land which lies between the *mer de glace* and the sea; and no object met the eye but our feeble tent, which bent to the storm."

About the return journey HAYES says (p. 135): "We travelled upwards of forty miles, and had descended about three thousand feet before we ventured to halt. . . . We reached Port Foulke the next evening, after a toilsome march, without having suffered any serious accident."

The next chapter (XI, pp. 137—148) contains more general remarks on the inland ice. HAYES seems to be greatly influenced by Dr. RINK, to whom he refers in a footnote p. 144. He opens the chapter with the following statement: "The results of the journey recorded in the last chapter gave me great satisfaction. They furnished an important addition to the observations which I had made in former years; and I was glad to have an opportunity to form a more clear conception of the glacier system of Greenland. The journey possesses the greater value, that it was the first successful attempt which had been made to penetrate into the interior over the *mer de glace.*" And the chapter closes with the following remarks upon the inland ice of Northwest Greenland (pp. 147—148): "Northward from "My Brother John's Glacier" it makes a broad curve in the rear of the hills hitherto mentioned, and opposite Van Rensselaer Harbor it is between fifty and sixty miles from the sea, where it was reached by Mr. Wilson and myself, as before stated. Its first appearance upon the coast in that direction is at the head of Smith's Sound, in the great Humboldt Glacier, which is reputed to be sixty miles across. Beyond this it presses upon Washington Land, and thence stretches away into the region of the unknown."

The distances given by HAYES do not seem to be based on observations of any kind; most likely they are merely estimated, probably somewhat overestimated.

During the first part of the winter a disease broke out among the dogs, and since the journeys planned for the spring relied on dogs to drag the sledges, it was necessary to get into communication with the Eskimos in order to obtain some dogs from them. On December 21st SONNTAG therefore started southward to reach Eskimo habitations. As he did not return, HAYES prepared to set out to search for him when on January 29th two Eskimos arrived at the ship reporting that SONNTAG had died. Next day SONNTAG's travelling companion, the Greenlander HANS, arrived. He reported that SONNTAG had fallen through the ice near Sutherland Ø; he managed to get out, and HANS rapidly drove him to an empty hut in the neighbourhood, but he did not succeed in saving his life.

The expedition now bought some dogs from the Eskimos, and in March SONNTAG's body was fetched and buried at the observatory.

In the latter half of March HAYES made a sledge journey northward to investigate the ice conditions there. He travelled along the coast as far as Rensselaer Bugt, whence he returned.

The large sledge journey northward was started on April 3rd. Along the first part of the route HAYES carried a boat, but the boat had to be abandoned after three weeks. The results gained by HAYES on this journey did not differ very much from those made by him in

1854. On May 12th he reached Kennedy Kanal, where he encountered open water. He records having reached Cape Lieber in 81°37′ N. lat. on May 18th with one companion. No observations are at hand from the journey northward along the western side of Kennedy Kanal. The journey has been much criticised by BESSELS (1879), and the circumstance that HAYES did not see Washington Land north of Kap Constitution might suggest that he did not push so far north as stated by him. However, as no corrections were made in the map of the Greenland coast on this journey, a closer discussion and criticism of it is beyond the scope of the present paper.

On July 14th the harbour was free of ice, and HAYES and his expedition left the place in the ship. It was impossible for the ship to push farther north than Smith Sund. The expedition called at Cape Lieber, whence it returned southward, and after crossing Melville Bugt without encountering any difficulties, arrived at Upernavik on August 14th. On October 23rd the expedition was back at Boston.

It will appear from the above that the geographical results of HAYES's journey as compared with those of KANE were small and in part dubious. It should, however, be pointed out that the expedition brought home a large material of astronomical, geodetic, magnetic, hydrographic, and meteorological observations (cf. SCHOTT, 1867). No less important were the biological results of the expedition.

During the expedition HAYES realised the great services which the Eskimos might render to explorers, and he sailed southward with the purpose of returning to Port Foulke as soon as possible, intending to gather the Eskimos, organise their hunting, and with the Eskimos as assistants continue his exploration of the regions towards the North Pole. However, it was not till PEARY's expeditions that these plans were carried into execution.

HAYES's Maps.

1) Charles A. Schott's map (Pl. 2). In February, 1865, a large map on a scale of 1:1,200,000 was submitted for publication to the editors of the "Smithsonian Contributions to Knowledge" by CHARLES A. SCHOTT, who had also worked up the cartographic material of KANE's expedition (Smith Contr., vol. XV, 1867).

The whole coast of Inglefield Land, the Humboldt Gl., and the coast of Washington Land are based on the observations made by KANE's expedition, while the coasts of Ellesmere Land and Grinnell Land are based on HAYES's results. The coast south of Etah is based on HAYES's observations on his boat-journey in 1854—55 as a member of KANE's expedition and on HAYES's new observations in 1860—61.

Thus while the coast from Etah to Kap Constitution is based almost entirely on the results of KANE's expedition, it appears from the map that RINK's conception as to an ice-covered interior of Greenland has gained ground, since the edge of the inland ice is indicated all the way from the southern part of Washington Land to the interior of Inglefield Gulf. Inglefield Land itself is bounded on the south by inland ice, which extends in an even curve without glacier tongues from Humboldt Gl. to Brother John's Gl. Minturn River is indicated as extending from the inland ice to Marshall Bugt. The route of HAYES's and WILSON's journey in September, 1853, is indicated as far as Minturn Elv, but not onwards to the edge of the inland ice. The representation of the relief on Inglefield Land is very rough but covers the whole land; local glaciers are nowhere indicated.—Until the Second Thule Expedition 1917 this map remained the best available map of Inglefield Land, but unfortunately the map was subjected to various alterations, which were not improvements (see below).

2) Hayes's map (cf. Fig. 4) (The Open Polar Sea[1], 1867, p. 72. Preface dated October 23rd, 1866). HAYES's remarks on this chart have been quoted above. He is evidently aware that it deviates highly from SCHOTT's chart, i. a. HAYES has moved Washington Land several degrees of longitude eastward. As a consequence the front of Humboldt Gl. trends southwest to northeast, not having the north-south direction almost following the 65th meridian as indicated by KANE and SCHOTT. Inglefield Land, too, has been somewhat elongated in an east-and-west direction, and by means of these corrections, which HAYES must have inserted by the unguided hand, the Kennedy Kanal is some 60—70 miles too broad on his chart. Since HAYES in his text to the chart makes some reservations as regards its accuracy (see above), there is no reason to give further consideration to these corrections here. What especially catches one's attention when looking at the map is HAYES's entirely correct conception of the inland ice as forming the great background of all the land areas from Washington Land southward to Wolstenholme Sund, or the whole area comprised by the chart; it is even more interesting to note that HAYES, in accordance with SCHOTT, indicates the inland ice as an evenly extending limitation of Inglefield Land, leaving Inglefield Land proper entirely free of ice.

Although longitudes and latitudes on HAYES's chart are very doubtful, and although he states that he reached Cape Lieber on Grinnell Land, which cannot be correct, his map gives the first mainly correct picture of Northwest Greenland from about 76° to about 81°

[1]) Facing p. 96 a map is found, covering the area from Sutherland Ø in the south to and including Life-boat Cove in the north, called "Port Foulke and Vicinity, North Greenland".

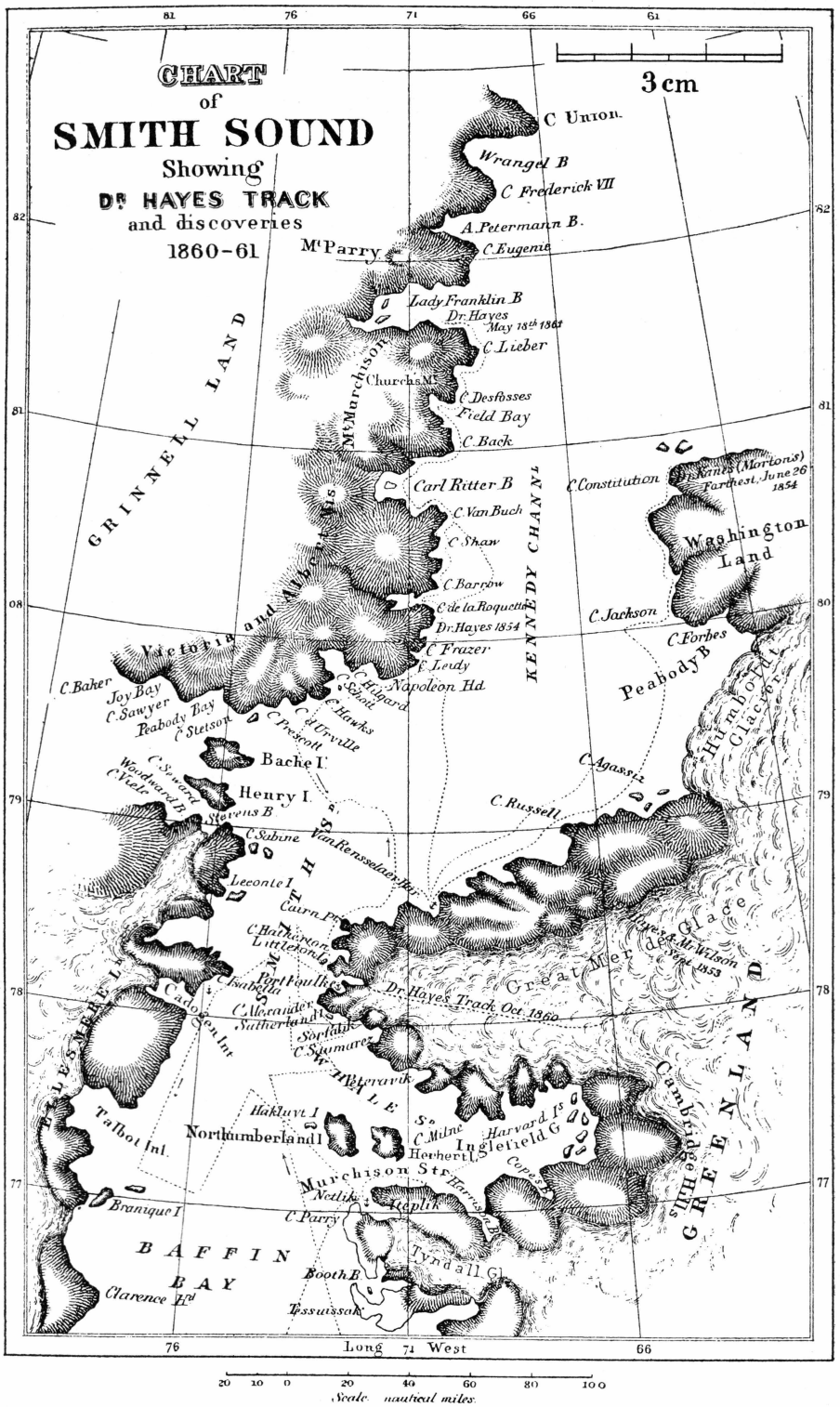

Fig. 4. HAYES's map in "The Open Polar Sea" (1867).

N. lat. with the inland ice forming the background and both Washington Land and Inglefield Land free from ice.

3) In 1867 an exceedingly instructive article by PETERMANN, dated April 15th, 1867, and entitled "Das nördlichste Land der Erde", appeared in "Petermanns Mitteilungen". PETERMANN here describes with his usual care and thoroughness, but also with sharp criticism, the exploration history of the Smith Sund route. The article is accompanied by six maps, Tafel 6, comprising the charts of BYLOT & BAFFIN, 1616, Ross, 1818, INGLEFIELD, 1852, KANE, 1853—55, and HAYES, 1860—61; and Tafel 7, comprising a small polar chart and graphic representations of Dr. KANE's temperature and wind observations in Rensselaer Bugt in 1853—55.

As stated above, PETERMANN criticises KANE's map in sharp terms (1867, pp. 180—181). Further he gives a detailed description of HAYES's expedition (pp. 181—187). P. 182 he mentions, and he actually believes, that HAYES reached Cape Lieber, and tries to explain why HAYES failed to sight the northern part of Washington Land situated just opposite. On p. 183 he proposes, giving his motives, that the whole peninsula between Melville Bugt and Kane Bassin should bear HAYES's name. This proposal was accepted, and the name is adopted on most charts up to and including the Danish official map of 1906. In recent times, however, the name has been dropped.

Pp. 190—200 PETERMANN gives a report of HAYES's expedition on the basis of his book "The Open Polar Sea". Of special interest are the two maps (Tafel 6, 4—5). No. 4 shows the discoveries made by KANE. The map is prepared with great care, i. a. a number of names are inserted which are not otherwise found on the maps of the KANE expedition, but only in his text. The travelling routes, too, are indicated, among others HAYES's and WILSON's journey to the inland ice at the source of Minturn Elv. The edge of the inland ice is indicated from some distance south of Marshall Bugt to Humboldt Gl., but at the same time one, or rather two coaslescent glaciers are shown south of Marshall Bugt. It would seem that HAYES has passed across the southernmost one. Finally, a glacier is indicated in Dallas Bugt and another east of Kap Scott, both of them reaching the sea. It is not quite clear on what basis PETERMANN draws these glaciers. It is true that KANE's map shows ice boundaries in a few places in the interior of Inglefield Land, and KANE in his text mentions and figures a glacier which reaches the sea at the coast of Inglefield Land between Rensselaer Bugt and Marshall Bugt. However, at this point PETERMANN is not in accordance with HAYES, on whose map in "The Open Polar Sea" Inglefield Land is represented as entirely free of ice. The same local glaciers are found on Map No. 5 (HAYES's map).

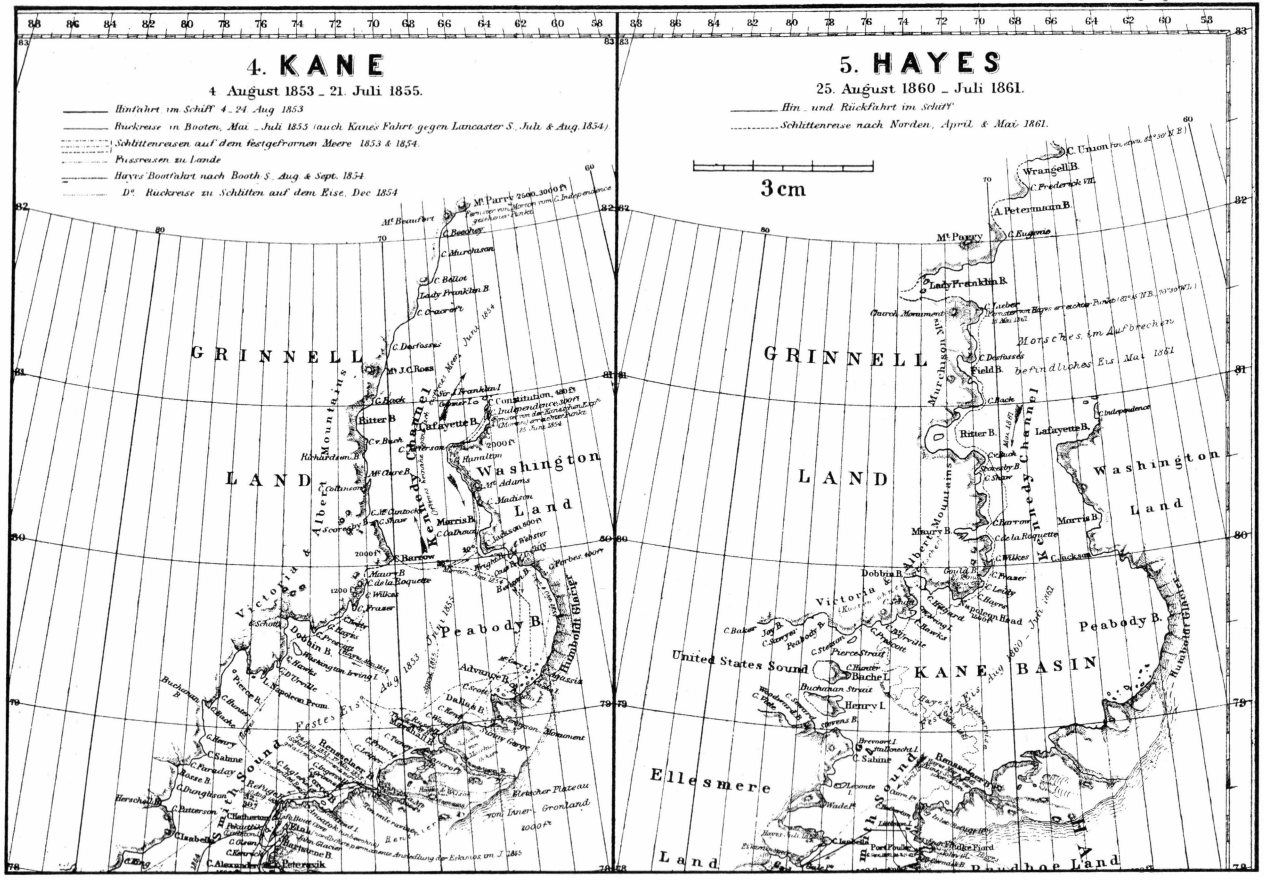

Fig. 5. PETERMANN's reproduction of KANE's and HAYES's maps (cf. the text).

UNITED STATES ARCTIC EXPEDITION
S. S. "POLARIS" 1869—70

Leader: C. F. HALL

(Cf. Pl. 3).

Literature.

1) BESSELS, EMIL: Scientific Results of the United States Arctic Expedition Steamer "Polaris", C. F. Hall commanding. Vol. I. Physical Observations. Pp. i—xii + 1—86 + 1—56 + 1—162 + 1—43 + 1—69 + 1—82 + 1—25 + 1—110 + 1—12 + 1—54 + 1—17 + 1—58 + 1—100 + 1—6 + 1—86. Ill. with charts and figures. Washington **1876**.

2) — Die amerikanische Nordpol-Expedition. Pp. i—xx + 1—647. With numerous illustrations in wood-cuts, diagrams, and a map in colours. Leipzig **1879**.

3) BLAKE, E. VALE: Arctic Experiences: containing Capt. George E. Tyson's wonderful drift on the ice-floe, A history of the Polaris Expedition, the cruise of the Tigress, and rescue of the Polaris survivors. To which is added a general Arctic chronology. Edited by E. Vale Blake. Pp. 1—486. With 1 map and several illustrations. London **1874**.

4) DAVIS, C. H.: Narrative of the North Polar Expedition. U.S.Ship "Polaris", Captain Charles Francis Hall commanding. Edited under the direction of the Hon. G. M. Robeson, Secretary of the Navy, by Rear-Admiral C. H. Davis, U.S.N. Washington **1876**. Pp. 1—696. Ill. with several maps and figures.

5) GREELY, A. W.: The Polar Regions in the twentieth century, their discovery and industrial evolution. With Illustrations and maps. Pp. 1—223. London **1929**.

6) KOCH, LAUGE: Contributions to the Glaciology of North Greenland. M. o. Gr. Vol. LXV Nr. 2. Pp. 179—464. With 140 figs. and 6 pls. Copenhagen **1928**.

7) MARKHAM, CLEMENTS R.: The Threshold of the Unknown Region. Pp. i—xvi + 1—357. With several maps. London **1873**.

8) NOURSE, J. E.: Narrative of the Second Arctic Expedition made by Charles F. Hall. Washington **1879**.

9) PETERMANN, A.: Das nördlichste Land der Erde. Mit 6 Karten, s. Tafel 6 und 7. Peterm. Mitt. **1867**, pp. 176—200.

10) — Die Amerikanische Nordpolar-Expedition unter C. F. Hall, 1871/3. Mit Karte, s. Tafel 16. Peterm. Mitt. Bd. 19, **1873**, pp. 307—316.

11) — Die Trift der Hall'schen Nordpolar-Expedition, 16. August bis 15. Oktober 1872, und die Schollenfahrt der Zwanzig bis zum 30. April 1873. Mit Karte,

s. Tafel 20. Peterm. Mitt. Bd. 19, **1873**, pp. 379—392. (Zusammengestellt aus dem "Report to the President of the United States of the Action of the Navy Department in the matter of the disaster to the United States exploring expedition toward the North Pole, accompanied by a report of the examination of the rescued party &c. Submitted by the Secretary of the Navy Department. Washington, 17. June 1873").

12) — Überwinterung der Mannschaft des Amerikanischen Expeditionsschiffes "Polaris" in Lifeboat Cove (Smith-Sund) 1872/3. Mitteilung von Dr. E. Bessels über die Amerikanische Nordpolar-Expedition. Peterm. Mitt. Bd. 19, **1873**, pp. 401—408.

13) — Die arktische Campagne von 1873. Peterm. Mitt. Bd. 20, **1874**, pp. 34—40.

14) — Das offene Polarmeer bestätigt durch das Treibholz an der Nordwestküste von Grönland. Peterm. Mitt. Bd. 20, **1874**, pp. 161—177.

15) — Die Umkehr der Hall'schen Polar-Expedition nach den Aussagen der Offiziere. Mit Karte, s. Tafel 13. Peterm. Mitt. Bd. 20, **1874**, pp. 252—261. (Unsere Karte ist eine Reduktion der offiziellen, soeben vom Hydrographic Office in Washington ausgegebenen: "Arctic Sea. The discoveries North of Smith Sound. By the U.S.ship "Polaris", under command of C. F. Hall, 1871—1873", etc.).

16) — Die grosse Englische Nordpol-Expedition unter Kapitän Nares, 29. Mai 1873—27. Oktober 1876. Mit 2 Karten, s. Tafel 24 und 25. Peterm. Mitt. Bd. 22, **1876**, pp. 456—473.

17) — Note on Bessels's Map. Peterm. Mitt. **1877**. p. 81.

18) Report to the President of the United States of the Action of the Navy Department in the matter of the disaster to the United States exploring expedition toward the north pole, accompanied by a report of the examination of the rescued party, etc. Submitted by the Secretary of the Navy. With a map by Fred'k Meyer. Dated June 17, **1873**. Pp. 1—161.

The expedition was in many respects in advance of its time and numbered many excellent members. However, HALL himself was the soul and spirit of the expedition, and his death therefore in great degree paralysed its operations.

C. F. HALL still remains one of the most interesting of Arctic explorers. He was born in 1821. He started his career as a blacksmith, but later he turned to journalism, and gradually there arose in him a burning desire to visit and explore the polar regions. However, ten years, during which he studied all the literature on Polar regions he could secure, were to elapse, before he was able to set out on his first voyage to the Arctic.

About the middle of the last century the English-speaking part of the world took as great an interest in the Polar countries as never before or after that time. This was due in the first instance to the catastrophe that happened to FRANKLIN and his men and subsequently to the many expeditions that set out in search of them. However, HALL was too late to contribute decisively to the elucidation of the mystery of the fate of the Franklin Expedition. But the thought occurred to

him that the Eskimos knew more about the fate of FRANKLIN and his men than they had revealed, and that the only way in which this information might be obtained was to stay some time among them.

At last, in 1860, HALL was able to go north with a whaler. The expedition, which was modestly equipped, lasted for about two years, during which HALL explored Frobisher Bay at the southern Baffin Land. Here HALL settled among the Eskimos, adopting their mode of life and learning their language and customs. On returning home in 1862, he was accompanied by two Eskimos, HANS and HANNAH, who accompanied him on his subsequent journeys.

In the years 1864—69 HALL stayed in the regions north of Hudson Bay, making sledge journeys to Fury & Hecla Strait and King William Land. On returning home, he was more anxious than ever to visit the northern tracts again. The following passage from a private letter written by HALL (DAVIS 1876, p. 19) characterises the object to which HALL devoted his life:

"...There is a great sad blot upon the present age, which ought to be wiped out, and this is the blank on our maps and artificial globes from about the parallel of 80° North up to the North Pole. I, for one, hang my head in shame, when I think how many thousands of years ago it was that God gave to man this beautiful world—the whole of it—to subdue, and yet that part of it which must be most interesting and glorious, at least so to me, remains as unknown to us as though it had never been created. Having now completed my Arctic collegiate education, I feel to spend my life in extending our knowledge of the earth up to that spot which is directly under Polaris—the crowning jewel of the Arctic dome."

After returning to Washington HALL was actively engaged in securing funds for an expedition to the North Pole. It was his hope that the Congress would grant him $100,000, so that he could go north with two ships. He was not aware whether Jones Sound or Smith Sund would be the best route towards the Pole, but if the worst came to the worst, he would make an attempt to get ashore near HAYES's wintering quarters at Hartstene Bugt, whence he would go by dog-sledges towards the North Pole. He received a grant of $50,000 and a government ship, which was called the "Polaris".

The "Polaris" was a schooner with a steam-engine; it was a strongly built ship and was further fortified with a view to the journey. The provisions of the expedition were well chosen; hardly any cases of disease occurred during the expedition, though it made the greatest demands on its members.

Evidently HALL had been very careful in selecting the members of his expedition. Captain BUDDINGTON had sailed as a whaling captain

for more than 20 years, while his assistant navigator GEORGE E. TYSON and First Mate H. C. CHESTER had sailed for years in the Arctic. HALL knew these three men beforehand, having met them in the Arctic, where BUDDINGTON and TYSON had spent several winters. Further, WM. MORTON, who had reached the farthest north on KANE's expedition, joined HALL's expedition as second mate.

The expedition numbered 21 members. The scientific staff consisted of Dr. EMIL BESSELS, who was a graduate of the university of Heidelberg and acted as surgeon to the expedition and chief of the scientific staff. He was a friend and pupil of the German geographer Dr. A. PETERMANN, on whose invitation he had taken part in a summer expedition to Spitsbergen in 1869. The other scientists were R. W. D. BRYAN, astronomer, and the German F. MEYER, meteorologist.

The Eskimos played a very great part on the expedition. First of all mention should be made of HALL's two faithful companions, JOE and HANNAH, and the West-Greenlander HANS HENDRIK, with family, who acted as dog-driver and hunter.

From the literature on the expedition it appears that various dissensions occurred during the journey, partly frictions between the scientists and partly between HALL and the officers, and after HALL's death there was a certain lack of discipline, no doubt because after the death of their leader BUDDINGTON was not interested in furthering the purposes of the expedition. However, altogether the dissensions do not seem to have been very different from those on several other wintering expeditions. No doubt they ought not to have been so largely discussed in literature; at any rate one receives the impression that when it came to the point and actual obstacles were encountered, the members of the expedition agreed in doing their duty to the utmost.

VALE BLAKE says (1874, p. 411) as follows: "From the experience of Captain Tyson on his whaling voyages, with his observations of others engaged in the same pursuit, it is evident that there exists in the United states a large body of men sufficiently acclimated to Arctic cold to make excellent Polar explorers, without submitting themselves to greater hardships than are common incidents of whaling voyages;" This was no doubt correct. The crew of the "Polaris" were not only very experienced men but men who were able to sustain several consecutive winterings under difficult conditions.

The objects of the expedition were threefold (DAVIS, 1876, p. 39), viz. 1st, geographical discovery; 2nd, science; 3rd, commerce. The main object of geographical discovery was to discover the North Pole or at any rate to reach as near to the Pole as possible.

The scientific work, as on KANE's and HAYES's expeditions, chiefly comprised meteorology, magnetic, tidal, and pendulum observations and

in addition, to the greatest extent practicable, geological and biological investigations.

As regards the third item on the programme, commerce, the expedition might possibly discover new whaling-grounds, which would then be of great economic value.

Report of the Journey.

The expedition started from New York on June 29th, 1871. Having called at New London and St. Johns, the ship reached West Greenland, where it called at several places in order to meet and take on board the West-Greenlander HANS HENDRIK, to buy dogs for the expedition, and to take in supplies of coal and provisions at Godhavn. On August 24th the ship left Tassiusak northward bound.

The expedition had an easy journey across Melville Bugt and past the Kap York district, and on the evening of August 27th the ship was off Rensselaer Bugt. On the way farther north the weather was rather foggy, yet on August 28th the ship passed 80° N. lat., on August 29th 81° N. lat., and on August 31st the ship reached its northernmost point, which HALL states to be 82°26′ N. lat., while MEYER gives it as 82°16′ N. lat.; it should probably be 82°11′ N. lat.

At this point the ice was densely packed, but water clouds were visible northward. A discussion now arose as to whether they should try to push farther northward. The majority of the ship's officers were of opinion that they should find a harbour for the ship near Repulse Havn; meanwhile, however, the ship drifted southward, altogether 88 miles. On September 5th the ship cast anchor near the place which was to become the winter quarters of the expedition. The place was not particularly well chosen, as there was only a small indentation in the coast which offered no protection as a harbour. The ship took shelter behind a large iceberg, which, however, proved to be a dangerous neighbour, since it was in motion until the end of November, and it must be characterised as a great piece of luck that the ship was not crushed by the ice.

On October 10th HALL, accompanied by CHESTER and the two Eskimos, started on a journey northward. They went across the flat land to Newman Bugt, and thence across this bay to Kap Brevoort in about 82° N. lat. They were back at the head-quarters on October 24th. Shortly after HALL was taken ill and died on November 8th.

Throughout the winter the weather was very unsettled and stormy, and nearly all the time there was open water in Robeson Kanal and Hall Bassin. When spring approached, the members of the expedition began to plan journeys in the neighbourhood; however, the journeys

were all very short, chiefly because Captain BUDDINGTON, who was now the leader of the expedition, was of opinion that they were to travel by boat, and apparently lacked any understanding of what might be attained by the aid of the two Eskimos and the dogs.

On March 27th BESSELS started southward towards Kap Constitution. He pushed some distance into Petermanns Fjord and into Bessels Fjord, but he failed to reach the actual goal of the journey, Kap Constitution, the farthest northern point reached by KANE's expedition, since at John Browns Kyst a little south of Kap Bryant he was stopped by open water. On April 8th he was back at the ship.

About the middle of May MEYER and TYSON made a sledge journey to Newman Bugt, and travelling over land east of Repulse Havn pushed as far as 82°9′ N. lat.

The best time for travelling was spent waiting for open water to form so near the ship that it was possible to go north by the boats.

One boat started out on June 7th, but was crushed in the ice next day. Another boat started on June 9th, reaching halfway into Newman Bugt on June 12th. A third boat reached Newman Bugt on June 17th. On June 26th the ship got free of the ice and on July 2nd made an unsuccessful attempt to reach the boats in Newman Bugt, but was barred by the ice. It was impossible for the boats to return owing to the unfavourable ice conditions, so the men were compelled to haul the boats ashore and return over land. On July 8th they were back on the "Polaris". (Cf. DAVIS, pp. 675—681, VALE BLAKE, pp. 185—189.)

On August 2nd Robeson Kanal was filled with ice, and all plans of pushing northward were therefore given up, i. a. because there was only coal left for six days' voyage. On August 12th the ship left Polaris Havn and steamed southwards. There was only little ice in Kennedy Kanal, on August 13th they passed Hands Ø, and on August 14th they were nearly in latitude 80° N. However, here, at the boundary between Kennedy Kanal and Hall Bassin, the ship was beset in the ice, and during the remaining part of the month she drifted slowly southwards.

During the month of September the weather was calm and settled, and the ship drifted southward at a slow speed. On October 1st the ship passed 79° N. lat. and on October 12th it was only 2 miles from Cairn Point on the west coast of Greenland.

On October 15th a storm broke out. The last two boats of the ship and a great part of the provisions and equipment were then carried on to a large ice-floe, where a hut had been built, the ship having for the last two days been subjected to strong pressure. In the night the ship sprung a leak, there was a general confusion, and about half of the

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members of the expedition were on the ice-floe when the ice suddenly opened and the ship drifted away from the floe.

The storm did not last long. Next day the men on the floe saw the ship, but they were not observed from the ship. In the course of the winter the ice-floe, on which Captain TYSON had taken the command, drifted southward through Baffins Bugt and Davisstrædet to near Labrador, where all the inhabitants of the floe, after a winter of adventures and hardships and frequent periods of hunger, were saved by the sealer "Tigress" on April 3rd, 1872.

During the storm on October 15th the "Polaris" had sprung a leak and had to be run ashore as soon as possible. This was done on October 16th near Life-boat Cove. The men on board the ship immediately began carrying ashore as much as could be saved from the ship. A couple of days later they met some Eskimos from the nearby settlement of Etah. They at once set about building a house, into which they moved on October 24th and stayed there during the winter.

On May 30th next year the wreck of the ship drifted southward. On June 3rd the men started southward in two small flat-bottomed boats built of wood secured from the ship, and on June 23rd they were taken on board the sealer "Ravenscraigh" in the northern part of Melville Bugt.

The excellent health condition of the members of the expedition during the two years was due, not only to the great Arctic experience of many of the officers, but also to the circumstance that the Eskimos constantly hunted seal, thus securing fresh meat for the expedition. During the second wintering at Polaris Havn meat was obtained from the Polar Eskimos, and as regards the men on the ice floe the two Eskimos there, by hunting seal, secured the meat on which the members supported life during the winter.

Geographical Results.

The geographical discoveries made by HALL's expedition in North Greenland are as follows: 1) the northern part of Kennedy Kanal; 2) Hall Bassin; 3) Robeson Kanal; 4) The frozen polar ocean called Lincoln Sea—the character of this area, however, is ill-defined; 5) the northern part of Washington Land with Petermann Peninsula; 6) Hall Land; the expedition was aware of the approximate position of the inland ice here, but failed to indicate it on the map; 7) the western part of Nyeboes Land; 8) Bessels Fjord; 9) Petermanns Fjord; and 10) Newman Bugt.

Grinnell Land and Grant Land north of 80° N. lat. were not visited, whereas the north coast of Greenland from Kap Constitution to Kap

Stanton was discovered and preliminarily mapped, and the coast from Kap Bryan to Repulse Havn was investigated on sledge and boat journeys.

The rather scanty results gained by the expedition are largely due to the lack of organisation which prevailed after HALL's death, and owing to which the spring of 1872 was utilised for sledge journeys to a slight degree only.

As regards the interior of Petermanns (or Southern) Fjord HALL's Expedition brought no solution. In April, 1872, BESSELS and BRYAN accompanied by the two Eskimos made an attempt to travel into the fjord, but they were stopped by closely packed icebergs. TYSON (BLAKE 1874, p. 177) says as follows about the geographical results of the party: "Into the first fiord, which we had called the 'Southern', they could not penetrate more than twenty miles on account of the numerous icebergs with which it was filled; but having ascended some of these, they could see that the fiord terminated in a glacier extending in a south-easterly direction as far as the eye could reach."

DAVIS says as follows in the official report of the expedition (1876, p. 345): "The fiord seemed filled from shore to shore with these bergs, which varied in shape and size, but not much in height. The termination of the fiord was not visible; its general direction was southeast."

Petermanns Fjord is described by BESSELS (1879, pp. 259—262). P. 259 he says: "Noch wussten wir nicht, ob der Petermann-Fjord ein wirklicher Fjord sei oder eine mit anderen Meerestheilen in Verbindung stehende Strasse. Als ich mit Chester während des vergangenen Herbstes auf unserer ersten Schlittenreise einen hohen Berg bestiegen, hatten wir die steilen Ufer auf eine weite Strecke überschaut, ohne irgendwelchen Abschluss zu bemerken.

"Mit der geheimen Absicht, einen östlichen Ausweg zu finden, und auf diese Weise Halls Land als Insel von Grönland abzutrennen, drang ich, nachdem unser Schlitten bepackt war, mit meinen beiden Begleitern in den Fjord ein."

Having penetrated some distance into the fjord, the further advance of the party was stopped by icebergs. BESSELS says (p. 261): "An dem jenseitigen Ufer der Spalte reihte sich Berg dicht an Berg; der ganze Fjord, so weit der Blick schweifen konnte, schien von Eisbergen erfüllt zu sein."

BESSELS summarises the results of his observations in the following way (p. 262): "Vorerst mussten wir die Hoffnung aufgeben, durch den directen Beweis zu entscheiden, ob der Petermann-Fjord ein echter Fjord sei oder eine sich nach Osten oder Südosten öffnende Strasse. Unsere Erfahrungen liessen bis jetzt einen sicheren Schluss noch nicht zu. Die massenhafte Anhäufung der Eisberge konnte zu Gunsten beider Wahrscheinlichkeiten gedeutet werden.

"Falls wir es mit einem Fjorde zu thun hatten, so könnte die Accumulation des Eises durch die Annahme ihre Erklärung finden, dass die in den Fjord einlaufende Flutströmung stärker sei als die zurücklaufende Ebbe. Besass der Kanal dagegen einen Ausgang, so liesse der Grund der gleichen Erscheinung sich durch die Existenz einer mehrjährigen Eisdecke erklären, welche den Ausgang temporär unwegsam macht und die Berge festhält. Nebenbei könnte dieser Ausgang von nur geringer Tiefe sein; und endlich liesse sich annehmen, dass die Strömung, welche aus dem Hall-Bassin in den Fjord setzt, schwächer sei als die, welche von der anderen Seite her in ihn eindringt. Die Interferenz zweier Flutwellen, von denen die eine von Osten nach Westen läuft und die andere in der entgegengesetzten Richtung, würde gleichfalls eine Stauung des Eises veranlassen."

As I have previously pointed out (1928, pp. 290—291), BESSELS appears to have maintained his theory that the fjord was a strait, for on the map published by him in 1879 he includes BEAUMONT's discoveries, but fails to take account of FULFORD's discovery of floating glacier ice in Petermanns Fjord.

Bessels Fjord is mentioned by TYSON (VALE BLAKE 1874, p. 178) in the following words: "South of this fiord they found another, smaller —not named—which was also beset with icebergs, and apparently between thirty and forty miles long. Several glaciers were seen, but, I believe, not examined."

The length of the fjord as given by TYSON does not agree with the statement by DAVIS (p. 349): ". . . they started up the fiord, into which several arms of a glacier emptied. Its head was about twelve miles from the encampment."

BESSELS describes the fjord that was named after him pp. 265—268. His description, however, is not clear. The visit to the fjord including a bear hunting lasted from April 4th 6 a.m. till April 5th slightly after midnight. He describes the head of the fjord in the following words (p. 267):

"Um halb vier des Nachmittags gelangten wir zu dem Ende des Fjords, dessen Länge etwa 25 Meilen beträgt. Die Ufer zur Rechten und Linken waren steil und zerrissen; im Hintergrunde verlief der Strand dagegen so flach, dass es nicht möglich war, die Grenze zwischen Land und Meer genau festzustellen . . . .

"Aus dem kleinen Thale, welches sich in der Verlängerung des Fjords erstreckte, wehte ein eisiger Wind, der zuweilen in sturmähnliche Böen ausartete. Bei Schneetreiben vollendete ich die Zeichnung der Gegend und nahm Peilungen nach den hervorragendsten sichtbaren Punkten."

The interior of Newman Bugt was not visited by the expedition. TYSON (VALE BLAKE p. 153) gives the following brief description of the region round Thank God Harbour: "Off to the south there is a

large glacier, which sweeps round in a wide circuit and falls into the bay north of us." This was written on September 16th and is therefore probably a mere supposition, since CHESTER and BESSELS did not start on their journey till September 18th (described by BESSELS, 1879, pp. 160—179). BESSELS evidently observed—what, by the way, can also be seen from the hills north of Thank God Harbour: the edge of the inland ice in the valleys between the mountains of the range now called Hauge Mountains. BESSELS ascended one of the mountains, the altitude of which he states to be "2000 Fuss", and describes his view from this peak as follows (pp. 167—168): "Von unserem erhabenen Standpunkte aus war es möglich, genügende Aufklärung über die topographischen Verhältnisse der Umgebung zu gewinnen, die bisher uns dunkel geblieben. Hinter dem Tafellande, welches die vor uns ausgebreitete Ebene im Norden begrenzte, kamen jetzt Gebirgszüge zum Vorschein, welche gestern von der Höhe des Kammes nicht sichtbar gewesen. Was uns als grosser, mit Eisbergen bedeckter Fluss erschien, erwies sich später, während Hall's Schlittenreise nach Norden, als das Ende einer ausgedehnten Bucht, die zwischen jenem Tafellande und dem hinter ihm liegenden Gebirgszuge das Land durchschnitt. Wie wir vermuthet hatten, standen die Gletscher, die wir gestern im Osten und Süden jenseits der abgerundeten Gebirgsgruppen erblickt hatten, in ununterbrochener Verbindung. Sie bildeten ein glänzendes, leicht wellenförmiges Hochplateau, welches völlig frei von Spalten schien."

It does not seem quite clear from this description whether a glacier was observed at the head of Newman Bugt, or whether its presence was merely supposed.

In his mention of HALL's expedition, GREELY says (1929, p. 73): "In reaching the most northern land ever attained by civilized man he found that the ice-cap of Greenland there ended, and he was in an ice-free, vegetation-covered, game-frequented area of several thousand square miles." This is no doubt exaggerated; BESSELS leaves the question as to the distribution of the inland ice on Washington Land (south of Petermanns Fjord) and on Hall Land (north of Petermanns Fjord) entirely open. No attempt at a determination of the edge of the inland ice was made, as done by KANE's expedition on Inglefield Land; and as a proof of the very little that was actually known about the interior of Washington Land, Hall Land, and Nyeboes Land, it may be mentioned that as late as in 1903 the edge of the inland ice is indicated as far as a little south of Kap Stanton on the official map issued by the American Hydrographie Office.

Despite all, however, HALL's expedition contributed immensely to the geographical exploration of Greenland, and the coast was surveyed for more than one and a half degrees of latitude farther northward.

The Maps of the Expedition.

While the hydrographic, meteorological, pendulum, and magnetic observations of the HALL expedition were saved, the greater part of the survey material was lost during the difficult return journeys. The mapping of the expedition is therefore far behind the scientific results, and a number of highly different maps are available.

1) "Six Maps of the Smith Sound Route illustrating the Progress of Exploration from BYLOT and BAFFIN to HALL. 1616—1873. Compiled by E. G. Ravenstein" (in: CLEMENTS R. MARKHAM, "The Threshold of the Unknown Region", London, 1873, p. 180).

The maps are found as an illustration to Chapter 9, Smith Sound, in MARKHAM's book, which was of the greatest importance at that time. Like the aforementioned maps by PETERMANN (Peterm. Mitt. 1867) they give the routes of the earlier expeditions from 1616 to 1873, but the maps are smaller and less accurate than those published by PETERMANN. Thus the map showing the explorations of the HALL Expedition is very deficient since RAVENSTEIN had obtained only incomplete information about the expedition from the TYSON party, and BESSELS had not yet returned (see below). The land from Wolstenholme Sund to Washington Land is in accordance with HAYES, though no local glacier is found south of Marshall Bugt, whereas the edge of the inland issues a glacier to near Dallas Bugt and another which descends into the sea east of Kap Scott. The front of Humboldt Gl. extends only as far as c. 69°40′ N. lat., and Washington Land is drawn partly in accordance with KANE's original map, but Kap Constitution is indicated in about 80°20′ N. lat. North of Kap Constitution and as far as Thank God Harbour the coast-line is only dotted, forming a bay, Polaris Havn. The coast-line is shown northward from Thank God Harbour, but neither Bessels Fjord, Petermanns Fjord, nor Newman Bugt are indicated on the map, though the name of "Newman Bay" is found. Robeson Kanal extends as a narrow channel in a northeasterly direction as far as c. 82°40′.

While thus the results of HALL's expedition are incompletely indicated, KANE's original placing of Kap Constitution (about c. 81°20′) is maintained. The southern Washington Land and Humboldt Gl. bear some resemblance to MEYER's subsequent map, and in the eastern part of Inglefield Land two glaciers are found, one of which reaches the sea. The map is altogether very inaccurate. The preface of the book is dated July 20, 1873.

2) Meyer's Map (cf. Fig. 6) ("Diagram of the Explorations of the Polaris, drawn by Fred'k. Meyer"), accompanying the "Report to the President of the United States of the Action of the Navy Department in

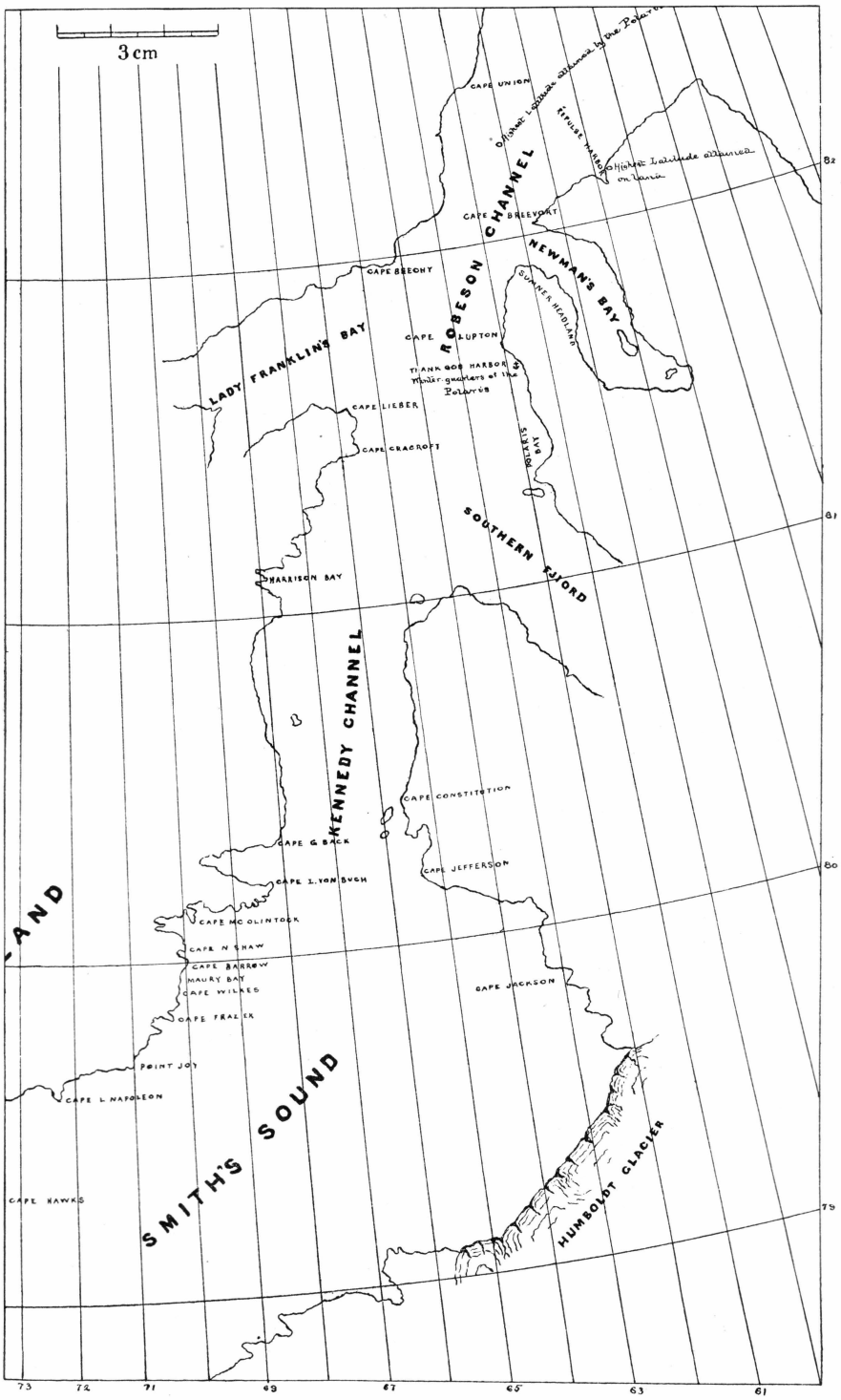

Fig. 6. MEYER's map, accompanying "Report to the President of the United States" (cf. p. 50).

the matter of the disaster to the United States exploring expedition toward the north pole, accompanied by a report of the examination of the rescued party, &c.", dated June 17, 1873. Apart from Humboldt Gl. the chart gives merely the outline of the coast, and shows quite a different picture from that given by KANE's chart i. a. of Humboldt Gl. and the southern part of Washington Land. It is true that Humboldt Gl. is indicated with a front about 50 miles in extension, but its northern edge reaches only as far as 79°45′ N. lat. and ends at 62° W. long. As compared with KANE's original map, Kap Constitution has been moved from about 81°20′ to about 80°27′ N. lat., while MORTON's representation of the coast between Kap Forbes and Kap Constitution (c. 60 miles) is maintained in all essentials. This is accomplished by giving both the front of Humboldt Gl. and the coast of the southern Washington Land a different trend from that on KANE's map, so that Kap Forbes comes to lie near the 62nd meridian and Peabody Bugt cuts deeper into the country. North of Kap Constitution Bessels Fjord is absent, 'Southern' Fjord (Petermanns Fjord) and Newman Bugt are much too broad, whereas Polaris Promontory and the whole peninsula now bearing HALL's name are too narrow. The chart is doubtless to be regarded as a rough sketch. No explanation is given of the corrections made as regards Humboldt Gl. and the coast of southern Washington Land.

3) In Petermanns Mitteilungen (1873) PETERMANN treats HALL's expedition in various articles in his usual thorough way. The most important of these is "Die Amerikanische Nordpolar-Expedition unter C. F. Hall, 1871/3" (Mit Karte, s. Tafel 16.)" (1873, pp. 307—316), dated 29. Juli 1873.

PETERMANN had watched the progress of HALL's expedition with very great interest, because Dr. BESSELS was one of his pupils, and MEYER as well as several other members of the expeditions were Germans. Even before the expedition started out in 1871 PETERMANN had published an article on its equipment and departure, and in 1872 he published a letter from Dr. BESSELS, describing the voyage from Washington to Upernavik. PETERMANN (1873, pp. 310—311) quotes part of MEYER's report on the voyage, and on p. 316 he gives some comments on the map (Tafel 16), which is based on the aforementioned map drawn by MEYER ("Diagram of the Explorations, etc.") accompanying the official report on the expedition by the American Navy Department. At the same time PETERMANN mentions SCHOTT's map, pointing out that the latter had not appeared when he (PETERMANN) prepared his Tafel 6 (Peterm. Mitt. 1867). On Tafel 16 PETERMANN now corrects Inglefield Land in accordance with SCHOTT's new map, while Humboldt Gl. and southern Washington Land are entirely based on MEYER's map, and likewise as regards the area north of Kap Constitution the

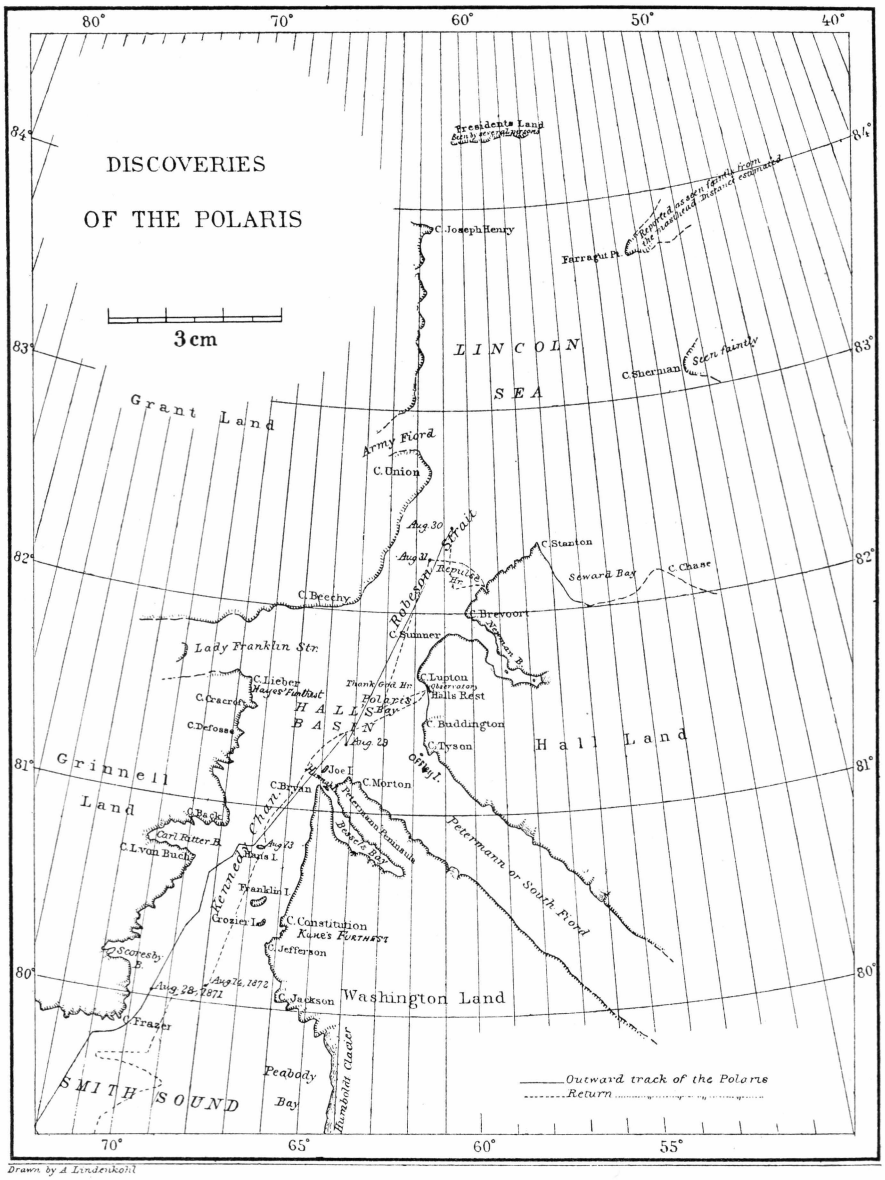

Fig. 7. Map accompanying DAVIS's official report on the "Polaris" Expedition.

map is a copy of MEYER's map, though giving some more details, i. a. representation of relief, which is not found on MEYER's map. See also PETERMANN, 1874, p. 252, and 1876, p. 473.

4) In 1876 DAVIS's official report on HALL's expedition was published. It contains (p. 356) a map (Fig. 7) entitled "Discoveries of the Polaris". On p. 13 the following remarks on the map are found: "As no records of surveys were brought back by the Expedition, the maps of the new

lands discovered are necessarily imperfect. The coast-line was laid down as accurately as possible, after all the members of the Expedition had been examined and their diverse testimony carefully compared. It may be said that the coast-lines north of the 82nd parallel are apocryphal. Captain Hall's estimate (see page 165) of the latitude of the most northern land, clearly seen, is perhaps nearer the truth." The map (p. 356) is drawn on a small scale and is very primitive, and gives only the coast-line and some few glacier fronts. Humboldt Gl. and the coast as far as Kap Constitution are in all essentials in accordance with KANE's map, though Kap Constitution has obtained its correct place. Bessels Fjord, Petermanns Fjord, and Newman Bugt are indicated, the land between Hall Bassin and Newman Bugt is much broader than on MEYER's map, while Newman Bugt is narrower. The direction of this fjord is more correct, and the peninsula with Polaris Promontory (Hall Land) is in a surprising degree in accordance with the actual facts. In this connection attention may be called to a map (DAVIS, 1876, p. 150) called "Track of Hall's last sledge journey". As compared with the other maps of the Hall Expedition this map, comprising the area later named Polaris Promontory, Newman Bugt, and the region of Kap Brevoort, is surprisingly good. Curiously enough neither MEYER nor BESSELS have apparently taken this map into consideration when drawing their maps, since they indicate Polaris Promontory and Newman Bugt quite differently.

5) In the same year (1876) BESSELS's scientific results (Vol. II, Physical Observations) were published. The map (cf. Fig. 8 and Pl. 3) accompanying this work is to be considered as the official map of the HALL Expedition. As pointed out by PETERMANN (1877, p. 81), it was drawn and reproduced some time before the return of NARES's expedition. The map is accompanied by the following note: "Note relative to the accompanying map. . . . As the entire material of the original survey was lost during the separation of the vessel from the floe, the delineation of the coast-line discovered by the expedition solely depends on the limited number of astronomical observations published in the accompanying volume, on some views of the coast taken during the passage of the vessel, and on others made on different occasions."

As regards the northern area the map bears some resemblance to MEYER's map. Newman Bugt is too broad, and consequently the peninsula with Polaris Promontory (Hall Land) is too small and narrow. Southern Washington Land is in accordance with DAVIS's map. Humboldt Gl. accords fairly well with KANE's map. As regards the inland ice the map is not very clear. Evidently BESSELS did not share Dr. RINK's conception, that the interior of Greenland was covered by the inland ice, though this view had already been adopted by HAYES.

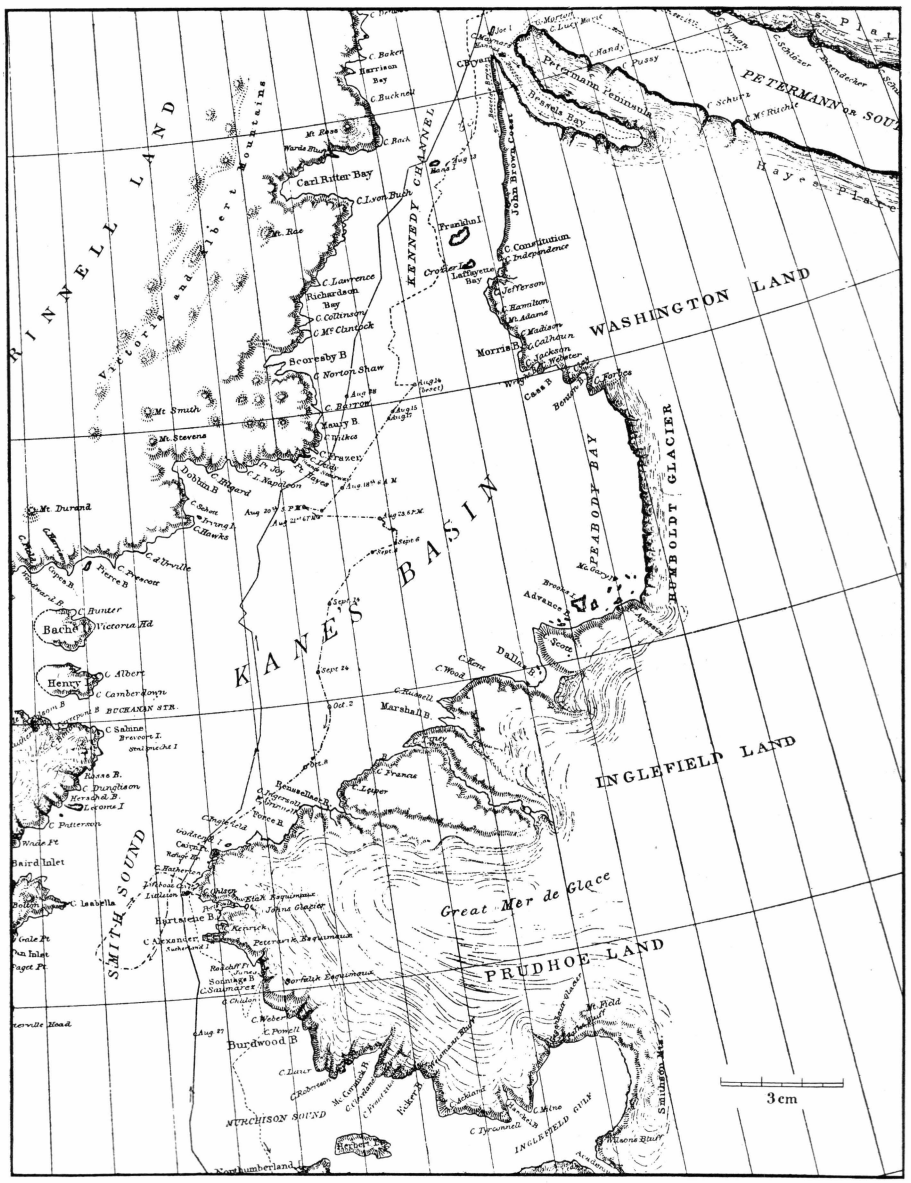

Fig. 8. Southern part of BESSELS's map (cf. p. 54).

For as appears from a letter from Dr. BESSELS to PETERMANN (Pet. Mitt. 1874, pp. 34—40) BESSELS is of opinion that the interior of Greenland "nicht aus einem Eis-Plateau bestehen kann" (p. 37), although BESSELS in 1871 together with CHESTER made a trip southward from Thank God Harbour to the mountains south of the plain around the winter-quarters (Hauge Mts.) during which he could not avoid sighting

the inland ice through the valley south of the mountains (the route of the journey is indicated on his map, though apparently of a somewhat exaggerated length). On the other hand he indicates continuous ice with glaciers on either side of Petermanns Fjord and ice on Petermann Peninsula as well as south and east of Bessels Fjord.

As regards Inglefield Land BESSELS is very unscrupulous. On his map the edge of the inland ice reaches to near Force Bugt, runs at a slight distance from Rensselaer Bugt, and issues a large glacier tongue which almost reaches Marshall Bugt; the highland between Marshall Bugt and Dallas Bugt is ice-covered, and a broad glacier descends near Dallas Bugt. However, during the journeys of the HALL Expedition these features could not possibly be observed, and during the wintering at Life-boat Cove BESSELS made no journeys which entitled him to correct the extension of the edge of the inland ice on Inglefield Land.

Thus it will be seen that BESSELS, in spite of SCHOTT's map of 1867 and HAYES's map from the same year, gives quite a different picture of Inglefield Land than the maps which should be authoritative for that land. In this way there arises a picture of Inglefield Land with two glaciers, one extending towards Marshall Bugt and one towards Dallas Bugt, they recur on NARES's map, whence they pass to the official maps (see i. a. the official Danish map of 1906). Not till 1917 did the two glaciers disappear, and the map was again in accordance with SCHOTT's map of 1867.

DR. PETERMANN'S OPINIONS CONCERNING THE SMITH SUND ROUTE

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Vorgetragen in der Versammlung der Königlichen Geographischen Gesellschaft von London am 23. Januar 1865, unter dem Vorsitz des Sir Roderick I. Murchison.

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4) — Das nördlichste Land der Erde. Mit 6 Karten, s. Tafel 6 und 7. Peterm. Mitt. Bd. 13, **1867**, pp. 176—200.

5) — Spitzbergen und die arktische Central-Region. Including: Dr. Petermanns Vortrag in den Geographen-Versammlung zu Frankfurt a. M. 23. Juli 1865. (cf. also Tafel 3). — Peterm. Mitt. Ergänzungsband IV, Nr. 16, **1867**.

6) — Die grosse Englische Nordpol-Expedition unter Kapitän Nares, 29. Mai 1875—27. Oktober 1876. Mit 2 Karten, s. Tafel 24 und 25. Peterm. Mitt. Bd. 22, **1876**, pp. 456—482.

7) RINK, H. On the supposed Discovery, by Dr. E. K. KANE, U. S. N., of the North Coast of Greenland, and of an Open Polar Sea, &c.; as described in „Arctic Explorations in the years 1853, 1854, 1855". Condensed from the Danish by Dr. SHAW. Journ. R. G. S. **1858**, pp. 272—287. With 1 map.

A synopsis of the history of discovery of the Smith Sund route would not be complete without some mention of the famous German geographer Dr. A. PETERMANN and the numerous articles written by him on the various expeditions along this route, from INGLEFIELD's summer journey to and including NARES's expedition. PETERMANN communicated by letters with HAYES, whom he esteemed higher than did posterity. Dr. BESSELS, leader of the scientific work on HALL's expedition, was one of PETERMANN's pupils, and PETERMANN likewise took part in the discussion of the English plans for NARES's expedition, contributing a fairly long exposé.

[1]) Only the most important articles by Dr. PETERMANN are listed.

PETERMANN always studied with the greatest care the plans for expeditions intending to go north by the Smith Sund route, and when the expeditions returned, he published detailed summaries of their experiences and results, often accompanied by critical remarks of great value. On going through all these articles from 1852—76, we shall find that the views set forth by PETERMANN may especially be grouped around three main points, viz. 1) a sharp opposition against every idea of the existence of an open polar sea; 2) a theory that Greenland extended northward to and beyond the North Pole and onwards to Wrangel Land at the north coast of Siberia; 3) arguments against the suitability of the Smith Sund route for reaching the North Pole as compared with the so-called Spitsbergen route, which according to PETERMANN was the most convenient route towards the North Pole.

As to 1). As regards the theory of an open polar sea PETERMANN (1855, p. 298 ff., and 1867, p. 180) as early as 1852 wrote an article in the Athenaeum on the basis of INGLEFIELD's finding of open water north of his farthest point in Smith Sund. He was very sceptical about KANE's romantic theory and florid descriptions, and he never avoided an opportunity of arguing against his theory of an open polar sea, thus for instance in 1859 on mentioning HAYES's new plans. HAYES, who even to his death believed in the existence of an open polar sea, utilised this theory as a means to arouse an interest in his expedition and unscrupulously called his expedition report "The Open Polar Sea". It was principally Dr. RINK's article in the Geographical Journal (1858)[1]) which knocked the ground from under the feet of this fantastic theory, but it was PETERMANN who in 1876 could write the epitaph of the open polar sea in his article on NARES's expedition (1876).

As to 2). In 1855 PETERMANN started his excellent geographic periodical (Petermanns geographische Mitteilungen). Even the first year it contained a detailed report on KANE's expedition. PETERMANN refers to and quotes what he had written three years before in the Athenaeum as to the supposition of the existence of open water at the North Pole. On p. 300 he especially considers the fact that KANE failed to find drift-wood along the coasts and that the Eskimos living at the coasts of Smith Sund apparently suffered from the want of drift-wood, since their sledges were chiefly made of bone. It was a well-known fact that large quantities of drift-wood originating from the Siberian forests are found along the northern coasts of the Atlantic. The absence of such drift-wood in Smith Sund became of decisive importance for PETERMANN's theory that Green-

[1]) An attempt at a reply to RINK's criticism (cf. HAYES in Proc. Geogr. Soc. London, 1859, Vol. 3, pp. 146—149, and Dr. NORTON SHAW with a letter from Prof. A. D. BACHE in HAYES, "An Arctic Boat Journey", London 1860, pp. xxvii—xxviii) was too badly founded to invalidate RINK's criticism.

land formed a land boundary of the sea north of Siberia right across to Wrangell Land (see Fig. 9). When occasional pieces of drift-wood were found by HALL's expedition, the theory was somewhat modified, it being then suggested that there might be a series of islands extending from Greenland to Wrangell Land, and finally the supposition was set forth that the drift-wood encountered by HALL's expedition might be

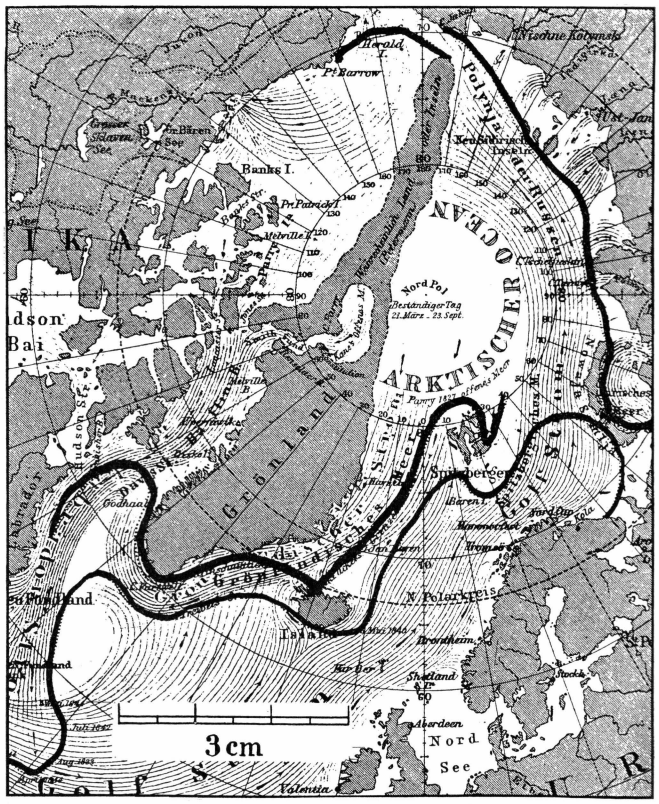

Fig. 9. Map of 1865, showing Dr. PETERMANN's theory about the extension of Greenland (cf. the text).

derived from the Bering Sea, whence it might have been carried by sea-currents around the north of America to Robeson Kanal.

In two articles (1865) PETERMANN sets forth his theory about the geography of the Polar area.[1]) Tafel 5 (see Fig. 9) represents PETER-

[1]) In Petermanns Mittheilungen 1866, pp. 28—29, A. PETERMANN mentions a Portuguese expedition 1660 which is reported to have made a voyage from Japan to Portugal via the Arctic Ocean. The journey is indicated on a map found in Mémoires de l'Academie Royale 1754. In a footnote PETERMANN says (p. 29): "Dieser Karte ist in mehrfacher Beziehung von Interesse; sie lässt unter Anderem Grönland bis zur Bering-Strasse reichen und das ganze arktische Centralgebiet aus einem ausgedehnten Meere bestehen. A. P."

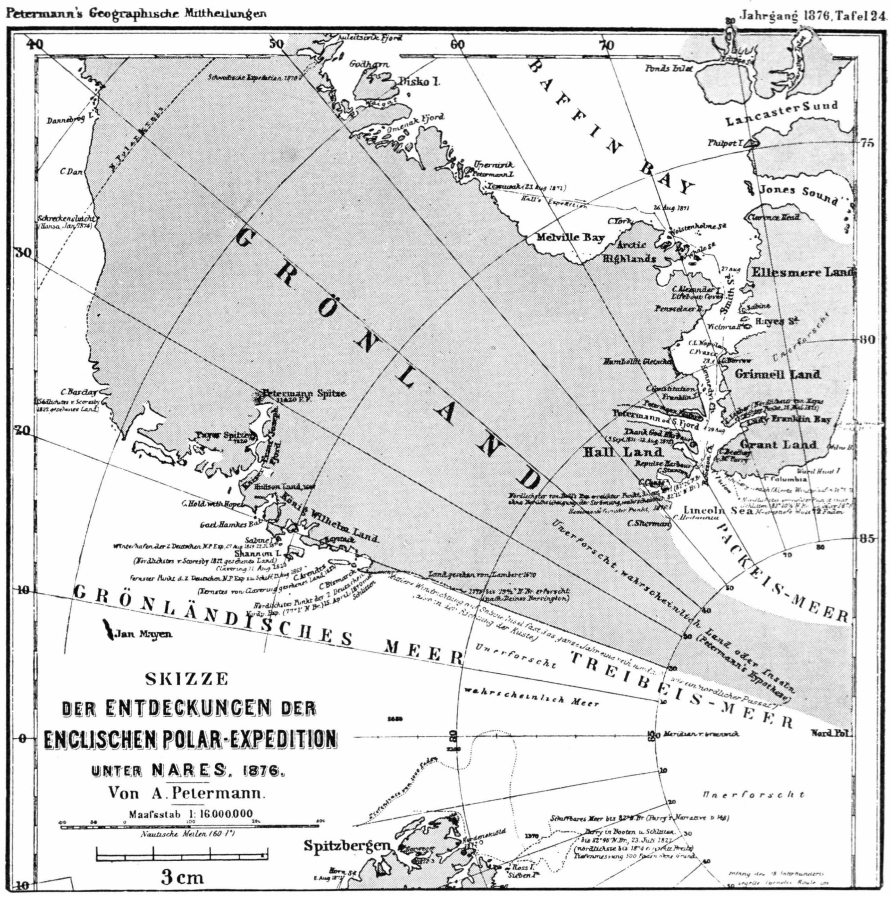

Fig. 10. Map showing PETERMANN's theory after NARES's expedition.

MANN's North Pole map, with land indicated from Greenland to Wrangel Land, and the Gulf Stream continuing along the coast of Siberia to Wrangel Land, while Smith Sund appears on the map as a closed bay. It is true that this map had to be modified at different points after NARES's expedition (see Fig. 10), but PETERMANN maintained the theory in its main features, and it came to play an important part during the subsequent years, even though after LOCKWOOD's discoveries it was further modified (see Fig. 12), and not till 1900, when PEARY travelled around the north of Greenland, was it definitely abandoned.

As regards the arguments in favour of the Spitsbergen route as the most suitable and easiest route to the North Pole, PETERMANN contributed largely to stimulate the general interest, which i. a. resulted in the first and the second German Expeditions, to Franz Joseph Land and East Greenland respectively.

THE BRITISH ARCTIC EXPEDITION 1874—76 UNDER NARES

(Cf. Pl. 4).

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Discussions and Preparations.

The British Navy, which after the return in 1854 of the much criticised BELCHER expedition and the end of the Crimean War had lost its leading position in polar exploration, numbered men who during

their youth had served in the Arctic and still took a great interest in the North Pole problem. With the greatest attention these men watched the American expeditions which pushed constantly farther northward along the Smith Sund route, as also PETERMANN's recommendation of the Spitsbergen route as the easiest way to the North Pole. As a testimony to this interest CLEMENTS MARKHAM's book "The Threshold of the Unknown Region" (London 1873) was published. The book, which appeared in several editions, was a strong appeal to the British Navy to resume its work in the Arctic service.

It was written after Captain TYSON and his ice-floe party had been saved but before any news had been obtained as to the fate of the ship the "Polaris" (pp. 204—05). Although MARKHAM gives much credit to the American explorers, we understand from his book that he regards them more or less as adventurers; and he is of opinion that ships of the Navy and Naval officers will be capable of much greater achievements. Thus he says (1873, p. 195): "Considering the inadequate means at his disposal, and the absence of naval discipline, Captain Hall's success is very remarkable, and shows how much important work may almost certainly be done by a thoroughly equipped naval expedition."

The Navy's interest in entering again into Arctic service appears from the following passage (1873, p. 272): "The navy of England cries not for mere war to gratify its desire for honourable employment or fame. There are other achievements as glorious as a victorious battle; and a wise ruler and a wise people will be careful to satisfy a craving which is the life-blood of a profession."

As regards Arctic questions the English opinion had a great respect for Dr. PETERMANN, but held an independent view deviating from that of PETERMANN. This was clearly expressed in MARKHAM's book, where it is said as follows (1873, p. 126): "The North Polar land, if it exists, will probably be found in islands stretching north of the extreme north point on the west side of Kennedy Channel; and this is one reason why the route by Smith Sound should be selected for a Government Arctic Expedition."

And p. 260 MARKHAM says as follows: "As routes by Behring's Strait and the Siberian seas are left out of the question for the present, as regards an English expedition, the number of routes by which the threshold of the unknown region may be passed is reduced to two—namely, the sea between Greenland and Novaya Zemlya, usually called the Spitzbergen route, and Smith Sound at the head of Baffin's Bay."

The Smith Sound route was strongly advocated by MARKHAM, i. a. he says (p. 262): "The Spitzbergen route cannot be recommended, because there is no sure prospect of exploring an extensive unknown area, and because no valuable results in geology, botany, ethnology, or

geodesy could be obtained under any circumstances." And p. 270: "By the Spitzbergen route there is the bare chance of doing little. By the Smith Sound route there is the certainty of doing much."

Moreover MARKHAM found a strong support of his view in KOLDEWEY, whose opinions he quoted against PETERMANN's view, for instance pp. 153—154: "One can hardly resist the conviction that the hope of attaining the North Pole by ship, or of finding an open sea around the Pole, are alike among the most improbable of things. . . .

'I confess that I myself was misled by representations in Dr. Petermann's 'Geographische Mittheilungen', and held it to be at least possible, by following a line of coast, to penetrate by ship far into the central Arctic regions, and then certainly to make one's way to the Pole. A winter in East Greenland, the most careful observation of those mighty masses of ice, their movements and formation, and of the whole conditions of temperature, and finally the careful study of Arctic literature in its original form, and not by means of one-sided extracts, have radically cured me and all my companions of this idea . . .

'If its principal object is to be the nearest possible approach to the Pole, I am quite of Osborn's opinion, that the best way appears to be through Smith Sound."

After quoting some remarks by Admiral Sherard Osborn as to the great value of Captain KOLDEWEY's opinion, MARKHAM adds (p. 154):

"The opinions of all English Arctic authorities in favour of the route for exploring the Unknown Region by way of Smith Sound, are thus strongly concurred in by the principal German authority."

MARKHAM recommends a naval expedition with two strongly built steamers and a large crew (see i. a. pp. 206—207). It further appears from the Appendix (p. 321) that in 1872 the Royal Geographical Society appointed an Arctic Committee to prepare the plans for the expedition. This committee was supported from various learned societies, and towards the end of the year the committee brought the matter before the Government (p. 322). The expedition started out in 1875 under forms fully worthy of the grand traditions of the earlier achievements of the British Navy in the Arctic.

As evidence of the great care with which the expedition was prepared may be mentioned CLEMENTS R. MARKHAM's Preface to "A Selection of Papers on Arctic Geography and Ethnology. Reprinted, and presented to the Arctic Expedition of 1875 by the president, council, and fellows of the Royal Geographical Society" (London, 1875). The book comprises two parts, one on geography and one on ethnology. Part I (Geography) contains a brilliant article by Dr. ROBERT BROWN, entitled "On the Physical Structure of Greenland" (pp. 1—73). It gives an excellent picture of our knowledge of the geography of Greenland

at that time. Dr. BROWN himself had travelled in West Greenland, he was a friend of and greatly influenced by Dr. RINK, and as a consequence hereof his view of the inland ice was fully up-to-date. He records briefly the journeys which up to that time had been made to and on to the inland ice. He deals at some length with the northern extension of Greenland, which was naturally a point of great interest to NARES's expedition. He regards KANE's and HAYES's idea, that Greenland ends in an "open Polar Sea", as "unsupported and unreasonable", and says (p. 25): "That it is a collection of islands bound together by the inland ice and its outpouring glaciers I have already ventured to state my belief as being a well-observed fact, and that, in a collection of broken islands, it extends throughout the Arctic Polar basin perhaps on to Wrangell's Land is, I further believe, not at all improbable." And on p. 70 he says: "Most likely it will be found that Greenland will end in a broken series of islands forming a Polar archipelago. That the continent(?) is itself a series of such islands and islets—consolidated by means of the inland ice—I have already shown to be highly probable, if not absolutely certain, as Giesecke and Scoresby affirmed (p. 25). It is not likely that the northern portion will be widely different."

Dr. BROWN further points out that the musk-ox lives north of Smith Sund, but is unknown south of Wolstenholme Sund; the glaciers of Melville Bugt seem to have formed an impassable barrier to the progress of the animal. As it is also found on the east coast of Greenland about 74° N. lat., it must have migrated around the north of Greenland. "How did it come across, for across Greenland it must have come?" (p. 71). It could not have travelled across the inland ice, it must necessarily have passed over dry land, where willows or other Arctic dwarf plants, on which it subsists, could be found. It might easily travel short distances on frozen ice from island to island and thus have travelled along the north of Greenland. The same applies to the lemming.

He further discusses the possibility of an Eskimo migration around the north of Greenland, and says (p. 72): "If it should be found that the Greenland coast trends on the east towards the west and on the west towards the east, as there is some ground for believing, it is just possible that the English Arctic Expedition might be able to double the northern extremity of the continent, more especially if a sea comparatively free of fixed ice (I will not venture to say "an open Polar sea") be found to lave its northern shores."

In the same book (pp. 80—96) Dr. RINK's criticism of KANE's book is reprinted from the Journal of the Royal Geographical Society, Vol. xxviii (1858). RINK mentions the Open Polar Sea discovered by MORTON, and says that it probably refers to one of the many places

(stream-holes) along the Greenland coasts which do not freeze even in the severest winter on account of the strong current (pp. 82—83).

The book further contains a reprint from the Journal of the Royal Geographical Society, Vol. XVIII (1858) of an article by the famous Russian Polar explorer Admiral Baron von Wrangell entitled "On the best Means of Reaching the Pole" (pp. 75—79). The article contains the following statements (p. 78 and 79):

"The utmost limits of the coast of Greenland towards the north remain yet unknown; but the meridian direction of its mountains and coasts allows us to suppose that, in proceeding along them, it is possible to approach the Pole nearer than from any other direction or even to reach that point." . . .

"If the most northern limits of Greenland, or the Archipelago of Greenland Islands, should be found at too great a distance from the Pole, and the attainment of that point seem impossible, the expedition might at any rate draw up the description of a country hitherto absolutely unexplored, and would, even by so being, render an important service to geography in general."

The large English expedition under the leadership of Nares, who as a young man had been a member of Belcher's expedition, was a Navy expedition, with all the power and one-sidedness which were a consequence of this arrangement. At the present time it is a matter for surprise that this large and well-equipped expedition was not joined by any real scientists.

The Aims of the Expedition.

The command of the expedition was placed in the hands of one of the ablest men of the British Navy, Captain G. S. Nares, and two large and strongly built steamers, the "Alert" and the "Discovery", were placed at his disposal. The expedition numbered 120 members, including a Danish interpreter, N. C. Petersen, and the Greenlanders Frederick and Hans Henrik[1]), the latter well known from Kane's, Hayes', and Hall's expeditions.

[1]) Hans Hendrik gives a good characteristic of Nares, saying as follows (Geogr. Magazine, April 1878, p. 91): "The Captain of the other vessel kept a good lookout for the road; he went up the hills incessantly without being tired. At length we started, although it appeared as if there was no thoroughfare in the direction we were to go. However, farther off there was more open water, and this we reached. During one day and night we traversed a tolerably ice-free sea, but then again had to force our way close along the shore, going on whenever the pack retired a little. The Captain of our other ship was beyond all praise, one might think he neither slept nor ate. Sitting in his look-out in the mast he sometimes took his meal there. On account of his extraordinary skill in ice-navigation he was our leader."

As will appear from the Sailing Orders, dated 25th May, 1875 (NARES 1878, Vol. I, pp. xi—xviii), the expedition was very carefully planned, irrespectively of the costs. NARES was free either to go northward along the west or the east coast of Smith Sund to select his winter quarters. He was to consider whether to leave a depot of some six months' provisions, which were to be available for the crew in case they should have to return by boat. Instructions were given as to how the two ships were to be placed in relation to each other during the wintering, and in case the ships had to be left, the members of the expedition were to go to the mouth of Smith Sund not later than the first week of September, 1878, where a relief ship would be directed to fetch the crew. Should the season of 1875 be so unfavourable as to prevent the expedition from penetrating beyond the 79th parallel, it was left to NARES to decide whether the ships were to winter there, or return to England and renew the attempt the following year.

The aim and objects of the expedition will appear most clearly from a passage in the Introduction to NARES's book, written by G. H. RICHARDS, who says as follows (NARES 1878, p. xxxiv):

"The general plan of operations had been virtually long decided by consent of all competent authorities. The first object was, if possible, to reach the Pole. Many other subordinate and collateral objects there doubtless were, both of a geographical and a purely scientific kind, but the main object was the attainment of the highest possible northern latitude."

The Progress of the Expedition.

The two ships, "Alert" and "Discovery", started from Portsmouth on May 29th, 1875, arriving at Godhavn on July 6th. They remained here till July 15th to load provisions and coal from the depot ship "Valorous", which had arrived a couple of days before. The ships now carried provisions for three years, and proceeded northward, calling at various Danish settlements, finally leaving Upernavik on July 22nd. Three days later Kap York came into sight, and the first depot was established on Carey Øer. On the 28th July they passed Kap Alexander, and a visit was paid by boat to Polaris House. On July 29th the ships headed towards Cape Isabella in order to go northward along the coast of Grinnell Land, which a continuous westerly wind kept fairly free of ice, though otherwise Kane Bassin was entirely ice-filled. Having established depots in a couple of places along the coast of Grinnell Land, the ship reached Kennedy Kanal on August 21st. On August 23rd the expedition reached Hall Bassin and placed a depot in northern Washington Land before heading westward again, and on August 25th the "Discovery" took up her winter quarters at the north side of Lady

Franklin Sound, while the "Alert" continued her way up through Robeson Kanal, reaching Cape Sheridan at the northeast coast of Grant Land on September 1st. As further progress northward was impossible, it was decided that the ship should remain there for the winter.

In the spring of 1876 a number of journeys were planned (cf. NARES 1878, Vol, I, p. 255), viz. a journey along the north coast of Grant Land (to 82°16′ N. lat., 86°33′ W. long.), to be led by Lieutenants ALDRICH and GIFFARD, and a journey northward over the ice of the Polar basin with sledges and boats under the command of MARKHAM; they pushed northward as far as 83°20′26″ N. lat., c. 83° W. long. (which was the polar record). These two journeys started from the "Alert" and did not touch Greenland.

From the "Discovery" three parties were sent out, namely, one party under the leadership of BEAUMONT, who via the "Alert" travelled across Sherard Osborn Fjord to Wulffs Land; a second party under FULFORD was to ascertain whether Petermanns Fjord was a sound; and finally ARCHER explored Archer Fjord south of Lady Franklin Sound.

Thus only the journeys led by BEAUMONT and FULFORD came to be of importance for the geography of Greenland. BEAUMONT succeeded in discovering and mapping the coast of Greenland from Kap Stanton, the northernmost point of the Hall Expedition, to Kap May, though, however, the interior of St. George Fjord and Sherard Osborn Fjord were not mapped, whereas Beaumont Ø, the coast round Kap Britannia, and Stephenson Ø were inserted on the map. FULFORD clearly ascertained that Petermanns Fjord to near its mouth was filled with a glacier. Further, he made some corrections in the map of the Hall Expedition, so it may be said that the Greenland coast from northern Washington Land to Wulffs Land was re-mapped. Corrections in the map were likewise made from Kap Madison to Kap Constitution on Washington Land, and Hartstene Bugt between Kap Alexander and Kap Ohlsen.

Point 25 of the Sailing Orders runs as follows (NARES 1878, I, pp. xvi—xvii): "25. Although the expedition intrusted to your charge is one of exploration and discovery, it must be kept in view that detailed surveys are unnecessary. The requirements of hydrography and geography will be provided for if the prominent features and general outline of the shores are sketched in as faithfully as circumstances will admit; and to ensure their recognition by future explorers. In the determination of the astronomical position of the principal points, no doubts should be permitted to exist as to the fidelity of the results that may be arrived at, so as to ensure confidence and respect." In spite of this, however, it must be said that NARES's expedition contributed greatly to a more correct mapping of the Smith Sund route than was previously known.

Altogether it must be said that NARES's expedition has given us a fairly correct idea of the possibilities for future exploration afforded by the Smith Sund route. After this expedition every idea of the existence of an open polar sea had to be abandoned. The route had been mapped as far as 83° N. lat. It was known that the narrow straits Smith Sund—Kennedy Kanal—Robeson Kanal are rather frequently free of ice in the late summer, whereas the ice will remain all the year round in Kane Bassin and Hall Bassin, and especially that the Lincoln Hav, which on NARES's expedition was called "The Paleocrystic Sea", is so closely packed with ice that navigation farther northward will hardly ever be possible.

As regards the technique of the sledge journeys the expedition meant no progress, rather the opposite; the experiences gained during KANE's, HAYES's, and HALL's expeditions of the use of Eskimos with dogs on sledge journeys, was not practically utilised. They travelled by means of heavy drag-sledges drawn by a number of men, and during their dash northward into the polar basin they even carried two boats. Naturally this travelling method greatly reduced the efficiency of the journeys. The energy displayed in order to reach so far with the heavy and clumsy sledges is surprising and admirable.

The expedition was especially handicapped by scurvy, which attacked nearly half of the members of the expedition and on BEAUMONT's journey along the north coast of Greenland caused the death of two members of his party. Curiously enough the expedition secured but little game; it is especially surprising that no greater number of musk-oxen were killed or sighted from Discovery Harbour, since later expeditions found musk-oxen in abundance round that harbour; on the other hand later expeditions encountered no musk-oxen on Hall Land or Nyeboes Land, where HALL's expedition found them to be fairly numerous.

Not only geographically, but in regard to a number of other scientific problems also the expedition contributed with large results, especially from Grant Land, where both ships had their winter quarters.

On July 31st the "Alert" left her winter quarters, and on August 11th she was near the winter harbour of the "Discovery". The "Discovery" did not get free from the ice till some few days later, when the ships sailed southward through the Kennedy Kanal without meeting any great obstacles. Kane Bassin was filled with ice, but at the end of August the ships reached Smith Sund and on September 8th they passed Victoria Head on Base Peninsula. The ice difficulties had now been largely overcome. On September 9th the ships passed Cape Isabella, and after calling at Godhavn and Egedesminde arrived safely at Portsmouth on November 2nd.

General Results.

NARES's expedition was a disappointment to his contemporaries. It terminated a twenty-four year period from 1852 (INGLEFIELD) to 1876 during which the Smith Sund route had been discovered and explored. NARES's expedition undertook a highly needed revision of the maps of the earlier expeditions[1]), giving the correct picture of the three narrow straits (Smith Sund, Kennedy Kanal, and Robeson Kanal), which are often passable, and the two more ice-filled basins, Kane Bassin and Hall Bassin. Finally, every thought of the Robeson Kanal as a strait which continued far northward with land on either side right to the North Pole had definitely to be abandoned, since ALDRICH on his journey ascertained that Grant Land did not extend so far northward as supposed, and BEAUMONT found that the north coast of Greenland extended in a north-easterly direction.

Thus the expedition had reached not the "open polar sea", but what NARES termed "the palæocrystic sea", a sea which was constantly covered with ice, not only large ice-floes, as north of Spitsbergen, but especially thick ice, which rendered all navigation northward impossible. NARES concludes his lecture, "On the Navigation of Smith Sound as a route to the Polar Sea", London 1877, in the following way (p. 281): ". . . I am afraid that great difficulty will be found in advancing much nearer to the Pole by the Smith Sound route than has already been attained, either in a ship, or by boat, or sledges, unless, indeed, the coast of Greenland—contrary to my expectations—trends to the northward beyond lat. 83°20′ N."

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[1]) In the Admiralty, London, a map is found (copy in the Royal Library of Copenhagen) marked: »Admiralty. Original Document to be returned to the Curator, Chart Branch, Hydrographic Department«, and entitled: »Arctic Sea northward from Baffin Bay — Smith Sound — Kennedy, & Robeson Channels. Chiefly from discoveries made by the American expeditions under Drs. Kane & Hayes 1854—61 and in the U. S. S. Polaris, under command of C. F. Hall, 1871—72, as derived from charts published by the U. S. Hydrographic Office, April 1874. A part of Smith Sound from the observations of Captn. E. A. Inglefield, R. N. in 1852. On this map the geographical results of NARES expedition are inserted, so that it gives a clear impression of the corrections in the coast-line made by this expedition.

The above-mentioned map contains an inset map shoving the coast of Greenland from a little south of Kap Alexander to a little north of Littleton Ø. On another copy of the inset map which is entitled: »Port Foulke and Vicinity — Winter Quarters (1860—61) of Arctic Exploring Expedition under Dr. I. I. HAYES from original chart projected for Smithsonian Institution, U.S., by Charles A. Schott, U. S. Coast Survey, 1865«; it is added in handwriting: »Correction by G. S. Nares, Captain RN. 19th Dec. 1877.« and various corrections with remarks on the basis of observations for longitude made by the expedition on Littleton Ø.

In the ensuing discussion RICHARDS, one of the men who had most strongly advocated the Smith Sund route, admitted that this route had now to be regarded as closed for ships to the Pole, and that accordingly it would seem that the Spitsbergen route, as supposed by PETERMANN, was the most suitable route. The Spitsbergen or, more correctly, the East Greenland route was now preferred by CLEMENTS R. MARKHAM also (1877, pp. 536—555).

The telegram[1]) sent home by NARES as a resumé of his experiences as to the Smith Sund route including the woods: "Pole impracticable", was never forgotten. Thus PETERMANN writes (1876, p. 457):

"Trotz dieser grossartigen und umfangreichen Bestrebungen ist das Englische Publikum enttäuscht und unzufrieden mit der Expedition, die 1.000.000 Thaler gekostet haben soll, und mit Recht. Denn die Urheber hatten dem Publikum nicht bloss weis gemacht, dass diess der beste Weg zum Nordpol sei, sondern dass auf diesem Wege der Nordpol von dieser Expedition auch wirklich erreicht werden würde.

"Im Allgemeinen freilich sind geographische Unternehmungen fast immer enttäuschend, das Publikum erwartet zu viel, und weil es zu viel erwartet, sollte man nie Etwas versprechen, nie Etwas in Aussicht stellen, auch wenn man das höchste Ziel verfolgt. Aber dann lassen sich auch die mehr oder weniger beträchtlichen Mittel oft nicht flüssig machen. Um eine solche grossartige Expedition, die 1 Million Thaler kostet, zu Stande zu bringen, musste man ein dem Gross-Publikum greifbares, in die Augen fallendes, Ziel wie den Nordpol vorführen.

"Und nun kommt diese grosse Expedition zurück, und ist kaum 70 nautische Meilen weiter vorgedrungen, als die vorhergehende halbverunglückte Expedition Hall's, die ihrerseits wieder nicht weiter vordrang als 36 naut. Meilen gegen Dr. Hayes, der mit ganz geringen Mitteln schon im Jahre 1861 bis 81°35′ N. Br. gekommen war. Das war freilich bitter, liess sich aber nach den vorausgegangenen Erfahrungen nicht anders erwarten."

At present, when the general disappointment because the expedition failed to reach the North Pole and did not push very far beyond the farthest north of earlier expeditions belongs to history, there remains the picture of an expedition which was an immense undertaking for its time, with great geographical results and with scientific results which remained unaltered for decenniums without proving out-of-date. The British Navy had resumed its place as the leading element within Polar exploration. However, this expedition brought to an end the achievements of the British Navy in the North Polar regions.

[1]) "Arrived all well. Pole impracticable. No land to northward. Otherwise voyage successful. Highest latitude, 83.20. Alert proceeds to Queenstown; myself to London, via Killarney." (Published in the press, October 28, 1876.)

Not many years earlier (on June 26th, 1871) Mr. GRINNELL, at a meeting in the American Geographical Society presented Captain HALL with the flag which, in 1838, had been with WILKES to the Antarctic regions, and which had since then been in the northern Polar seas with DE HAVEN, KANE, and HAYES. "Now I give it to you, sir," said Mr. Grinnell: "take it to the North Pole, and bring it back in a year from next October." (MARKHAM 1873, p. 198). When NARES started out, it was likewise generally hoped that he would reach the North Pole. The later expeditions were more cautious, giving no promises of reaching the North Pole. A period in which the aim was to beat the polar record, now began.

Journeys and Discoveries in Greenland.

BEAUMONT's journey is described in great detail in "Journals and Proceedings, etc." (London 1877, pp. 338—394), and his travelling routes and geographical discoveries are inserted on the official map of the expedition (Pl. 2, to face p. 38), which is also reproduced in "Voyage to the Polar Sea" (NARES 1878). Facing p. 358 a special map on a greater scale, showing BEAUMONT's discoveries, is likewise given. In the configuration of the coast and the presentation of the relief there are some minor discrepancies between the two maps (to face p. 38 and p. 358). The map in Pl. 4 is based on the map facing p. 38, since this must be regarded as the official map of the expedition, though that facing p. 358 is more complete at certain points. Several well executed landscape sketches accompany BEAUMONT's report. His travelling report is mostly a narrative of the progress of the expedition and the very difficult conditions under which it took place and a description of the disease which gradually affected the participators of the journey to an increasing degree.

It was mostly the members on board the "Discovery" who made the journeys along the Greenland coast. The main journey, however, was started from the "Alert", since Lieutenant BEAUMONT and Dr. COPPINGER arrived there on April 16th, having left the "Discovery" on April 7th, 1876. On April 10th Lieutenants RAWSON and EGERTON had started on a reconnaissance trip to Greenland, reaching the coast at Repulse Havn, whence they proceeded for some distance northward along the coast. On April 18th they returned to the "Alert", bringing the good news that ice conditions were altogether favourable along the Greenland coast.

On April 20th BEAUMONT and COPPINGER started out, each with an 8-man drag-sledge, accompanied by EMERSON with a 5-man drag-sledge. Next day Lieutenant RAWSON followed, likewise with a 5-man drag-sledge.

On April 28th they struck the Greenland coast near Repulse Havn; from this point EMERSON returned to the "Alert" on April 29th.

A little north of the point reached by RAWSON and EGERTON on their reconnaissance trip conditions grew very difficult and nearly hopeless, it being very toilsome to get the heavy drag-sledges across the huge pressure ridges and snow-drifts which are so characteristic of this coast.

On May 5th Dr. COPPINGER returned back from Kap Stanton. At that time there was no sign of disease among the men of the party, but already the next day the sailor HAND's legs grew stiff, and his case rapidly showed unmistakable signs of scurvy. From Kap Stanton to Kap Bryant ice conditions improved somewhat.

On May 10th, however, BEAUMONT realised that RAWSON had to go back and that HAND should join this party.

A mountain, named Mt. Wyatt after Lieutenant WYATT RAWSON, was ascended by BEAUMONT and RAWSON. It is stated to be 2050 feet.

On May 11th RAWSON started back with a party of three men and the sick HAND. That day BEAUMONT reached Kap Bryant and for the first time had a view into St. George Fjord, whose head, however, he failed to discern.

However, to BEAUMONT's party the prospects now seemed serious, in that several of the men showed signs of scurvy.

Section 9 of NARES's orders to BEAUMONT, dated April 20th, 1876, runs as follows (Journ. Proc. 1877, p. 339): "9. Should you discover any deep inlet, which in your opinion might prove to be a channel affording an easier journey to the eastward than the coast line of the Polar Sea, it is desirable that it should be explored this year."

This remark by NARES is very interesting, since it shows that BEAUMONT was to explore a channel, if any such existed, leading to the east coast.

To understand this it must be borne in mind that at that time it was the general opinion (cf. BROWN, 1875, in MARKHAM: A Selection of Papers, etc.) that Greenland extended across the north pole to Wrangell Land, but that channels might be supposed to exist, by way of which the musk-ox and other animals and possibly the Eskimos also had travelled to the east coast.

P. 348 BEAUMONT explains why he did not find it advisable and possible to travel into Sherard Osborn Fjord and St. George Fjord, whose head was not visible either. However, judging from the ice conditions he did not believe that any of these two large fjords formed channels leading to the east coast.

On account of the scurvy, which attacked most of his men, and the continuous bad weather with fog and snow, BEAUMONT only pushed on in the hope of reaching Kap Hooker. His journey across the mouth

of Sherard Osborn Fjord, with calls at Kap Cleveland and Reef Ø, was a march of sick men, who by exerting their utmost forces and energy made their way laboriously through the hopelessly deep snow.

On May 21st BEAUMONT with one man reached the coast of Wulffs Land, but was unable to ascend the hills there, and on May 23rd the return journey was started. At Dragon Pt. BEAUMONT ascended the mountain south of the cape, Mt. Windham Hornby, whose height is stated to be 3700 feet. From this point he had a good view across the regions he failed to visit. At Dragon Pt. a large cairn was built, in which were deposited a detailed report and a sketch map, which were later brought home by the Second Thule Expedition 1916—18.

On June 3rd the party was back at Kap Stanton. At this time only BEAUMONT himself and one man of the party were still in good health. On June 10th they reached the depot at Repulse Havn after passing a hole with open water near Blackhorn Cliff. On June 24th they arrived at Newman Bugt, where they caught sight of a dog-sledge: it was RAWSON, COPPINGER, and the Greenlander HANS who had set out from Polaris Havn on a rescue expedition, since according to the plan BEAUMONT was to be back at this point on June 15th. The two parties now travelled together across the plain towards Polaris Havn. However, they made only slow progress, and on June 28th the Greenlander HANS and Dr. COPPINGER started with the two men most severely ill. Next day the sailor POUL died on their arrival at Polaris Havn.

On June 30th HANS returned to BEAUMONT's party with a dog-sledge, and on July 1st all at last reached Polaris Havn.

During BEAUMONT's absence various parties setting out from the "Discovery" reached Greenland. Thus on May 7th FULFORD with one lieutenant and eleven men and an iceboat left the ship bound for Polaris Havn; on May 10th Captain STEPHENSON started out, and both parties arrived at Polaris Havn on May 12th. Next day a memorial tablet of metal was erected on HALL's grave and a ceremony was held. On May 15th COPPINGER and EMERSON arrived with eight men and two sledges from Repulse Havn, and on May 17th STEPHENSON started back to the ship with a party numbering 30 men, and arrived at the ship next day. On the same day FULFORD and COPPINGER set out for Newman Bugt to establish a depot there to support BEAUMONT's return journey. On May 21st he was back at Polaris Havn, and the following day they started into Petermanns Fjord.

Petermanns Fjord was carefully explored in the period from May 22nd to June 7th. They found the fjord to be almost occupied by a floating glacier, of which both FULFORD and COPPINGER give good descriptions. Finally they visited the depot at Kap Morton, and on June 7th the party was back at Polaris Havn. The journey into Petermanns Fjord

is described by COPPINGER (in NARES. A Voyage to the Polar Sea, Vol. II, App. XVI, pp. 346—351; and in: Journals and Proceedings, etc. 1877, pp. 444—446, with two drawings entitled "N. E. Shore of Petermann Fiord from camp at glacier on S. W. shore" and "S. W. Shore of Petermann Fiord from camp of 25th May, 1876", and "Plan of Petermann Fiord. The coast line is taken from Lieutt. Fulford's Chart") and by FULFORD in a diary containing also angle measurements (Journals and Proceedings, etc., pp. 437—443). The Admiralty further possesses a chart entitled "No. 8 H. M. S. "Discovery". Chart of Petermann Fiord as explored by Lieutt. Fulford May & June 1876", stamped: Hydrographic Office Dec. 21, 1876, and marked: A 5056, Shelf Peterman Fiord Tv. (a copy of this map is found in the Royal Library of Copenhagen). Several of the names found on this map were used by me on my Map of North Greenland (1932).

Since BEAUMONT did not arrive at Polaris Havn on June 15th, as expected, RAWSON and COPPINGER went to Newman Bugt, where they met BEAUMONT's party in a very bad state on June 24th.

On July 12th FULFORD with two men started for the "Discovery", and arrived there on July 15th. Next day STEPHENSON set out with one sledge and six men, arrived at Polaris Havn on July 19th, and stayed there till July 29th. BEAUMONT and COPPINGER with five men now stayed at Polaris Havn. They were to try to cross Hall Bassin at the beginning of August. For various reasons they were unable to start till August 8th. The ice was in strong motion, drifting southward, yet they succeeded in getting ashore on Grinnell Land on Augst 11th, and on August 14th they were on board the ship.

As will be seen from the above, several parties including a large number of men set out for Greenland from the two ships of the NARES Expedition. On account of the primitive travelling method (drag-sledges) and scurvy they usually travelled very slowly, and this was also the reason why BEAUMONT's party did not push very far eastward. However, the coasts from Wulffs Land in the northeast to Kap Morton in the southwest were covered by their journeys and it was ascertained that Petermanns Fjord was almost entirely filled with a glacier. Owing to the unfavourable conditions BEAUMONT was only able to state that St. George Fjord and Sherard Osborn Fjord extended far southwards. No attempt was made to explore the interior of Newman Bugt. Several of the parties made cartographical surveys partly along the coasts partly from the sea-ice, and important corrections were made in the maps of the HALL Expedition; BEAUMONT likewise discovered and mapped a considerable part of the coast east of Kap Stanton.

THE UNITED STATES EXPEDITION TO LADY FRANKLIN BAY, GRINNELL LAND, 1881–84

Leader: A. W. GREELY

(Cf. Pl. 7).

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On the occasion of the international polar year 1881—82 the United States of America decided to establish a station for the purpose of scientific observation north of the eighty-first degree of north latitude at or near Lady Franklin Bay, where the "Discovery" had its winter-quarters during NARES's expedition. A military expedition was sent out, and on March 11th, 1881, First Lieutenant A. W. GREELY was charged with the command of the expedition, which numbered 25 members (GREELY, 1888, p. 97).

The expedition left St. Johns, New Foundland, on July 7th, 1881, on board the vessel "Proteus". During the upward journey the ship called at Godhavn, Ritenbenk, and Upernavik, and after a successful journey she passed Kap York on July 31st. She proceeded northward, unobstructed by the ice, and on August 4th arrived at Lady Franklin Bay. Here, however, the ship encountered some ice, so not till August 12th did she cast anchor at the winter quarters of the "Discovery", and the unloading was commenced. It was completed on August 19th, but the ship remained in the neighbourhood until the 26th, when she returned southwards. The wintering station was named Ft. Conger, and the expedition immediately set about exploring the region round the place.

Greenland was not visited till the spring of 1882, when on March 1st LOCKWOOD started for Thank God Harbour, travelled round Polaris Promontory, and returned to Ft. Conger on March 11th. Subsequently various members of the expedition visited the Greenland coast in order to establish depots to support LOCKWOOD's planned journey along the north coast of Greenland.

On April 3rd, 1882, LOCKWOOD, accompanied by 10 men, started from Ft. Conger with one dog-sledge and three drag-sledges. The party reached Kap Bryant on April 29th, whence LOCKWOOD, BRAINARD, and the Greenlander FREDERIK proceeded with one dog-sledge towards Kap Britannia, the easternmost point seen by BEAUMONT in 1876. They reached Kap Britannia on May 4th, and next day LOCKWOOD ascended the cape (588 m) in order to make observations. Subsequently the party continued their journey along the north coast of Greenland, reaching the north point of Lockwood Island (83°23′8″ N. lat., 40°46′ W. long.) on May 13th. Next day LOCKWOOD made observations from a mountain (616 m). On May 15th the party started the return journey, reaching Kap Britannia on May 20th and Kap Bryant on May 24th, where they remained till May 26th. On June 1st they were back at Ft. Conger.

As no ship arrived in the course of the summer to fetch the expedition, it was forced to spend a second winter in the place. Next spring LOCKWOOD contemplated travelling northward again along the coast of Greenland to reach even farther. In the days March 10th—17th he made a trip to Kap Sumner on the Greenland coast to establish a depot there. On March 27th he set out from Ft. Conger with two dog-sledges on the planned journey northward; however, he was stopped by open water at Blackhorn Klint, and returned to Ft. Conger on April 12th. He much desired to make a further attempt, but GREELY objected to it owing to the advanced season. LOCKWOOD then made a long sledge journey through the valleys between Grant Land and Grinnell Land to Greely Fjord.

Since this summer, too, no ship arrived at Lady Franklin Bay, it was decided that the expedition should go southward by boat. The winter was spent at Cape Clay on Bedford Pim Island in Smith Sund, and here gradually eighteen members of the expedition died. Finally, on June 22nd, 1884, a ship arrived to rescue them. One further member died during the return journey to America, so that 19 out of the 25 original members of the expedition had died. Among them were two of the members of the sledge journey to Lockwood Ø, namely the Greenlander F. T. CHRISTIANSEN, who died on April 5th of starvation, probably in connection with scurvy, and LOCKWOOD, who died on April 9th of scurvy. The third member of the party, BRAINARD, survived the expedition.

This large expedition, which ended with one of the great catastrophes of polar history, only contributed to the exploration of Greenland by LOCKWOOD's journey along the north coast in 1882. On the other hand this journey was of the greatest significance and was carried through with extraordinary energy; and with that journey LOCKWOOD inscribed for ever his name in the exploration history of Greenland. His journey was made known through his diary, which was published in extenso.

In order fully to comprehend the geographical results of the journey it will be necessary to take a general view of the available literature on it. In November, 1884, that is to say, very shortly after the return of the expedition, GREELY published a brief report, entitled "Recent Discoveries in Northern Greenland and in Grinnell Land" (Proc. Roy. Geogr. Soc. Vol. vi, 1884). Two years later GREELY's detailed report on the expedition appeared ("Three Years of Arctic Service", Vols. I—II, London 1886). Chapter 3, "Greenland" (pp. 25—35), contains a brief description of Greenland. Chapters 23—35 (pp. 295—350) contains a narrative of LOCKWOOD's journey from Ft. Conger along the north coast of Greenland to Lockwoods Ø and back. Finally, Chapter 27 "Summer Explorations" (pp. 366—416) deals with various questions concerning Greenland.

In 1888 GREELY published a "Report on the Proceedings of the United States Expedition to Lady Franklin Bay, Grinnell Land". First a report is given on the progress of the expedition from month to month, including LOCKWOOD's journey in 1882 (pp. 23—38) and his unsuccessful journey in 1883 (p. 40). Appendices 51 and 52 contain the orders to LOCKWOOD to undertake the journey in 1882 (pp. 183—184) and Appendix 53 LOCKWOOD's original report on the journey (pp. 185—224).

In 1885 CHARLES LANMAN published "Farthest North; or, The Life and Explorations of Lieutenant James Booth Lockwood, of the Greely Arctic Expedition" (New York 1885). LOCKWOOD's journey is reported

in Chapters 11—12 (pp. 139—194), and the book contains a map which is a true copy of LOCKWOOD's original map published by GREELY (London 1884, cf. above). LANMAN attaches the following interesting remarks to the map (pp. 2—3):

"The map is a reproduction of that published by the London Geographical Society, which is an exact transcript of maps drawn by Lieutenant Lockwood and submitted by him to Lieutenant Greely with reports of sledge journeys. This map gives the names agreed upon by Lieutenant Greely and Lieutenant Lockwood, and are those referred to in the journal and in this book. It is much to be regretted that many of these names differ from those on the official map published by authority to the world. The names first given commemorate events connected with those wonderful sledge-journeys, as will be seen in the text; and, if a few unimportant lakes and points were named after friends and relatives, this might have been conceded to one who accomplished so much, and that much so well. The map of the London Geographical Society will probably live, and the other perish, as it should."

From LOCKWOOD's journey along the north coast of Greenland the following maps are available:

1) Map published at London, 1884 (Proc. Royal Geogr. Soc. p. 686).
2) Reproduction of same, published by LANMAN 1885.
3) Two maps published by GREELY 1886 in "Three Years of Arctic Service", viz. Map showing LOCKWOOD's explorations from Ft. Conger to Kap Britannia (p. 305) and from Kap Britannia to Kap Washington (p. 324). The names on these two maps differ somewhat from those on the original map published in London 1884, likewise the representation of the relief is somewhat different.
4) Map published in GREELY's official report (1888, p. 187). The relief again differs somewhat from the original maps, and the names are in some degree altered.—This map must be regarded as the official map of the expedition, and is reproduced by me in Pl. 7. In 1917, on mapping part of the north coast of Greenland, I used as many of LOCKWOOD's original names as possible (cf. Pl. II, Medd. om Grønl., vol.64, 1922).

Whenever possible LOCKWOOD made observations for latitude and longitude by means of a sextant. Further, he measured the angles to prominent points and mountain peaks and thus secured a map, which, as the journey was made along the outer coast, chiefly comprised the coast proper. He principally used a pocket compass, that is to say, a very primitive instrument when used in regions in which the compass needle is unreliable. LOCKWOOD's map is accordingly primitive (cf. LAUGE KOCH, 1922, pp. 82—83).

In his "Reports on Exploration of North Coast of Greenland" (GREELY 1888, p. 185 et seq.) LOCKWOOD says as follows ("Lieutenant Lockwood's abstract of sledge journey on the north coast of Greenland, with general remarks on the same", p. 188): "Beyond Cape Bryant to Cape Britannia and beyond, as far as I traveled, the coast line, if such it may be termed, presents a great similarity of appearance, a series of high, rocky, and precipitous promontories, probably the north projections of islands in many cases with intervening inlets. It was not till near my farthest that I met any shore lying in the general direction of the line of travel, our route almost invariably being from one point to another across the openings of these inlets. It was very seldom that I could say whether these inlets were bays or channels connecting with larger bodies of water to the south. There was no visible land at the heads of several of them. They were very much like immense canals, and gave the whole coast the appearance of the Greenland coast between Upernivik and Proven, and Disco. From the top of Cape Britannia I saw one that extended off towards the east and seemed to make islands of all the projecting promontories to its north."

It is interesting to note that LOCKWOOD, who on the upward journey had visited Godhavn, Ritenbenk, had subsequently sailed through the Vaigat, and visited Upernavik, compared this region of West Greenland to the northernmost part of the north coast of Greenland discovered by him, thus considering the latter as an archipelago.

LOCKWOOD further writes (p. 188): "I could see [from Britannia and Lockwood Island] no glaciers that I recognized as such, though from the floe while traveling I saw a very large one, and one or two quite small." From no place along the coast did he record inland ice.

Pls. 1—2 represent some fairly correct landscape sketches from the journey, of which the sketches "Victoria Inlet from near Cape Britannia" and "View looking into Chipp Inlet" should be specially noted.

Some further landscape sketches are found in the text, however, they are far less carefully done. On p. 202 a sketch is found entitled "Coast of fiord east of Stephenson Id." (i. e. Victoria Fjord). In the sketch, land is visible all along the interior of the fjord. If this sketch has been taken to represent the view into Victoria Fjord, it is possibly on this basis that Victoria Fjord was later indicated on the Hydrographic Office map of 1903 (No. 2142) as a not very extensive fjord with a large ice-free land beyond, although this is not in accordance with LOCKWOOD's text. For LOCKWOOD says in his diary for May 5th (printed just below the sketch): "We were apparently on an island; its most northern limit ended in a bold headland a half-dozen miles distant. Away to the northeast, or a little south of it, was a bold headland, some 15 or 20 miles off, the termination of a promontory or island stretching to the north.

Between it and me were the projecting capes of three similar bodies of land farther to the right, all separated by great fiords stretching to the south and overlapping one another so that little could be seen to the south of them but a confused mass of snow-covered peaks. Glancing round towards the north and west the eye rested on nothing but the ice-pack till Beaumont Island was reached. After that the mountains near Cape Bryant. Stephenson Island is evidently an island; for the opening of a fiord that separates it from Cape May can be seen, and on its east is an immense fiord running to the south. The two fiords are (to all appearances) connected. No land visible at the head of the large one"—i. e. Victoria Fjord—"To the east of this the coast trends off towards the southeast, forming, with the south side of the Britannia coast, an immense funnel ending in a fiord."—Nordenskiöld Fjord—"All to the south is an indistinct mass of snow-covered mountains."

LOCKWOOD's diary contains no statement like that found in his General Remarks quoted above viz.: "From the top of Cape Britannia I saw one" (fjord) "that extended off towards the east and seemed to make islands of all the projecting promontories to its north". There can be no doubt that LOCKWOOD has had at any rate a partial view of J. P. Kochs Fjord, which extends eastward, forming the southern boundary of several of the promontories which he passed during the subsequent days. On his maps, most distinctly on that of 1886, the areas southeast of Kap Britannia Ø and south of Elison Ø towards Markham Ø are left open, but otherwise J. P. Kochs Fjord is not indicated.

On May 6th LOCKWOOD looked into Nordenskiölds Fjord from the sea-ice northwest of the island with Kap Britannia; he gives the following description (p. 203): "The fiord at whose mouth we camped ran to the southeast or south an immense distance; no land visible at its head. In this direction, but hardly more than 10 miles off, a fiord ran—or seemed to—in a direction generally parallel to our course and to make islands of the land on the right of our course."

On his map LOCKWOOD erroneously indicates two parallel fjords, Nordenskiölds Fjord and Chipp Inlet; from either side of Kap Salor on Elison Ø he believed he looked into two parallel fjords, but actually it was one and the same fjord, namely Nordenskiölds Fjord.

On his return journey on May 19th he again looked into Nordenskiölds Fjord. He describes the view as follows (p. 209): "The mountains in sight all covered with snow; the fjord [Nordenskiöld Inlet] opposite could be seen to run a long distance inland, straight as a canal; no land visible at its head."

Another of the large fjord systems, the present De Long Fjord, which was regarded by LOCKWOOD as two fjords, named by him Meigs

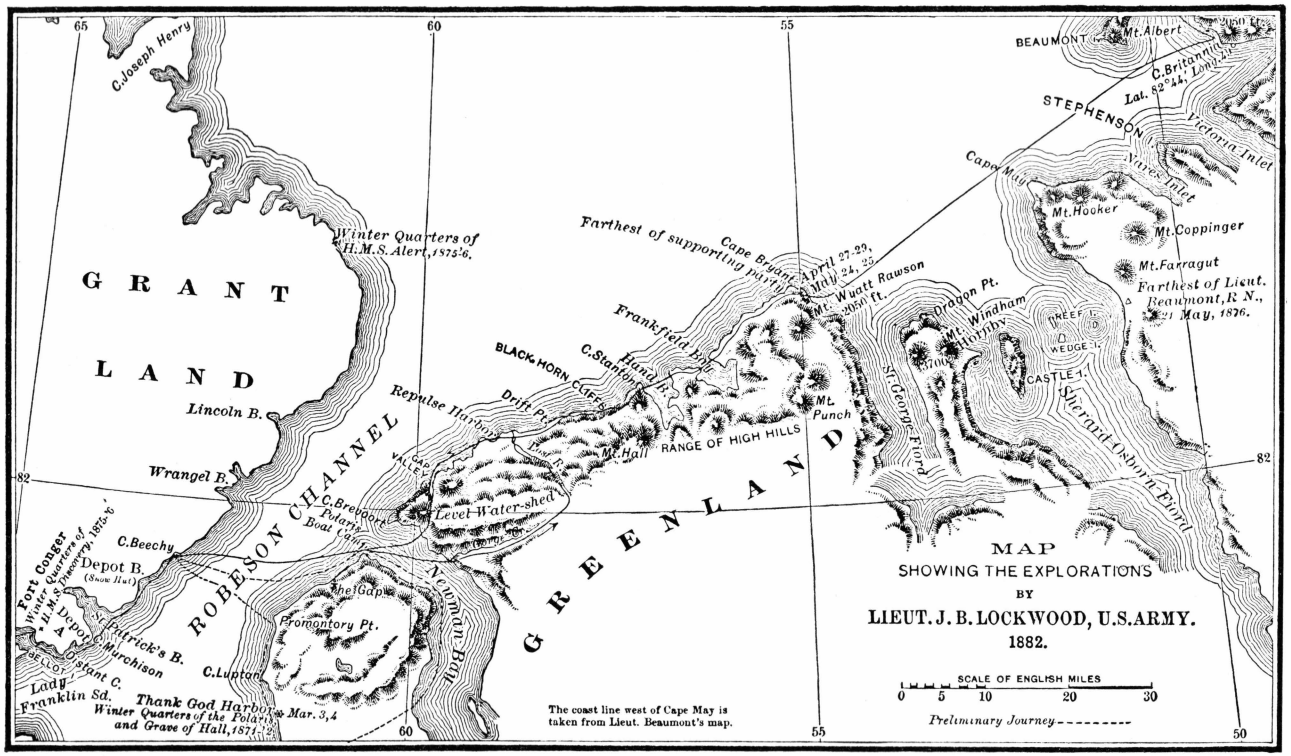

Fig. 11. Map showing the western part of Lockwood's journey (cf. "Three Years of Arctic Service". vol. I, p. 305).

Fjord and Wild Fjord, separated by Hazen Land (Meigs Fjord was later altered to De Long Fjord), was described by LOCKWOOD on his outward journey as follows (p. 205): "May 10. . . . we reached the cliff [Cape Hoffmeyer] which formed the entrance to the fiord [De Long Fiord], bay, or channel we had just crossed." And on the return journey he described it as follows (p. 208): "May 16. . . .The two inlets [Weyprecht Inlet and Wild Fiord] passed to-day seemed of immense extent and have many lateral branches. The last [Wild Fiord] particularly runs a long way into the interior; I could not see the head of it, due, perhaps, to the state of the atmosphere. A long way up is an island." —These two statements, which give more details than LOCKWOOD's sketch-map, naturally came to play an important part when PEARY had to combine his observations from the inland ice with those made by LOCKWOOD from the sea ice.

Apart from LOCKWOOD's comments to his diary, the diary itself, and his map, no material is available from his hand, since he died during the expedition. GREELY in his publications mentions LOCKWOOD and his work with the greatest admiration. It must be taken for granted that LOCKWOOD after his return from the journey often discussed his observations with GREELY, who repeatedly refers to them in his publications on the expedition.

In his preliminary report (1884) GREELY says as follows about LOCKWOOD's journey (p. 679): "It also carried Greenland over forty miles northward, giving that continent a much greater extension in that direction than it has generally been credited with. . . .The newly discovered coast resembled in many respects that of southern Greenland. The main land was intersected by many deep fiords with numerous outlying islands. The interior of the country, as seen from an elevation of some 2000 feet, consisted of confused masses of mountains, either eternally snow-clad or covered with an ice-cap, the fiords presented to the eye nothing but broad level expanses of snow and ice, being devoid of any marked ice-foot, floe-bergs, pressed up hummocks, or any other indications tending to prove their direct connection with the Spitzbergen Sea."

In 1888 GREELY further amplifies this, saying (p. 27):

"The new coast—Hazen coast—trending to the northeast, is a succession of high, rocky, and precipitous promontories, probably the north projections of islands in many cases, with intervening inlets. Immense fiords extend inland long distances, while the interior of the country is a confused mass of snow-covered mountains."

. . . . .

"The ice-foot was slight and illy-defined north of Cape Bryant. The fiords and bays were immense expanses of level snow, their regular

surface rarely broken by hummock or floe-berg. This to me seems to indicate that Victoria Inlets are but entrances to a fiord, not to a strait, and that the interior country is the mainland of Greenland."

Thus it is evident that both LOCKWOOD and GREELY regarded the extensive fjords, whose heads LOCKWOOD was unable to discern, as fjords and not as channels, and regarded all the new land which LOCKWOOD discovered as the mainland of Greenland or parts of it, which had been cut off by the fjords and channels between them so as to form islands. It is therefore surprising that GREELY in 1896 (Handbook of Arctic Discoveries, p. 238) wrote as follows about PEARY's and ASTRUP's journey in 1892: "Finally, on 26th May, they reached the north edge of the inland-ice near 82° N., whence they looked to the north on the brown-red, comparatively ice-free land discovered by LOCKWOOD in 1882. The fiord, into which they could not descend, doubtless connects with Nordenskiöld Inlet of LOCKWOOD, 1882, and PEARY supports GREELY's opinion of 1884, that Greenland here ends, and that the discovery of LOCKWOOD is an entirely new land."

The same contention is set forth in probably the last edition of GREELY's book "The Polar Regions in the Twentieth Century" (1929), where GREELY says about PEARY (p. 77): "He incorrectly held the same opinion as Greely, that the regions to the north of Navy Cliff formed a new land, when in fact it is part of Greenland."

As regards the northward extension of Greenland GREELY says (1884, p. 679): "The farthest point seen on the Greenland coast was estimated to be about lat. 83°35′, long. 38°. There were no indications that the farthest point seen was the northern termination of Greenland."

In 1886 GREELY wrote (Vol. I, p. 349): "The age of the tide at Conger and the exceptional depth of the sea north of Cape May (one hundred and thirty-seven fathoms and no bottom) augur to my mind the inconsiderable extension of Greenland to the northward (say to the eighty-fifth parallel) and the presence there of a deep sea as compared with the shallow basin north of Grinnell Land."

Finally, GREELY says as follows (1886, Vol. I, p. 416):

"Similar physical conditions must govern the distribution of the inland ice in Greenland, and I doubt not that from Thank God Harbour one can travel eastward to St. George Fiord, and probably thence, through inlets and connecting valleys, over the coast of Greenland to the east coast. Such a trip I had planned, but was obliged to abandon it for want of dogs. The absence of any coast-glaciers north of Petermann Fiord, the extreme inland extension of Victoria, Nares, Sherard Osborn, and other inlets, as well as the comparative freedom of the bordering coasts from snow are all significant facts.

"The actual determination of the northern edge of the inland ice of Greenland would have been a valuable contribution to Arctic geography, which would have fittingly supplemented the discovery of such extraordinary physical conditions as resulted from our summer explorations in Grinnell Land."

It will be evident from what has been quoted above that after LOCKWOOD's journey along the north coast of Greenland and their experience from Grinnell Land and Grant Land, LOCKWOOD and GREELY conceived a fairly correct idea of the conditions prevailing in the northernmost part of Greenland, though the knowledge on which it was based was slight and in many cases mere suppositions. GREELY was of opinion that Greenland did not extend far northward beyond the northernmost cape seen by LOCKWOOD. He did not believe that the long fjords whose heads LOCKWOOD failed to see, were channels which extended to the Spitsbergen Sea, that is to say, to the east coast of Greenland. And thirdly he assumed that large ice-free land areas occurred inside the outer coast of northern Greenland. These three views have later proved correct.

II.

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26) — The North Pole. 116 ills., 1 map. Pp. i—xii + 1—326. London **1910**.
27) Mr. Peary's Work in Greenland. Journ. Amer. Geogr. Soc. Vol. XXVII, pp. 60—62. 1895. (Reply to an attack by M. CHARLES RABOT in Comptes Rendus of the Paris Geogr. Soc. (1894, pp. 428—437)).
28) RABOT CHARLES. Les récentes explorations arctiques. Compte Rendu des Séances de la Soc. Géogr. **1894**, pp. 428—437.

Introduction.

For all time PEARY will stand as one of the greatest characters in the history of the exploration of Greenland. For 23 years, from his 30th to his 53rd year, he devoted his life to polar exploration. In this period he led eight expeditions to the Arctic, all with more or less connection to Greenland. Such a long life as an Arctic explorer and such a distinguished character will no doubt even in the future arouse interest in PEARY and his work.[1])

It was FRIDTJOF NANSEN who was to solve the two greatest riddles of his time in the Arctic, viz. the nature of the inland ice, by his first

[1]) Comprehensive biographies of PEARY have been published by GREEN, Wm. H. HOBBS, and GORDON HAYES.

traverse of the inland ice in 1882, and the demonstration of the presense of an ocean north of Eurasia, during the drift of the "Fram" in 1894—95. However, for centuries the dream of reaching the North Pole had been the incentive to all Arctic exploration. With immense energy and power, PEARY concentrated his efforts on reaching this goal, and in the course of years made a number of experiences and secured important results which have been of great advantage to subsequent expeditions.

PEARY's journeys were as follows:

1886: A journey for about 100 miles towards the interior of the inland ice from Disko Bugt and back, with the Dane MAIGAARD as sole companion.

1891—92: Stay at MacCormick Bugt (the Thule district) during the winter; in the spring a journey across the inland ice to Navy Cliff, East Greenland, and back.

1893—95: Stay for two winters in Bowdoin Bugt (the Thule district), in the spring of 1894 a journey of 128 miles on the inland ice, in 1895 a journey across the inland ice to Navy Cliff and back.

1896: Summer expedition; transport of the large meteorite Ahnighito to the coast.

1897: Summer expedition; transport home of the same, in the "Hope".

1898—1902: Winter-quarters at C. D'Urville, Grinnell Land, 1898—99; at Etah, Northwest Greenland, 1899—1900; at Ft. Conger, Grant Land, 1900—01; and at Kap Sabine, Ellesmere Land, 1901—02. Most important journeys were the journey around the north of Greenland to Kap Clarence Wyckoff in 1900 and the journey over the pack-ice to 84°17′ N. lat. in 1902.

1905—06: Wintering with s.s. "Roosevelt" at Cape Sheridan, Grant Land. In 1906 a sledge journey in the spring over the pack-ice to 87°6′ N. lat. and back along the north coast of Greenland from Kap Neumayer to the ship. In the summer a journey along the north coast of Grant Land to Cape Thomas Hubbard and back to the ship.

1908—09: Stay, with s.s. "Roosevelt", at Cape Sheridan, Grant Land. In 1909 a journey to the North Pole. In the spring a journey by MACMILLAN and BORUP to Kap Morris Jesup and back to the ship.

The results of these many large expeditions are an immense amount of experience, which has not only been incorporated in maps and other publications, but which has also formed, and in the future will form, the basis for journeys and investigations of these regions.

The first three of PEARY's eight expeditions, all of which were carried out for private means, were inland-ice expeditions. The first of them, in 1886, which started from Disko Bugt and was termed by PEARY 'a reconnaissance', had for its main object to secure experience regarding travelling on the inland ice. It will not be further dealt with here, but it is interesting to note that PEARY termed the inland ice the imperial highway, and on his next two expeditions regarded it as a travelling route and not as the goal itself.

PEARY's next expedition, 1891—92, was perhaps the most successful of all his journeys and that which was richest in results.

The third expedition, in 1893—95, had a large program and numerous members. In the plans too great importance had been attached to the inland ice as a travelling route, and altogether the expedition was unsuccessful.

The following two expeditions were only short summer trips, having for their object partly to bring home the large meteorites, partly, in 1897, to prepare the Eskimos for the next great expedition.

The expedition in 1898—1902, the largest and most prolonged of PEARY's expeditions, in several respects came to be a turning point. PEARY had learnt that a white man who travels alone with Eskimos makes the greatest progress. In his negro, HENSON, he had found a man who as a sledge-driver was fully equal to the Eskimos. PEARY had his own ship, but it was too weak to be used to force its way up through the Smith Sund route, and PEARY therefore had to begin his sledge-journeys rather far to the south. Gradually the reaching of the North Pole became PEARY's only goal, and this consequently gave his expeditions a one-sided character. Almost by chance he made his journey along the north coast of Peary Land to find out how far the land extended towards the North Pole; in so far it may be termed a North Pole journey. In 1902, in spite of his southern starting point, he succeeded in beating MARKHAM's polar record of 1876.

On his two last expeditions, 1905—06 and 1908—09, PEARY had at his disposal the ship "Roosevelt", built specially for the purpose, so he could push northward to 83° N. lat. before starting his sledge journeys. These two expeditions were entirely North Pole expeditions, though during the first one he mapped part of the north coast of Grant Land.

All the results and experience gained on PEARY's eight expeditions may be grouped in the following categories, which, however, do not claim to be exhaustive:

1) The North Pole. With the expedition in 1908—09 the race to reach the North Pole, which had for centuries been the main incentive to Arctic exploration, came to an end. The present generation

who have witnessed the landing of an expedition by airplane at the North Pole in order to pass the winter there, will hardly understand the importance of this. However, if we are to understand PEARY and his time, it must be borne in mind that this goal had for centuries stimulated all geographic exploration of the Polar countries.

2) The Polar pack-ice. By his journeys in 1902, 1906, and 1909, PEARY has contributed more than anyone else to our knowledge of the ice and sea-currents in the large area between the North Pole and Grant Land—Greenland.

3) The geography of Grinnell Land and Grant Land. PEARY made various corrections in the available maps, and the northwest coast of Grant Land was discovered and mapped by him. A large material concerning travelling conditions and animal life in these regions was secured.

4) Ice conditions along the north coast of Greenland. Prior to PEARY's journeys, the north coast of Greenland had only been visited by two men, namely BEAUMONT in 1876 and LOCKWOOD in 1882. On journeys in 1900 (PEARY), 1906 (PEARY), and 1909 (MACMILLAN and BORUP) PEARY and his expeditions contributed to our knowledge of ice and travelling conditions here. The subsequent Danish expeditions (KNUD RASMUSSEN 1917, LAUGE KOCH 1921) further contributed to the experience gained. PEARY's journey in 1900, in particular, showed that great movements may take place in the ice here, a point of importance for the elucidation of the wanderings of the Eskimos around the north of Greenland.

5) Ice navigation in the Smith Sund-Robeson Kanal. Especially PEARY's last two expeditions contributed in great degree to our knowledge of the conditions for navigation in these waters northward to the Polar Ocean. The experience gained as regards the possibilities for travelling by this route in a strong ship built for ice navigation has not yet been utilised.

6) The inland ice. Nobody has ever made such long journeys on the inland ice as PEARY. As his journeys were made at the beginning of the period of inland ice exploration, and since the inland ice of North Greenland is more variable than in any other place, his experiences are of the greatest value for our understanding of the inland ice, and especially for the later inland ice journeys (KNUD RASMUSSEN 1912 and 1917, LAUGE KOCH 1921) made in the same regions.

7) The wind systems on the inland ice (cf. HOBBS 1926, 1936).

8) During his many stays and visits to the Thule district PEARY and his expeditions contributed with numerous geographical data, improvements in the existing maps, a large photographic material, i.a. of the glaciers of the district, meteorological information, etc., etc.

9) The Polar Eskimos. In the period 1891—1909 PEARY and his expeditions practically constituted the only link between civilisation and the polar eskimos. Eskimo bows and arrows and other primitive implements were replaced by up-to-date weapons, which to a high degree facilitated their struggle for life. Quite morally also PEARY came to mean very much for these people. He trained them in long sledge-journeys in the service of white men, and I think it is safe to say that without the influence of PEARY the subsequent Danish expeditions starting out from the Kap York district (1st and 2nd Thule Expeditions and the Jubilee Expedition) would have taken a different course; for they were based on the experience and tradition which had been created by PEARY.

However, as mentioned above, a great part of all this material, this vast amount of experience as to the technique of travelling and of practical and scientific results, has not been utilised so far, and part of it will be lost in the course of years gradually as his travelling companions die.

As regards the configuration of the inland ice and the glacialogical material available from the Kap York district in the form of descriptions and photos, the reader is referred to my paper 'The Glaciology of North Greenland' (1928), in which this material has been dealt with.

It is my hope that I shall be able to utilise the abundant geographical material from the Kap York district and Melville Bugt in a future paper.

In the present paper none of PEARY's material from areas outside Greenland or of the Greenland material from the Kap York district south of Kap Alexander, the westernmost point of Greenland, is treated. I shall confine myself to dealing with the geographical results of PEARY's journeys across the inland ice of North Greenland and along the north coast of Greenland. Accordingly the following journeys will be dealt with:

1) PEARY's and ASTRUP's discoveries on their inland-ice journey in 1892 and the geographical results of the journey.
2) The plans for the expedition 1893—95 and why they were not carried through.
3) The journey along the north coast of Greenland to Wyckoff Land in 1900.
4) The journey along the north coast of Greenland in 1906 from Kap Neumayer.[1])
5) BORUP's and MACMILLAN's journey to Kap Morris Jesup.

[1]) cf. footnote p. 129.

PEARY'S PLANS AND JOURNEYS IN RELATION TO THE EXPLORATION OF NORTH GREENLAND

The Expedition 1891—92.

As stated above (pp. 57—60) A. PETERMANN had set forth the theory that the northeastern part of Greenland north of Kap Bismarck continued across the North Pole in the form of continuous land or islands (see figs. 9 and 10).

After the Greely Expedition, on which LOCKWOOD travelled along the north coast of Greenland from Kap Britannia northeastward, PETERMANN'S theory was modified in some degree. However, on starting on his journey in 1892, PEARY thought that Greenland extended northward at any rate as far as 85° N. lat. This is clearly expressed in the Journal of the American Geographical Society, 1891, p. 156, and especially in "Northward over the Great Ice" (Vol. I, p. 40), where PEARY (on a map and in the text) indicates the following "prophetic routes" across the inland ice, viz (cf. Fig. 12).

"From base of Noursoak Peninsula to head of Franz Joseph Fjord, and return. (A).

"From Whale Sound to northern terminus of Greenland or intersection of ice-cap with East Coast.[1] (B) This route the key to the Greenland Problem.

"From Disco Bay to Cape Dan."[2] (D)

Thus even at an early date PEARY proposed various inland-ice routes, pointing out that especially the northern route (B) might solve the problem as to the northern extension of Greenland. This route was chosen by PEARY in 1892.

PEARY (1898, Vol. I, p. 438) gives the following summary of his "Objects and results of '91—'92 expedition":

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[1]) "This route actually covered by me in 1892.

[2]) "This route utilised by NANSEN in 1888. (E)."

"OBJECTS[1])

"Determination of the northern limit of Greenland overland.

"The possible discovery of the most practicable route to the Pole.

"The study of the Whale-Sound Eskimos.

"The securing of geographical and meteorological data.

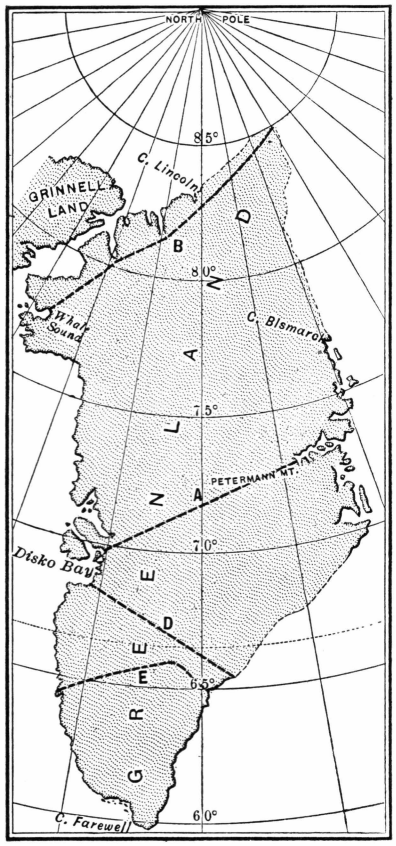

Fig. 12. PEARY'S map (cf. p. 93).

"RESULTS[2])

"The determination of the northern extension and the insularity of Greenland, and the delineation of the northern extension of the great interior ice-cap.

"The discovery of detached ice-free land-masses of less extent, to the northward.

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[1]) Original prospect presented to Philadelphia Academy of Natural Sciences and American Geographical Society in 1890.

[2]) Bull. Am. Geog. Soc., No. 4, 1892.

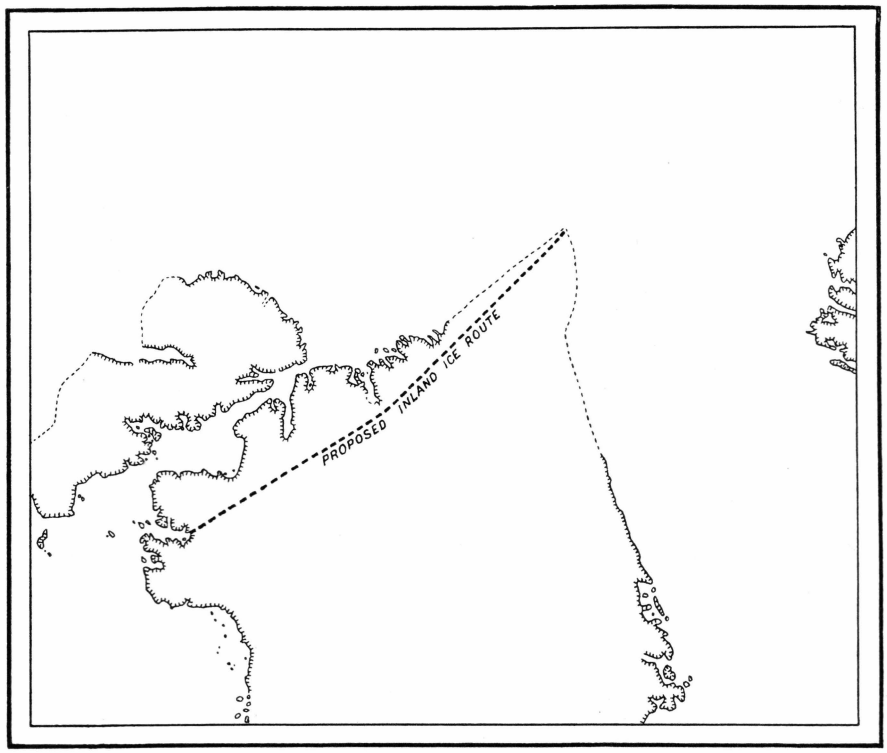

Fig. 13. The route planned by PEARY 1892.

"The determination of the rapid convergence of the Greenland shores above the seventy-eighth parallel.

"The observation of the relief of an exceptionally large area of the Inland Ice.

"The delineation of the unknown shores of Inglefield Gulf, and the imperfectly known shores of Whale and Murchison Sounds.

"The discovery of a large number of glaciers of the first magnitude.

"The first complete and accurate recorded information of the peculiar and isolated tribe of Arctic Highlanders (Dr. Cook).

"Complete and painstaking meteorological and tidal observations (Verhoeff).

"Sledge journey, which is unique in respect to the distance covered by two men without a cache from beginning to end, and in respect to the effectiveness with which those men were able to handle a large team of Eskimo dogs.

"Corroboration of the opinion advanced that the Inland Ice offered an "imperial highway".

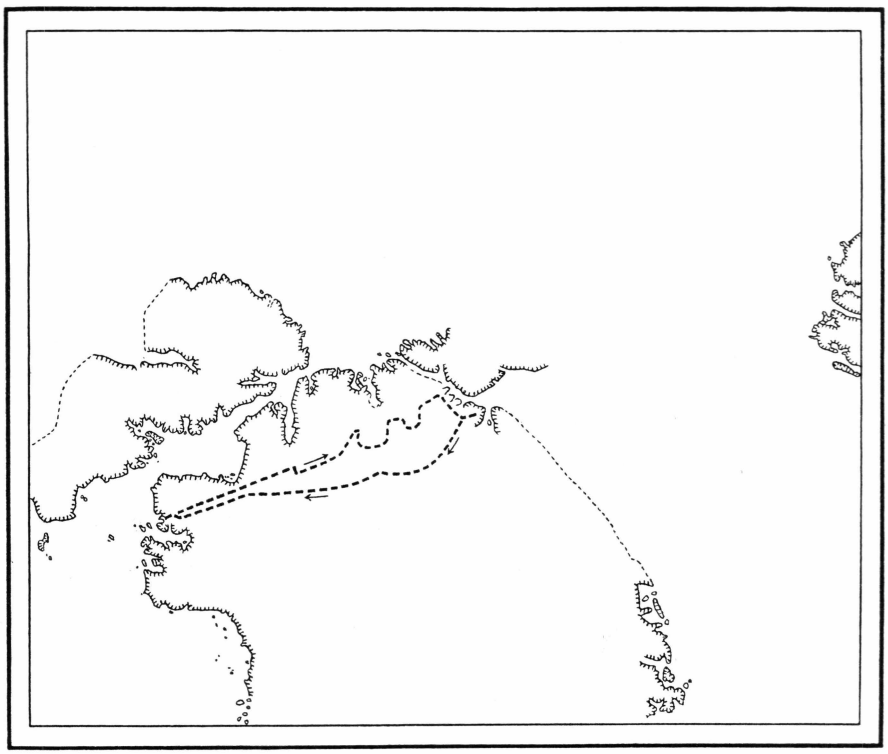

Fig. 14. PEARY's route 1892.

The Expedition 1893–95.

PEARY (1898, vol. II, p. 550) gives the following summary of the "Objects and Results of North-Greenland Expeditions of 1893 to 1895":

"OBJECTS

"The delimitation of the detached lands lying north of main Greenland.

"The filling in of the remaining gaps in the northern and north-eastern coast-line of Greenland.

"In the event of favourable conditions, an attempt upon the Pole.

"The completion of the detail survey of the Whale-Sound region.

"Continuation of the studies of the Smith-Sound Eskimos.

"The discovery of the "Iron Mountain".

"RESULTS

"The crossing of the Inland Ice-cap of North Greenland under a most serious handicap of insufficient provisions.

"The completion of the detail survey of Whale Sound.

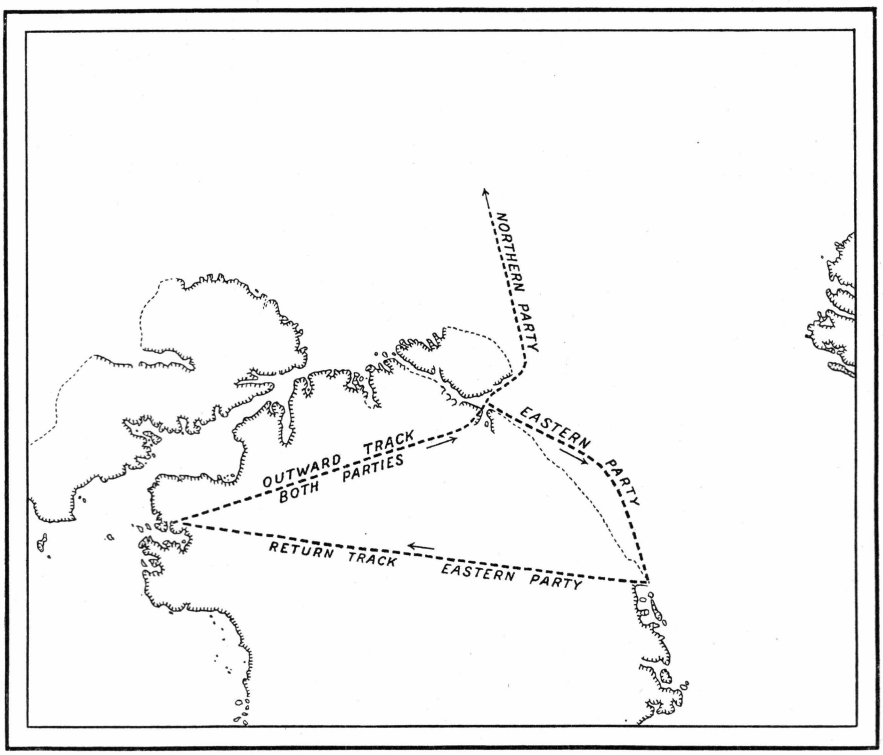

Fig. 15. Routes planned by PEARY 1893—95.

"Large accessions of material and information in connection with the Smith-Sound Eskimos.

"The discovery of the "Iron Mountain", or Cape York "Saviksue", and the bringing home of two of those interesting meteorites."

"It will, however, be necessary to deal in more detail with PEARY's plans for his expedition in 1893—95. These plans are treated by CYRUS C. ADAMS in an article in The Geographical Journal (Vol. II, 1893, pp. 303—316). This article is of importance, since it gives the first summary of the results of PEARY's Expedition 1891—92 based on a study of all PEARY's notebooks from his first North Greenland expedition, and secondly it discusses at length the plans for the new expedition 1893—95.

These plans were briefly as follows: The sledge journey on the inland ice in 1894 was to begin about the middle of March, that is to say, two months earlier than the journey in 1892. Eight or nine men with dogs and sledges were to start to Independence Bay by a direct route so as to avoid the large crevassed depressions behind the glaciers of the north coast. It was PEARY's hope that they would reach Independence Bay in the first days of May. Here the party was to divide into

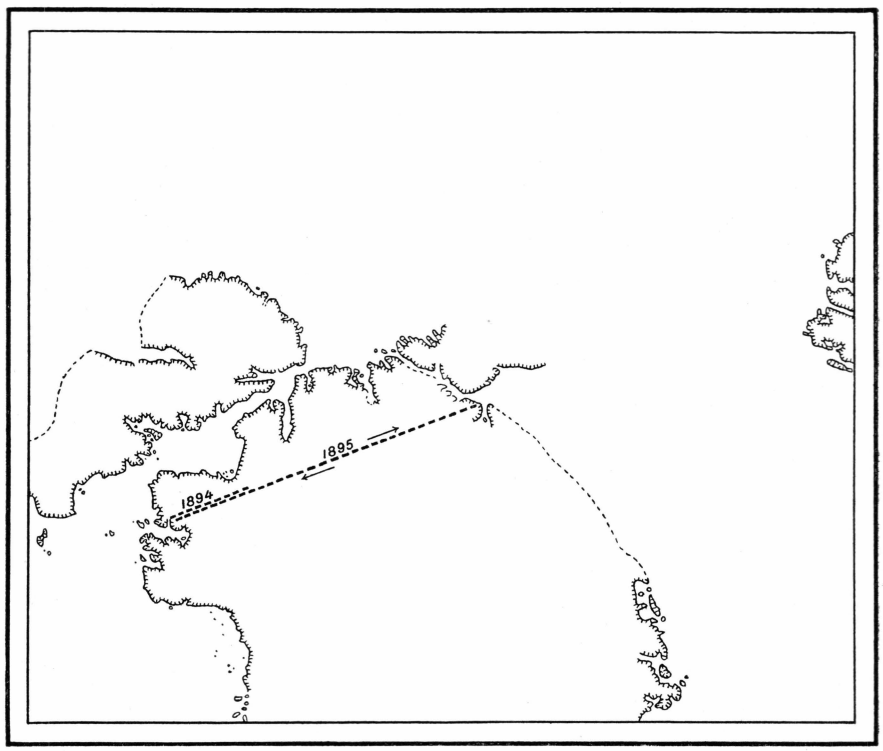

Fig. 16. PEARY's travelling route 1894—95.

three sections. One of these, consisting of three men, was to go south-eastward along the coast and complete the survey of the unknown shore to Kap Bismarck, where the party was to ascend the inland ice and go direct to the winter quarters at Inglefield Bredning. The plans for the other two parties are not so clearly defined. If possible, they were to make a complete survey of the land masses north of Victoria Fjord (i.e. the land north of the Peary Channel). Further, PEARY wished to reach the highest attainable north. Two or three men with one sledge were to start towards the Pole east of the present Peary Land, and travel as far as they could; they were, however, to return to Inglefield Bredning in the same season.

It will be seen that as late as March 12th, 1894, PEARY maintained this original plan (PEARY 1898, Vol. II, pp. 93—94), though he now speaks about a northern and a southern party and a party at the head of Independence Bay which by hunting musk-oxen were to secure the return journey for the northern party.

The principal reasons why this expedition was on the whole unsuccessful are that PEARY thought it possible to travel on the inland ice as early as March, and further, that he overestimated the strength of

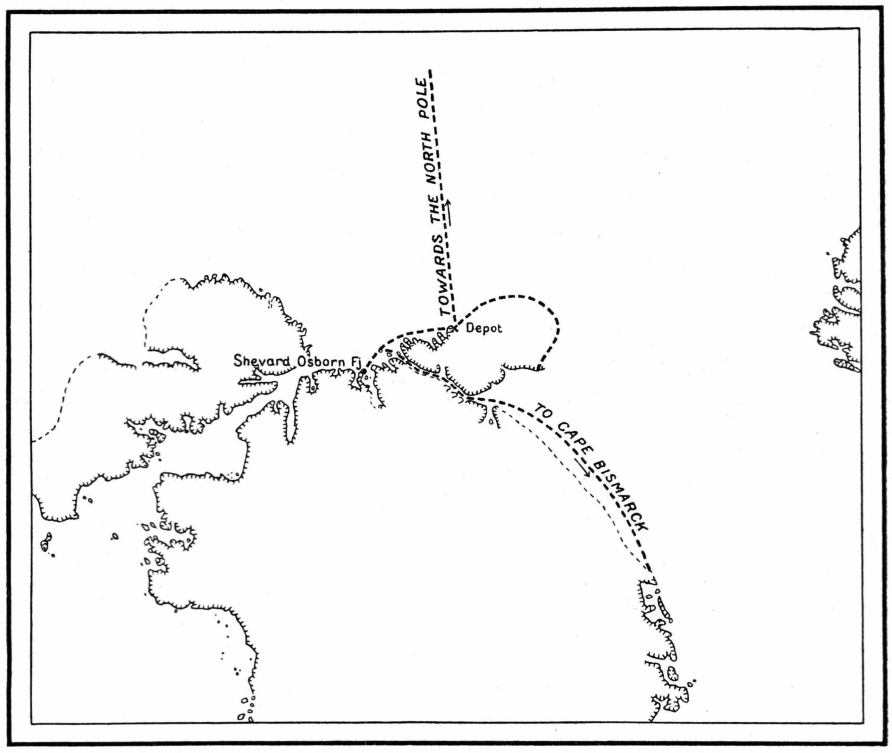

Fig. 17. The routes planned by PEARY 1898—1902.

his men. A journey across the inland ice to Independence Fjord, from this fjord to Kap Bismarck, and return across the inland ice was a task which could not be entrusted to men entirely inexperienced in arctic travelling. Moreover, as PEARY says himself, ASTRUP was a quite different man from what he was on the first expedition in 1892.

The Expedition 1898–1902.

PEARY has nowhere so clearly summarised the plans and results of this expedition as those of the preceding expeditions. In his lecture to the Royal Geographical Society, London, on December 6th, 1897 (Geogr. Journ. 1898, Vol. XI, pp. 213—240), PEARY first summarises his previous expeditions and subsequently discusses at length his plans for the future (pp. 236—238). He says in this connection that JACKSON and NANSEN have brought the news that "Franz Josef Land was not the southern terminus of an arctic continent, but an archipelago of comparatively limited extent", and that the drift of the "Fram" had shown that north of Siberia there was no land which could come into consideration as a possible means of reaching the pole. He then emphasises

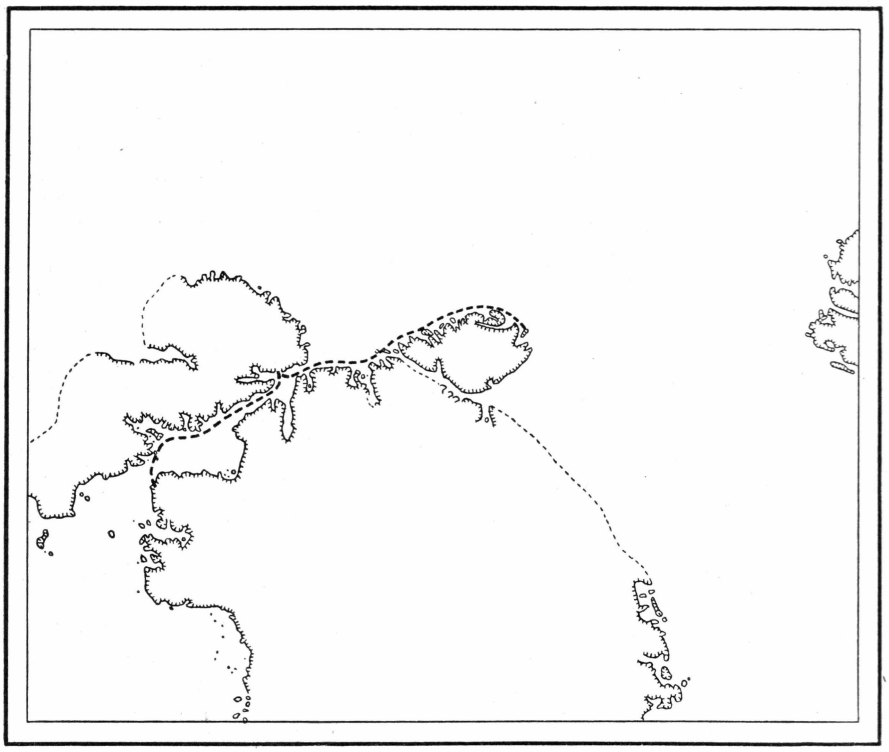

Fig. 18. PEARY's travelling route 1900.

that "the land lying north of main Greenland remained the most northerly known land on the face of the globe" and that "the route along the north-west coast of this land, with *terra firma* for a base, was not merely the *most* practicable route, but that it was the *only* practicable route by which to reach the yet unscaled apex of the Earth, the north pole".

It was now PEARY's plan to proceed with his ship to Whale Sound, to take onboard there eight or ten of the best young Eskimos with their wives, dogs, tents and sledges, etc., and transport them by ship as far northward as possible, "making Sherard Osborn fjord my objective point". There PEARY would establish a colony and send back his ship. "The environments and conditions of life would be practically the same, and my Eskimo would feel at home". As soon as possible PEARY would establish a large depot of supplies "at the most northerly point of the land, wherever that may be. We know the land here extends beyond 83°24′; it is very likely it reaches to 85° N." In February or perhaps in March, PEARY, accompanied by two or three of his best men, would endeavour to reach the North Pole. He says further: "On my return from the northern trip, or in the interim between successive attempts,

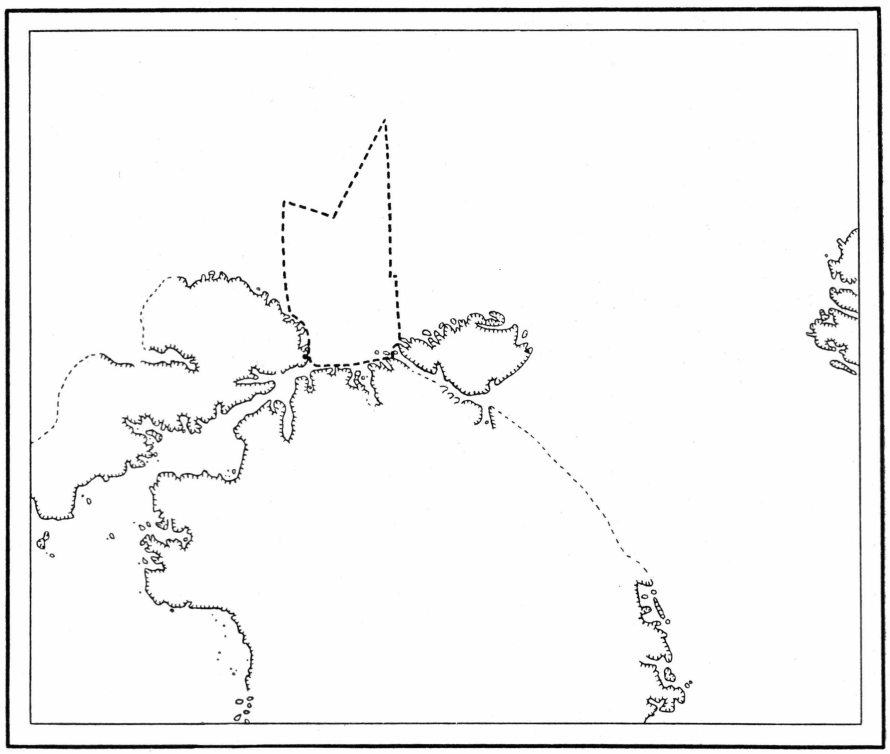

Fig. 19. PEARY's travelling route towards the North Pole 1906.

I should endeavour to complete the geographical features and characteristics of the northern land and the north-west coast of Greenland, and endeavour also to fill in the outline of the east coast down to Cape Bismarck; in other words, to complete the delineation of the land-masses of this section of the arctic basin. Then I shall retrace my steps along the north-west coast to my original base at Sherard Osborne fjord. From here I shall return in my ship, if she succeeds in effecting the connection; otherwise I shall ascend to the ice-cap from the head of Sherard Osborne or Petermann fjord, and take the route with which I am so familiar, across the inland ice to Whale sound, where my ship can reach me without difficulty."

That these plans were realised to a slight extent only, was principally due to the fact that PEARY's ship, the "Windward", was not strong enough to push northward along the Smith Sund route.

The Expedition 1905–06.

On the programme for this expedition the north pole was the only object. During PEARY's dash towards the pole in 1906, starting from

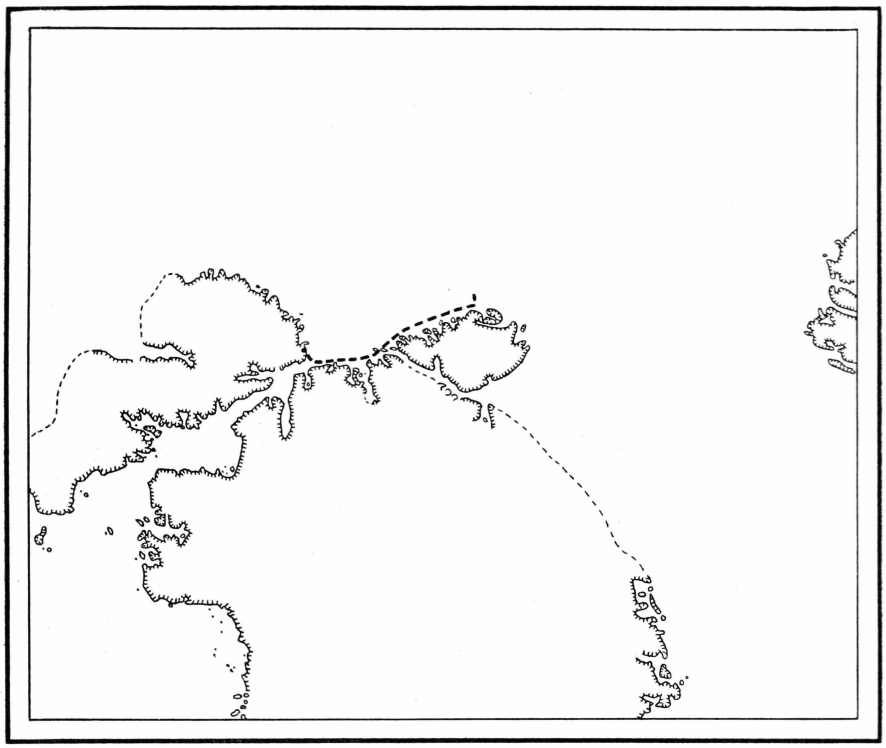

Fig. 20. BORUP's and MACMILLAN's route on PEARY's North-Pole-Expedition 1909.

Grant Land, he drifted with the ice so far eastward that he came ashore at Kap Neumayer[1]) on the north coast of Greenland, and travelled along this coast back to his ship at Cape Sheridan.

The Expedition 1908–09

likewise had the reaching of the north pole as its sole object. BORUP and MACMILLAN were directed to Kap Morris Jesup in order to support the parties aiming for the north pole in case they were to drift eastward, and further to make "some tidal observations". It would seem that there have been some plans for an exploration of the Peary Channel, however, they were not realised.

Apart from extending our knowledge of travelling and hunting conditions along the north coast of Greenland, the two last-named expeditions were of no importance for the geography of Greenland.

[1]) Cf. footnote p. 129.

THE EDGE OF THE INLAND ICE FROM HUMBOLDT GL. TO 82° N. LAT.

Cf. Fig. 23 and Pl. 17, A,B.

Before starting on the journey in 1892 PEARY apparently contemplated travelling near the edge of the inland ice from the head of one fjord to the other. This is reflected in the account given by ASTRUP (1895, English edition 1898) concerning PEARY's plans for the first journey across the inland ice of North Greenland. Thus ASTRUP says (1898, p. 15) that four or five men "will start over the inland ice for the Humboldt Glacier .... If good progress is made, we shall continue from the Humboldt Glacier to the head of Peterman-fjord. From here two or three of us will push on ... Those in advance will continue to Sherard Osborne fjord, go farther on to the head of De Long fjord, and finally push on towards the northernmost point of Greenland. When this is reached, and its geographical position determined, the party will return by the same route to Whale Sound ..."

However, as is well known, the deep depressions behind the West and North Greenland fjords forced PEARY to go rather far back on the inland ice. ADAMS (1893, pp. 308—309) says as follows:

"Mr. Peary desired, on his northern route, to travel near enough to the western edge of the ice-cap so that if possible he could look down on the continuation of the Smith Sound outlet to the north and map the northwest coast of Greenland. He failed in this purpose, and the reasons are interesting.

"He found that behind Petermann, Sherard Osborne, and other fiords, are glacial basins widening, fan-shaped, from the heads of the fiords, extending inland 30 to 50 miles east of the fiord heads, and considerably depressed below the general level of the ice-slope. These basins are separated one from another by very prominent divides, whose summits are from about 5000 to over 6000 feet in height, while the basin plateaus are only 3500 to 4200 feet above sea-level. In his desire to skirt the edge of the ice-cap he attempted to cross these basins, and became involved in the phenomena that mark more rapid ice movement and the birth of glacial rivers. In other words, he met numberless crevasses,

yawning for the destruction of his little party, and he was put to no end of trouble to circumvent them. Some of them were impassable, and in all cases he was eventually compelled to turn inland to get around the heads of the basins. Fortunately, at the place where he reached the northern edge of the ice-cap, he was considerably nearer the west coast than at most points along his route; and he has no doubt that, from his lofty elevation of over 5000 feet, he saw the entrance to Victoria Inlet where it joins Lincoln Sea."

Before discussing what PEARY and ASTRUP saw of land and ice edge during their journey on the inland ice in 1892 I shall briefly summarise our knowledge and the history of discovery of the large glaciers and the intermediate land areas along the stretch of the coast from Kap Alexander to Peary Land.

Discovery and Mapping of the Edge of the Inland Ice from Etah to 40° W. long.

The edge of the inland ice between Brother John's Gl. and Humboldt Gl. (Inglefield Land) was discovered and mapped by KANE's expedition in 1853—54. Mapped by the present author in 1917 and 1922.

Humboldt Gl., discovered by MACGARRY and BONSALL in 1853, mapped by MORTON in 1854.

The edge of the inland ice between Kane Basin and Petermanns Fjord (Washington Land, Daugaard-Jensens Land), was discovered and mapped by the present author in 1921.

Petermanns Fjord, discovered by HALL in 1871, mapped in 1872 by BESSELS, who regarded it as a sound. Petermanns Gl., discovered and its front mapped by FULFORD in 1876. The depression of the glacier was discovered by PEARY in 1892.

The edge of the inland ice between Petermanns Gl. and Newman Bugt (Hall Land), mapped by the present author in 1922 to near Newman Bugt.

Newman Bugt. The fjord was discovered by HALL in 1870. Whether a glacier descends at its head has not been ascertained so far.

The edge of the inland ice between Newman Bugt and St. George Fjord (Nyeboes Land) towards Newman Bugt, discovered and partly mapped by KNUD RASMUSSEN[1]) and the present author in 1917.

St. George Fjord. The mouth of the fjord discovered by BEAU-

[1]) In 1917 KNUD RASMUSSEN was the leader of the expedition, but did not take part in the cartographic work. If his name is not mentioned for that year, it is because I travelled alone.

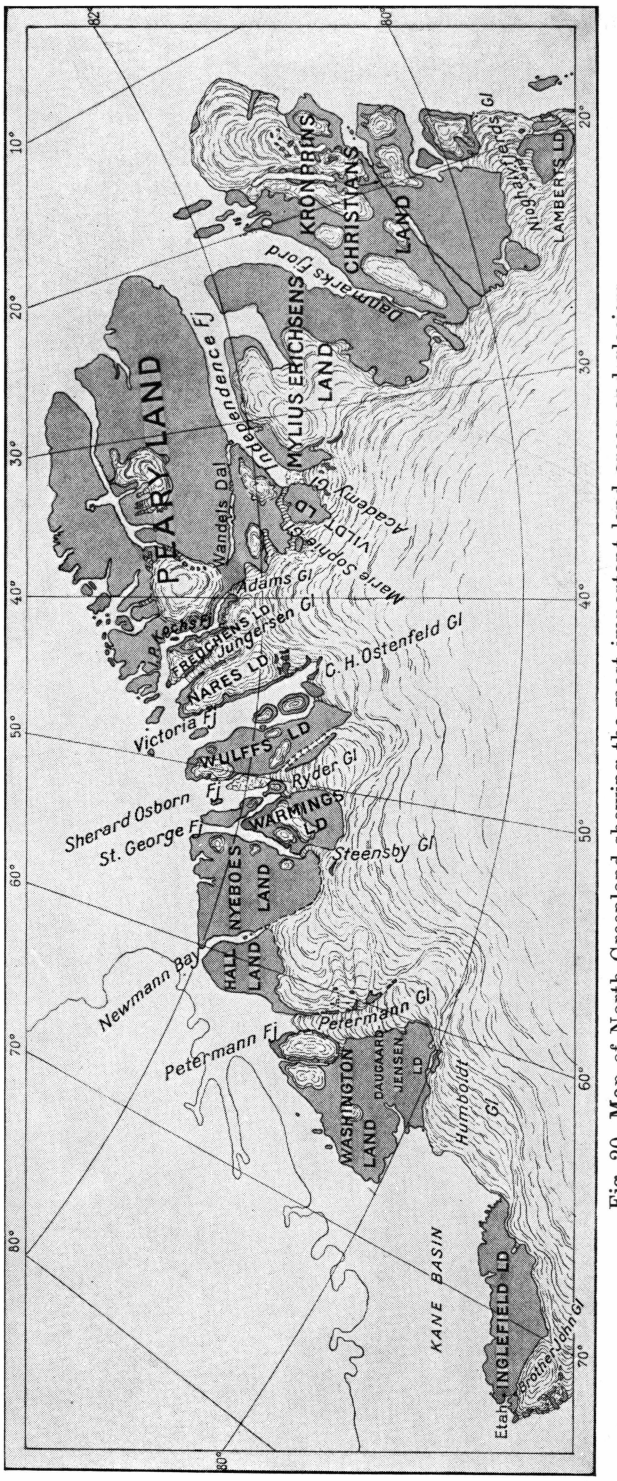

Fig. 20. Map of North Greenland showing the most important land areas and glaciers.

MONT in 1876, the interior of the fjord mapped by KNUD RASMUSSEN and the present author in 1917.

Steensby Gl. Discovered and mapped by KNUD RASMUSSEN and the present author in 1917.

The edge of the inland ice between St. George Fjord (Steensby Gl.) and Sherard Osborn Fjord (Ryder Gl., Warmings Land). Discovered and mapped by KNUD RASMUSSEN and the present author in 1917.

Sherard Osborn Fjord. Discovered and mapped as a very deep fjord by BEAUMONT in 1876. A depression with crevasse systems behind the fjord was discovered by PEARY in 1892; however, PEARY was in doubt whether it was the depression of this or of St. George Fjord.

The flat Ryder Gl. was discovered, and its outer portion mapped by KNUD RASMUSSEN and the present author in 1917; its inner part and the depression was mapped by the present author in 1921.

The edge of the inland ice between Sherard Osborn Fjord and Victoria Fjord (Wulffs Land), discovered and mapped by the present author in 1921.

Victoria Fjord. The mouth of the fjord was discovered and mapped by LOCKWOOD in 1882. Its depression in the inland ice was discovered by PEARY in 1892, but erroneously taken to be that of Sherard Osborn Fjord. A floating glacier (C. H. Ostenfeld Gl.) erroneously mapped by the present author in 1917. The interior of the fjord with a glacier at its head was discovered and mapped by the present author in 1921.

The edge of the inland ice between Victoria Fjord and Nordenskiölds Fjord (Nares Land). Discovered and mapped by KNUD RASMUSSEN and the present author in 1917. Additions to the map of Victoria Fjord inserted by the present author in 1921.

Nordenskiölds Fjord. The mouth of the fjord discovered by LOCKWOOD in 1882. PEARY would seem to have passed a slight depression in the inland ice behind this fjord; he erroneously assumed that his Channel ended in this fjord. In 1917 the present author ascertained that the fjord is almost entirely occupied by a floating glacier (Jungersen Gl.), and that no channel opens out there, and in 1921 he found a flat depression behind the fjord.

The edge of the inland ice between Nordenskiölds Fjord and J. P. Kochs Fjord (Freuchens Land). The outer part of J. P. Kochs Fjord was discovered and mapped by KNUD RASMUSSEN and the present author in 1917, the inner portion discovered and mapped by the present author in 1938.

While thus KANE's Expedition mapped the edge of the inland ice from Brother John's Gl. behind Inglefield Land and further the edge of Humboldt Gl. as far as 80° N. lat., neither HAYES's Expedition

(1860), HALL's Expedition (1869—70), NARES's Expedition (1874—76, with the exception of the discovery of Petermanns Gl.), nor GREELY's Expedition (1881—84) contributed to the mapping of the edge of the inland ice along the north coast of Greenland.

In this connection I call attention to a statement by GREELY (1886, Vol. I, p. 416): "Similar physical conditions must govern the distribution of the inland ice in Greenland, and I doubt not that from Thank God Harbor one can travel eastward to St. George Fiord, and probably thence, through inlets and connecting valleys, over the coast of Greenland to the east coast. Such a trip I had planned, but was obliged to abandon it for want of dogs. The absence of any coast-glaciers north of Petermann Fiord, the extreme inland extension of Victoria, Nares, Sherard Osborn, and other inlets, as well as the comparative freedom of the bordering coasts from snow are all significant facts.

"The actual determination of the northern edge of the inland ice of Greenland would have been a valuable contribution to Arctic geography, which would have fittingly supplemented the discovery of such extraordinary physical conditions as resulted from our summer explorations in Grinnell Land."

On the basis of his experience on Grinnell Land and LOCKWOOD's experiences on his journeys along the north coast of Greenland in 1882, GREELY claims that large areas of ice-free land must be found there, and proposes their mapping as an object for future work.

It will be seen that on his inland ice journey in 1892 PEARY could not take up this work.

PEARY's and ASTRUP's Journey from McCormick Bugt to 82° N. lat., 40° W. long.

The most detailed accounts of this journey were given by ASTRUP in his book "Blandt Nordpolens Naboer" (Kristiania 1895, pp. 164—193, English edition London 1898, pp. 175—214) and by PEARY in his "Northward over the Great Ice" (1898, Vol. I, pp. 284—318).

ASTRUP's travelling report is partially written in the form of a diary, and is accompanied by a map on which the route and the date for each day's march are indicated. PEARY's report is not a diary, though it gives more details in various respects.

On April 30th ASTRUP, GIBSON, and Dr. COOK accompanied by some Eskimos started on to the inland ice near the head of McCormick Bugt in order to bring the equipment up across the first steep slopes. On May 3rd PEARY followed them.

On May 14th they reached the plateau of the inland ice, and on May 15th they started on the journey. PEARY says (1898, Vol. I,

p. 292): "My course was north-east true, which, assuming the charts to be correct, should enable me to clear the heads of the Humboldt, Petermann, and Sherard-Osborn indentations."

On May 17th they reached the highest point between Inglefield Bredning and Kane Bassin.

On May 19th and 20th they experienced a gale; they were then near Inglefield Land, and PEARY decided to go 5 miles eastward in order not to approach too near to the land.

On May 24th they had travelled 130 miles (according to ASTRUP 210 km) from McCormick Bugt, and GIBSON and Dr. COOK returned back from this point. PEARY and ASTRUP then had 14 dogs and two sledges.

On May 30th they sighted land to the northwestward. Next day it was more clearly visible and turned out to be snow-covered mountain plateaus near Petermanns Fjord. Later they had a wide view out through Petermanns Fjord, but at the same time they encountered large crevasses, which forced them to turn eastward over a stretch of 10 miles, when they again went northeastward.

It is worth noting that PEARY and ASTRUP from their position on the inland ice could not see the rather low-lying Daugaard-Jensens Land[1]). Evidently PEARY travelled along the edge of the circus of Petermanns Gl. On June 1st they made an observation, taking various bearings to the mouth of Petermanns Fjord. This observation has not been published, but their descriptions seem to show that they were actually farther east than they assumed.

On June 6th they passed the highest point between the depression of Petermanns Gl. and the depressions of the fjords of the north coast. On June 7th they again made an observation, which has not been published either. On June 8th or 9th they sighted the coastal mountains. PEARY says (1898, Vol. I, p. 308): ". . . camping in view of Sherard-Osborne Fjord, as I at first supposed, on the 8th of June. I had not expected to sight land again so soon, and if the maps were correct, it should have taken about two marches more to have brought me within sight of this inlet, but I assumed that naturally the delineation of the inner portion of the great fjord might be considerably out in latitude, and that what I saw before me must be Sherard Osborne. Future developments showed me that I was wrong, and that St. George's Fjord penetrates farther inland than had been supposed, and that this was what I saw before me."

ASTRUP states that their northeastward course was cut off by huge depressions in the ice, extending eastward and inland from the glaciers

[1]) According to the description PEARY was a little farther east than the Second Thule Expedition in 1917, which travelled across crevasse systems.

at the head of a fjord to the northwest of them. Some observations were made here, but these, too, must have been doubtful, for according to PEARY's route the camp should be situated in about 53° W. long., or almost in the same place where the 2nd Thule Expedition ascended the inland ice in 1917; but the conditions as described by the 2nd Thule Expedition are not in accordance with the descriptions given by PEARY and ASTRUP; probably their camp was situated two or three degrees of latitude farther east, for if so, their description agrees with the actual conditions. It is quite right that they could distinguish the depression leading towards the head of St. George Fjord far out in the northwest, but the depression by which they were now confronted was the depression of Sherard Osborn Fjord.

Only four observations were taken during the whole journey; for practical reasons they travelled in the night, and it would cause great delay if they were to make observations in the day. It would seem that these observations were only observations for latitude, at any rate ASTRUP, mentioning the observation made on June 26th (observation No. 4), states the latitude, but not the longitude. Hence it is not surprising that the route from McCormick Bugt to the depression behind Sherard Osborn Fjord was somewhat more easterly than assumed by PEARY.

The following two weeks were to be the most difficult ones of the journey. Diverse obstacles were encountered, the weather was thick and stormy, and no observations were taken. PEARY writes that he "had grown to hate the sight of the land". Some distance farther on he says (vol. I, pp. 314—315): "Just as long as the black cliffs peer up at us over the round of the ice-cap, just so long are we beset with crevasses, slippery ice, hummocks, howling wind-storms, furious drifts, and fogs". And p. 315: "Once out of its sight, we find summer weather, light winds, little drift—in a word, peace and comfort."

It will be understood that during this troublesome time no attempt was made to link up with BEAUMONT's map of the north coast. Sherard Osborn Fjord was the only one of the fjords of the north coast which had previously been partially mapped, by BEAUMONT, far towards the interior. LOCKWOOD's mapping farther eastward indicates the entrance of the fjords, but not their extension.

It is peculiar to note that PEARY and ASTRUP evidently held the view that Sherard Osborn Fjord was the only really extensive fjord. On the basis of their descriptions it is fairly easy to reconstruct their journey, and this I have done in my "Contributions to the Glaciology of North Greenland" (1928, Pl. 6).

On June 20th or 21st, having passed the first depression and again proceeding northward, they sighted land ahead, and both PEARY (1898,

I, p. 314) and ASTRUP (1895, p. 190) felt certain that it was the land round Sherard Osborn Fjord, and ASTRUP fancied that they might beat the polar record travelling on the inland ice. There can be no doubt that the land they sighted was the southern part of Wulffs Land, that is to say, the land east of Sherard Osborn Fjord. Subsequently they had to pass another large depression with huge crevasses (viz. the depression behind Victoria Fjord with C. H. Ostenfeld Gl.). Having passed this depression, they struck good going and the weather was fine, so the following days, June 23rd—25th, they made good progress. ASTRUP says in his travelling report that during these days they sighted land, while PEARY states (p. 317) that (probably on June 24th or 25th) they travelled at an altitude of about 6000 feet, "the land mountains visible to the north-west nearly all the time, and towards the end of the march a fjord with high sharp peaks on its northern side coming out clearly in the north-west."

It appears from PEARY's and ASTRUP's maps that in the days of June 24th—25th they took the fjord into which they looked to be Sherard Osborn Fjord, not being aware that it was actually Victoria Fjord. On June 26th ASTRUP took an observation at noon, the result was 81°58′ N. lat., but shortly after, in latitude 82° N., longitude 40° W., their northeastward course was barred by large land-masses and a fjord, which forced them to turn southeastward[1]).

The Edge of the Inland Ice on PEARY's Maps.

It will be seen that from McCormick Bugt to the depression behind Petermanns Fjord PEARY and ASTRUP were fully aware of their position, though their course was somewhat more easterly than planned. However, when they sighted land south of the large fjords of the north coast, they did not know whether they were confronted by the depression of St. George or of Sherard Osborn Fjord; and when subsequently they looked down across Victoria Fjord, they took it to be Sherard Osborn Fjord. This is reflected in the various maps resulting from the journey. Of these maps mention may be made of PEARY's map published in Mrs. PEARY, "My Arctic Journal" (1893, p. 241). On this map Washington Land is practically ice-free, Hall Land and Nyeboes Land largely free of ice. Sherard Osborn Fjord extends far

[1]) Although there is no actual disagreement between ASTRUP's and PEARY's travelling reports, it is sometimes difficult to give the exact date, since PEARY's report is not written in the form of a diary, and since the marches, as is usual on spring journeys in the polar countries, took place in the night. Thus PEARY writes (p. 317) for June 26th "in the morning", while according to ASTRUP's report it should be the evening.

inland, and between 50° and 55° W. long. a broad glacier descends from the inland ice, partly towards St. George Fjord (whose head, however, is not connected with the glacier), partly northeastward towards the head of Sherard Osborn Fjord. Then follows on either side of 50° W. long. and south of Sherard Osborn Fjord a large ice-free land area, and finally, east of the latter, a large glacier descending westward towards Sherard Osborn Fjord. The whole land area between Sherard Osborn Fjord and "the Peary Channel" is indicated as free of ice.

On November 30th, 1892, that is to say, immediately after his return to Norway, ASTRUP delivered a lecture to the Geographical Society at Kristiania (Det Norske Geogr. Selsk. Årbog 1892—93. Map Pl. 2). The lecture was in a very popular form, dealing mostly with the stay of the expedition among the Eskimos, but briefly mentioned the journey across the inland ice. The accompanying map is without details, and differs considerably from ASTRUP's later maps.

In his book "Blandt Nordpolens Naboer" (1895, p. 224) ASTRUP published a map in colour, on which the travelling routes with dates are indicated; the map is in close accordance with the map published by Mrs. PEARY in 1893. The map accompanying the English edition (1898) of ASTRUP's book is a copy of the map in the Norwegian edition, though it is without colour and altogether more sketchy.

ADAMS's article on PEARY's expedition (1893) is accompanied by a map, which is stated to be "Reduced from Admy Chart No. 275, with corrections at Inglefield Gulf and additions at Independence Bay from surveys and sketches made by Mr. Peary 1891, 2." Like ASTRUP's map it shows the edge of the inland ice in accordance with the map in Mrs. PEARY's book.

Finally, a map accompanying PEARY's lecture to The Royal Geographical Society, London, on November 10th, 1903, (Geogr. Journ., Vol. 22, 1903, map p. 724) gives the edge of the inland ice in close agreement with the above-mentioned maps (Mrs. PEARY and ADAMS).

The same year, however, we find in the Bulletin of the American Geographical Society (Vol. XXXV, 1903, pp. 496—534) a "Report of R. E. Peary, C.E., U.S.N., on work done in the Arctic in 1898—1902", sent in to the Society on October 15th by The Peary Arctic Club, New York. The accompanying map (published December, 1903) is stated to be "Based on the Chart of the Hydrographic Office, Published at Washington, D.C., Oct. 1903" (viz. No. 2142). As regards the edge of the inland ice the map differs essentially from PEARY's maps. It seems to have been prepared by the Hydrographic Office without consultation with PEARY, but to be based to a great extent partly on earlier expedition reports ("Incorporated with the earlier surveys"), partly on mere suppositions. Thus Washington Land is covered by the inland ice to very

near the coast. The inland ice extends far out on Hall Land, and between Newman Bugt and St. George Fjord it extends beyond the 82nd parallel. Further, Sherard Osborn Fjord penetrates far into the country; its interior is somewhat doubtful, but a large fjord here extends into the inland ice. Between Sherard Osborn Fjord and the Peary Channel PEARY's assumptions have been largely followed.

This map remained the official map up to 1915. It is interesting to note, however, that in "Nearest the Pole" (1907) PEARY reproduced this map in colour, but adds land south of Sherard Osborn Fjord. Thus here we find again the nunatak which PEARY assumed to occur between the two large depressions, presenting again the picture of a land south of Sherard Osborn Fjord bounded on either side by a glacier descending into the fjord, one from the west and the other from the east; the two glaciers were assumed to have formed the two large depressions which PEARY had to skirt.

It will appear from the above that even though it may have been PEARY's original plan to travel from the head of one fjord to the other, the large depressions forced him back from the coast, and it was impossible for him to draw accurately the edge of the inland ice from Humboldt Gl. to Peary Land; apart from a very theoretical attempt at combining his observations with those from Sherard Osborn Fjord, he actually made no attempt to draw a definite boundary from the Humboldt Gl. as far as 40° W. long.

THE HISTORY OF THE PEARY CHANNEL FROM 1892 TO 1907

Cf. Pls. 8 and 17, A, B.

In a number of publications PEARY and his travelling companion ASTRUP set forth the supposition that there existed a channel which terminated Greenland to the northeast, and north of which, according to PEARY, "detached land-masses" occur. In 1900 PEARY succeeded in determining the northern extension of these land-masses and in indicating their boundaries in all essentials. In 1906 the name of Peary Land was given to these land-masses on the official Danish map.

The 26th of June, 1892, was a turning point for PEARY and ASTRUP on their inland ice journey. In the fine weather and good going of the preceding days they had covered considerable distances, after passing the depression of a large fjord which they took to be Sherard Osborn Fjord.

The overcoming of the difficulties caused by the depressions of the large fjords of the north coast and the favourable travelling conditions made ASTRUP very optimistic, and on halting in the morning of June 26th, having covered 32 km in the course of the night, he decided to take a latitude observation at noon before turning in, in order to find out how far north they were. The result was 81°58′ N. lat. On the one hand he still hoped that they might be able to travel on the inland ice as far north as 85° N. lat., that is to say, to beat the polar record; on the other hand he was afraid that the inland ice would soon stop, because during their last march they had travelled rapidly downhill, and he asks: "Was it not because the 'imperial highway', as Mr. Peary called it, was drawing to a close?"

In the evening they started out again. Having travelled a short distance, they sighted land right ahead. To the north-northwest they sighted the mouth of a large fjord, and the continuation of this fjord could be seen to the northeast. This new obstacle put in their way was a great disappointment to ASTRUP.

It is quite natural that they took this new fjord from the north coast which now barred their way to be Victoria Fjord, the first large

fjord indicated on LOCKWOOD's map north of Sherard Osborn Fjord. This explains why they constantly speak about "Victoria Inlet" in their text. Evidently the whole journey thus far had been made on the basis of odometer distances and compass bearings, apart from some few (latitude?) observations. Subsequently, when determining the position of Navy Cliff, they realised that the fjord was probably not Victoria Fjord, but Nordenskiölds Fjord, about which LOCKWOOD expressly states that as far as he could see it extended far inland.

During the next four days they followed a southeasterly course, "still on account of the aforementioned fjord—Victoria Inlet—which never seems to stop". In those days they had a wide view across Peary Land, and they must soon have realised that they had reached the northern limit of the inland ice and now proceeded along its northeastern boundary. On their march in the night between the 1st and the 2nd July they were looking down upon a glacier, and a broad opening in the coast mountains came into view. PEARY says (1898 I, p. 319): "Through this opening could be seen neither the reflected ice-blink of distant ice-cap, nor the cloud-loom of land." At that moment they began to realise that they had reached the east coast, and decided to descend to the land in order to gain a view of the fjord they had sighted. ASTRUP writes that this night they began to feel certain that they were confronted with a channel, which separated the mainland of Greenland from the more northerly mountain lands.

Original Literature concerning the Peary Channel.

In the succeeding pages I shall quote in extenso what PEARY and ASTRUP[1]) have written about the Peary Channel.

1892. 1) "Mr. Peary's Return from Greenland". Journal of the American Geographical Society, Vol. 24, 1892, pp. 470—473. P. 472 it is said:

"On June 26 we were under the 82° parallel, when the land which I had been keeping in view to the northwest confronted me to the north and northeast and then to the east, deflecting me to the southeast. After marching four days to the southeast, the land still extending southeast and east, I made direct for it toward a large opening in the mountains visible over the nearer summits, and landed on July 1."

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[1]) According to WM. H. HOBBS, ASTRUP mentions the inland ice journeys in 1892 in the following paper to which I have not had access: Eivind Astrup, Peary's Journeys across Northern Greenland, The North Greenland Expedition of 1890—1892 (In S. L. Behrens, Nansen in the Frozen World, Holman, Phila., 1897, pp. 321—438, Ill.).

2) R. E. PEARY: "The North Greenland Expedition of 1891—92." —Journal of the American Geographical Society of New York, 1892, Vol. XXIV, pp. 536—558. With 1 map. On p. 542 PEARY says:

"Again setting my course to the north and northeast, everything went smoothly for several days. We climbed gradually and easily over the highest divide we had yet encountered—something over 6000 feet in elevation—and were descending slightly towards the northeast, when, on the 26th of June, I was discouraged to see the land which had been occasionally visible to the northwest rise into view north and northeast.

"Advancing a short distance farther, the entrance of a large Fjord came into view in the northwest, and soon after the land rose into view north and northeast, with the depression of the Fjord beyond it. I then deflected my course to the east, and soon found the land and the Fjord beyond it again confronting me; deflecting still more, this time to the southeast, I advanced until the first of July, when a broad break in the land beyond the Fjord was visible opening out to the northeast, and I immediately made for the land with the intention of reaching this opening."

And about the outlook from Navy Cliff he says:

"To our left lay the depression of the Fjord which had barred our passage, and still farther to the northward we could make out the entrance of a second Fjord, reaching apparently to the northwestward."

3) ROBERT E. PEARY: Report of the Operations of the North Greenland Expedition of 1891—92.—Proceedings of the Academy of Natural Sciences of Philadelphia, 1892, pp. 342—349.—P. 346 PEARY says:

"Again setting my course to the north and northeast everything went smoothly until the 26th of June. On this day I was discouraged to see the land, which had been occasionally visible in the northwest, rise into view to the north, and then northeast. Then the northwest entrance of a Fjord came into view, and we could trace its course southeasterly just beyond the nearer mountains of the land north and northeast. I changed my course to east, when I was soon confronted by the land and the Fjord beyond. Then I turned to the southeast, and travelled in that direction until the first of July. A wide break in the land beyond the Fjord opened out to the northeast, and I immediately headed for it. Land was reached just before midnight of the 1st. On the 4th of July Astrup and myself, having travelled some twenty-five miles over the coast land, came out upon a vertical cliff about 3,500 feet high, and saw below us the white expanse of the great bay into which the Fjord debouched. This bay opened out to the northeast, and its distant northern shore was free of snow and ice."

4) ROBERT N. KEELY: "In Arctic Seas or The Voyage of the 'Kite' with the Peary Expedition—together with a transcript of the log of the 'Kite'." Pp. i—vii + 1—524. Illustrated by maps, portraits and photographic views. Philadelphia 1892.—KEELY says (p. 387):

"By the twenty-sixth of June the eighty-second parallel was reached. The coast-land, which during the days immediately preceding had, from time to time, been sighted, and up to this point was invariably seen toward the northwest, here suddenly confronted the travelers on the northeast, trending first east, and finally southeast. Supposing he had reached Victoria Inlet, Lieut. Peary changed his course southeast, expecting he would be able to skirt it and get around its head, as he had already turned that of Petermann and Sherard Osborn. But the coast, now clearly in sight on the left, maintained its trend in a direction almost true southeast and parallel with the course adopted, and several glaciers were passed, all flowing in a northeasterly direction.

"At length, on July 1, land was sighted almost due east. It was mountainous, free of ice or snow, and through a depression between two of its highest knobs nothing was seen in the sky beyond of the ice blink, nor of that blue haze indicating land. What could it be then but a lofty headland, and what beyond but the waters of the high Arctic ocean washing the eastern coast of Greenland?

"The northern terminal point of the large glacial mass which covers the whole interior of Greenland had been reached—that was clear. At its foot, before the travelers, lay a bare, stony country; beyond it the higher land first seen, and beyond that—what?"

1893. 1) EIVIND ASTRUP: Løitnant Peary's Grønlandsekspedition 1891—92.—Foredrag den 30te november 1892. (Det Norske Geografiske Selskabs Årbog, IV, 1892—1893, pp. 25—44. Med 1 kart).

In this lecture the Peary Channel is not expressly mentioned, but ASTRUP says (p. 41, translated from the Norwegian): "On the 27th we had at last reached the 82nd parallel, but here our further advance northward was suddenly cut off; for right ahead and eastward, as far as our eyes could reach, we only sighted high, partially snow-covered mountains and no inland ice. We therefore had to change our course, and for the next five days we travelled east- and southeastward. Finally, on July 2nd, we sighted an opening between the high mountains to the northeast of us, and we then suspected that we had reached the east coast. It was about midnight that after two months' uninterrupted ski and snowshoe-running we again set foot on bare land."

On the accompanying map, which is very sketchy, no channel is indicated.

2) JOSEPHINE DIEBITSCH-PEARY: My Arctic Journal, a Year among Icefields and Eskimos. With an Account of The great white Journey

across Greenland by ROBERT E. PEARY, Civil Engineer, U. S. Navy, pp. 1—240, several figs., 1 map. New York and Philadelphia 1893.

On p. 226 Mr. PEARY says: "Once there, we continued our march, always northeastward, till on the 27th of June I discerned black mountain-summits rising above the horizon of the ice-cap, directly ahead of us. Then the northwest entrance of a fjord came into view, and we could trace its course southeasterly just beyond the nearer mountains of the land north and northeast. I changed my course to east, when I was soon confronted by the land and the fjord beyond. Then I turned to the southeast, and traveled in that direction until the 1st of July, when we, after fifty-seven days of journeying over a barren waste of snow, stepped upon the rocks of a strange new land, lying red-brown in the sunlight, and dotted with snow-drifts here and there."

3) CYRUS C. ADAMS: Lieutenant Peary's Arctic Work. (The Geographical Journal, Vol. II, No. 4, October, 1893, pp. 303—316, 1 fig., 1 map (p. 384).

ADAMS says as follows (pp. 309—311):

"Fortunately, at the place where he reached the northern edge of the ice-cap, he was considerably nearer the west coast than at most points along his route; and he has no doubt that, from his lofty elevation of over 5000 feet, he saw the entrance to Victoria Inlet where it joins Lincoln Sea.

. . . . .

"He proved that the northern extension of the great interior ice-cap ends below 82° N. lat. He followed its edge about 60 miles, and he saw it stretching away west and east for a considerable distance. A few glacier arms extend from it to the inlet north of the mainland, and the largest of them, Academy Glacier, which empties into Independence Bay, compares in size with the largest of the South Greenland glaciers.

. . . . .

"He was able to make out both shores of Victoria Inlet in the neighbourhood of its entrance into Lincoln Sea. He traced the higher mountains that border the northern side of the channel all along from Lincoln Sea to Independence Bay. He was unable, at his distance from the western edge of the ice, to see the southern border of the channel between 45° and 40° W. long.; but in his march along the edge of the ice-cap to the south-east he was able now and then to see the channel through rifts in the mountains that border it. He has no doubt that he had traced the northern border of the mainland and established the insularity of Greenland.

. . . . .

"On the edge of the north-east coast of Greenland, Peary climbed a giant trap cliff (Navy Cliff), whose north-east face drops almost ver-

tically to the level of Independence Bay, 3800 feet below. Looking to the west he saw the eastern opening of the inlet that he had followed across North Greenland. To the north, north-west and north-east, stretched steep, red, brown bluff, on the other side of Independence Bay with a flat foreshore reaching to the water's edge. Two broad fiord or channel entrances were made out, one far to the north-west and one to the north-east of Observation Point. The unbroken bay ice stretched away to the white horizon of the Arctic Ocean. Peary could distinctly discern the broad expanse of the ice-covered sea, but the distance was too great to make out any details of the surface. The most distant land was far to the north-east and must have been 60 miles away. It showed no ice-cap, and there were no signs of ice-cap on the lands west and north-west. Mr. Peary has no doubt that these lands are parts of an archipelago of unknown extent.

"It was July 4th, 1892. The day was delightfully warm and calm. The position of Observation Point on Navy Cliff was fixed as 81°37′5″ N. lat., and 34°5′ W. long."

1894. CHARLES RABOT: Les récentes explorations arctiques. (Compte Rendu des Séances de la Soc. Géogr. 1894, pp. 428—437). RABOT points out various differences between the details of the information about the expedition in 1891—92 given by PEARY and those given by ASTRUP in his lecture to the Geographical Society of Christiania. RABOT evidently overlooked that ASTRUP's lecture was highly popular, dealing mostly with the Eskimos among whom the members of the expedition stayed. A reply to RABOT's attack on PEARY appeared next year in Journal of the American Geographical Society (1895, Bd. XXVII, pp. 60—62). Since RABOT's attack seems to be due to misunderstandings, it will not be further dealt with here.

1895. EIVIND ASTRUP: Blandt Nordpolens Naboer. Kristiania 1895.

ASTRUP says (p. 19) as follows (translated from the Norwegian):

"On June 27th, in about the eighty-second degree of latitude, we found our course cut off northward, because here the Greenland inland ice ceases completely, so we turned our course towards the east coast, which we reached on July 4th, the United States' Day of Independence. We discovered here a very wide and extensive fjord, which, in honour of the day, we named Independence Bay.

Further ASTRUP says (p. 192 et seq.):

"On the night of the 26th we again covered more than 32 km. Next day was a Sunday. I remained up till noon to get an observation of latitude, being anxious to know how far north the laborious marches of the last few days had taken us.

"The result was 81°58′, which I immediately told Lieutenant Peary. Very many superfluous words were not said by any of us on the inland

ice; as a rule we were content to think by ourselves, and I shall not deny that before falling asleep that day I gave wings to my thoughts. Northwards they flew, beyond the nearest latitudes, until they approached the 85th parallel, which I had pictured in my imagination as the northernmost point of the mainland of Greenland. Another week, and nothing in the world should prevent us from being there, "If only the inland ice does not fail——if only it does not stop.——Why did we descend so rapidly to-day?"——"Was it not because the "imperial highway", as Mr. Peary has called it, was nearing its end?"——"Shall we really push farther northward than any other human being—right to the immediate vicinity of the pole——and by such simple means?"—"There is sufficient strength and enthusiasm——if only that blasted inland ice does not stop suddenly." Thus I lay for a long time, indulging in fancies, before I fell asleep. At long last I had been seriously attacked by the "arctic fever", so well known to arctic explorers.

"But life is full of bitter disappointments. We had scarcely started out that evening, heading northeastward, when we sighted land right ahead of us. To the north-northwest we could distinctly trace the entrance of a large fjord between the high, dark coastal mountains, and it was this fjord whose continuation we now saw in a northeasterly direction. So here was another obstacle which we had to work round. Once more we changed our course to due east, but since the weather had gradually turned overcast and thick with snow, so that we lost sight of the land, at the same time as we began to descend with great rapidity, Mr. Peary found it most advisable to halt and await clearer weather.

"In the succeeding four days we followed an entirely southeasterly course, still on account of the aforementioned fjord—Victoria Inlet—which, it seemed, would never come to an end, and our suspicion that it possibly extended in the form of a channel between the west and the east coast grew daily stronger. During these four days we covered a little over 70 km.

"At last, in the night between the 1st and the 2nd July, we sighted an opening in the high mountains to the northeast of us, and since this opening, as far as could be seen, could be nothing but a continuation of the fjord-branch from the west coast which had for the last few days forced us out of our course, we now began to feel certain that we had before us a channel which separated the wild mountain landscapes to the north from the true continent of Greenland on which we stood.

"It was useless to waste more time travelling in a south-easterly direction, the main point being now to ascertain whether the wide cleft we saw debouched into the Arctic Ocean on the east coast of Greenland, or whether it was merely an apparent opening, a fjord from the west

coast closed at some place far away. This had to be found out at once, and we therefore laid our course towards the nearest land.

. . . . .

On pp. 206—7 ASTRUP says:

"By nine o'clock a.m. we had reached the aforementioned mountain peak, and from a height of 3800 feet we here had a magnificent and unforgettable view. The very mountain on which we stood, and which Mr. Peary gave the name of Navy Cliff, terminated towards the north in an exceedingly steep mountain wall, continuing with but few interruptions right to the edge of the sea-ice.

"And down there at the foot of the mountain lay a huge bay, widening out eastward and surrounded by high, steep mountain walls. How far inland this bay or fjord cut its way, we were unable to decide with certainty, for mountains lying in front barred our view to the northwest, but the probability is that it is directly connected with the large indentation on the west coast bearing the name of Victoria Inlet, and forming with this a channel which separates the tracts of land situated north of the eighty-second parallel from the actual continent of Greenland.

"At any rate it is a fact that between both these fjords there exists a continuous broad ravine bounded by mountain walls several thousand feet high, and the only question as to which there can be some uncertainty for the time being is whether the bottom of this depression along its middle portion is situated above or below the level of the sea.[1]) Geologically, however, the latter alternative must absolutely be regarded as the most probable. Further, we may probably assume with certainty that the aforementioned most northerly land-tracts are intersected by channels running in different directions, or, in other words, that they consist of several separated islands.

"Just below us to the right a huge glacier, nearly 20 km broad, sloped towards the sea-ice, where it debouched in almost fan-shaped regularity. On the other side of this huge stream of ice towered another perpendicular mountain much higher than that on which we stood or probably not very much below 5000 feet. This mountain plateau, crowned by a projecting tongue of the inland ice, terminated in an abrupt and very conspicuous headland situated to the northeast of us and at a distance of nearly 25 km from Navy Cliff. To the northwest extended long, regular coast bluffs of a red-brown colour, quite steep at the top, but farther down sloping gently towards the sea-ice. We noticed a fairly great resemblance between these coast mountains and the mountain slopes on the eastern side of MacCormick Bay, near Red-

[1]) Spaced out by me.

cliffe House. A single solitary dome of snow crowned the central mass of the mountains, while the remaining ones were free of snow. From these and northeastward as far as the eye could reach, there extended regular coastal plateaus rising abruptly from the sea, probably some two thousand feet high and completely free from snow, at their summits as well as towards the sea."

1898. 1) R. E. PEARY: Journeys in North Greenland. (Paper read at the Royal Geographical Society, December 6, 1897. Map p. 235. See also map, Geogr. Journal, Vol. II, p. 384).—(Geogr. Journ., Vol. XI, No. 3, March, 1898, pp. 213—240, 13 figs.).

PEARY says as follows (pp. 220—222):

"Again setting my course to the north and north-east, everything went smoothly for several days. We climbed gradually and easily over the highest divide we had yet encountered—something over 6000 feet in elevation—and were descending slightly towards the north-east, when, on June 26, in lat. 82°12′ N., I was discouraged to see the land which had been occasionally visible to the north-west rise into view north and north-east. Advancing a short distance farther, the entrance of a large fjord came into view in the north-west, and soon after the land rose into view north and north-east, with the depression of the fjord beyond it. I then deflected my course to the east, and soon found land, and the fjord beyond it, again confronting me; deflecting still more, this time to the south-east, I advanced until July 1, when a broad break in the land beyond the fjord was visible opening out to the north-east, and I immediately made for the land, with the intention of reaching this opening. After reaching the inner edge of the land-ribbon, where the inland ice came down against the slope of the mountains at an elevation of about 4000 feet, we were obliged to travel some 25 miles over the mountain crests and ridges before reaching a summit which gave us an unobstructed outlook over the great bay stretching out to the north-eastward. These 25 miles, over a surface consisting of sharp rocks of all sizes, were extremely trying to Astrup and myself. The fatigue of climbing with our heavy packs and hampered by the dogs, which we were obliged to take with us, was greatly increased by the enervating effect of what was to us an almost tropical temperature, accustomed as we had been to the clear, cold, searching atmosphere of the inland ice. When, however, we reached at last the summit of the great bronzed cliff, some 3500 feet in height, guarding the head of the great bay, we forgot all our fatigue in the grandeur of the view before us. To our right, across a great glacier, rose other vertical bronze cliffs 4000 feet or more in sheer height, and ending in a wild promontory. Northward and northeastward stretched a bold, bluff, red-brown line of shore, the nearest portion of it surmounted by an ice-cap of limited

extent, but the more distant portions free of all cresting ice-cap and of snow. To our left lay the depression of the fjord which had barred our passage, and still further to the northward we could make out the entrance of a second fjord, reaching apparently to the north-westward. At our feet, beyond the great fan-shaped face of the glacier, which I estimated to be 20 miles in periphery, were scattered numerous icebergs, prisoned in the still unbroken surface of the bay ice. Beyond this the bay ice seemed perfectly smooth and unbroken, and stretched away uninterrupted to the distant white horizon of the north-eastern arctic ocean. Far out in the centre of the bay I could make out a clouded appearance, undoubtedly due to the formation of water-pools upon the surface of the ice, the first signs of approaching disintegration. Our position was 81°37′ N. lat., 34°5′ W. long."

2) R. E. PEARY: Northward over the Great Ice. Vol. I, pp. 1—521, with maps, diagrams, and about eight hundred illustrations. London 1898.

A map is given at p. 40.

Pp. 317—319 PEARY says as follows:

"On the 26th of June we were descending slightly. In the morning[1]), as we started, heavy white clouds covered the entire sky, except a narrow ribbon of blue south and south-west. Our course was north-east true, but, land appearing to the north-west, north, and north-east soon after starting, I changed the course to east true. The entrance to a fjord with precipitous black shores lay north north-west true from us. As we advanced to the east, the clouds increased in density and a light driving snow came up from the south-west, shrouding the ice with that shadowless light which makes even the snow beneath one's feet invisible. I kept on, however, still keeping my course by the wind, until the very perceptible descent warned me from past experiences to halt and wait for clearer weather. This I did after a march of ten miles. When the snow ceased several hours later, the land loomed up close ahead of us, with the depression of the fjord beyond, and had I continued blindly through the fog I should have brought up right in the head of another great glacier. Our next march to the south-east was a short one, only ten miles, and nearly parallel with the land. Dark-brown and red cliffs looked down into a grand vertical-walled cañon reaching up towards our camp and everywhere north-west, north, and east, black and dark-red precipices, deep valleys, mountains capped with cloud-shadowed domes of ice, stretched away in a wild panorama, upon which no human eyes had ever looked before. The glorious summer calm and warmth of the last three days were now accounted for by the presence of so much surrounding land.

[1]) Probably evening.

"Assuming the fjord ahead of me to be Victoria Inlet, and thinking that I could round it, as I had already rounded Petermann, St. George's, and Sherard-Osborne Fjords, I kept away to the south-east, parallel with the edge of the Inland Ice and the shore. But always as I advanced, the mountains of the shore grew into view before me, keeping me constantly to the south-east, till the 1st of July. On that day a wide opening, bounded on either side by high vertical cliffs, showed up in the north-east over the summits immediately adjacent to the Inland Ice.

"Through this opening could be seen neither the reflected ice-blink of distant ice-cap, nor the cloud-loom of land. I had no further time to waste in travelling to the south-east, in which direction the coast land-ribbon still stretched away as far as the eye could reach. I must reach this opening at once and discover if it looked out into the East-Greenland Arctic Ocean, or whether there was distant ice-covered land to the north-east, which might still be reached by rounding the head of the fjord far to the south-east. Changing my course to north-east true, my elevation at the time being some five thousand feet above sea-level, ski and sledges and dogs sped merrily down the constantly increasing gradient of the ice-cap, straight for the red-brown mountains of the strange land. After several hours, the gradient grew so steep that it became necessary to descend diagonally along the slope. The land, though yet some miles away, seemed as if at our very feet, and as if we might easily throw a stone upon it."

About the outlook from Navy Cliff PEARY says (pp. 345—348):

"Looking to the west, we saw the opening of the fjord that had barred our northern advance. It was this fjord whose western entrance we had descried afar off days before. Now we knew that we had paralleled its course across the northern end of the mainland from Robeson Channel clear to the Arctic Ocean off the shores of north-east Greenland. For days we had kept constantly in view the mountain masses forming the southern boundary of this channel, and through rifts in the mountains we had from time to time seen this depression, and had now and then caught glimpses of the frozen channel occupying it; and we had seen beyond it mountains and fjords stretching between them. It was evident that this channel marked the northern boundary of the mainland of Greenland.

"To the north-west, north, and north-east stretched steep red-brown bluffs on the other side of the bay, with a flat fore-shore reaching to the water's edge; and we could make out to the northward the entrance of a second fjord or channel extending apparently to the north-westward. The resemblance of these bluffs to that shore of McCormick Bay which formed our headquarters was very striking. Close at hand a single isolated ice-cap crested these bluffs, but disappeared in the middle

distance; and, beyond that, the shores which stretched far away to the north-east were free of snow, and the summits free of ice-caps. On the west side of the fjord opening were numerous little islands. There is every reason to believe that to the north-west, north, and north-east we were gazing upon an archipelago whose western limits Lockwood had discovered in 1882.

"At our feet, beyond the great fan-shaped periphery of our big glacier, were scattered many icebergs prisoned in the still unbroken surface of the bay ice. Beyond this, the bay ice seemed perfectly smooth and unbroken, and stretched away uninterrupted to the distant white horizon of the north-eastern Arctic Ocean. We could distinctly discern the broad expanse of the ice-covered sea, but the distance was too great for us to make out any details of the surface. The most distant land we could make out, far to the northeast, looking over the point of Glacier Cape, must have been sixty miles away. It seemed to be flat-topped and there was no ice-cap on it.

"Far out in the centre of the bay, we could make out a clouded appearance, undoubtedly due to the formation of water pools upon the surface of the ice, the first signs of approaching disintegration. But we could see no signs of cracks in the distant bay ice; and we looked in vain for any signs of ice-cap on the lands west and north-west of our point of view.

. . . . .

"Our silent contemplation of the sublime view at an end, I opened the box containing my transit, and set it firmly among the rocks to make my observations for position. The interims between these observations (equal altitudes from three hours before local noon to three hours afterwards) gave time for a round of photographic views and notes upon our surroundings, and to begin the construction of the cairn, which should be in the coming years the silent record of our visit there. The result of the observations was the fixing of the position of Observation Point as 81°37′5″ north latitude and 34°5′ west longitude."

PEARY'S JOURNEY AROUND THE NORTH OF GREENLAND 1900

PEARY's large four-year expedition 1898—1902 touched Greenland to a small extent only, since only one of the four winters, viz. 1899—1900, was spent at Etah in Greenland, while three winters were spent at various points on the west side of Smith Sund-Robeson Kanal.

As already mentioned, PEARY's ship the "Windward" was not strong enough to push north of Smith Sund.

Unfortunately the reports on this great expedition are very brief and contain little of geographic interest. In Bulletin (formerly Journal) of the American Geographical Society (Vol. 35, 1903, pp. 496—534) we find "Report of R. E. Peary, C.E., U.S.N., on work done in the Arctic in 1898—1902", sent to the Society by the Peary Arctic Club of New York City on October 15, 1903. On November 10th, 1903, PEARY gave a lecture to the Royal Geographical Society, London, "Four Years' Arctic Exploration, 1898—1902", published in The Geographical Journal (Vol. 22, 1903, pp. 646—672, map p. 724), worked up evidently on the basis of the same (above-mentioned) report from the Peary Arctic Club. Finally, the same report is reprinted almost unaltered in PEARY's book "Nearest the Pole" (1907).

On March 4th PEARY left Etah accompanied by several Eskimos, having sent his negro HENSON and some Eskimo parties in advance. On March 12th he reached Cape D'Urville, and on March 28th Ft. Conger after 24 days' travelling from Etah, during six of which the party was storm-bound.

PEARY had not yet decided whether to attempt to push towards the North Pole or to go along the north coast of Greenland. However, owing to the advanced season and loss of dogs he decided for the latter plan, and started from Ft. Conger on April 11th with seven sledges. After surmounting various obstacles in the shape of ice hummocks and open water, PEARY reached Kap Bryant, and then, during three days' marches, Kap Frederick, the north point of John Murray Ø. From this point two more Eskimos were sent back, so only PEARY

himself accompanied by HENSON and one Eskimo proceeded on the journey.

On May 8th PEARY reached LOCKWOOD's cairn on Lockwood Ø, and next day he reached Kap Washington and ascertained that the cape was not the northernmost point of the north coast of Greenland.

The ice along the north coast of Greenland seems to have been in unusually great motion that year, none of the other travellers along this route (LOCKWOOD 1882, MACMILLAN and BORUP 1909, PEARY 1906, KNUD RASMUSSEN 1917, and LAUGE KOCH 1921) encountered so much open water and so much movement of the ice as PEARY on his journey in 1900.

For the first time in his travelling report PEARY here (Bull. 1903, pp. 517—518) gives a brief description of the geography of the country, mentioning the low icebergs produced by a couple of glaciers west of Kap Washington and thus solving in part the question about the many "floe-bergs" which were a mystery especially to NARES's expedition (cf. Medd. om Grønl., Vol. 65, pp. 326 and 389).

On May 13th PEARY reached Kap Morris Jesup, the northernmost point of Greenland. From this point he set out across the pack-ice towards the North Pole, reaching latitude 83°50′ N. on May 16th. It was impossible to proceed farther owing to leads of open water between the ice floes, and water clouds were distinctly seen on the horizon. At this camp PEARY made observations and made a profile of the coast from Kap Washington to Kap Bridgman, which profile is published on Admiralty Chart No. 2142.

Next day PEARY started back, reaching Kap Bridgman, whence the coast bent southeastward. He states the latitude of Kap Bridgman to be the same as that of Kap Washington.

The next few days' journeys took him to 83° N. lat. During the first march he passed the mouth of the large Frederick E. Hyde Fjord. On the next march he saw a mountain peak in the interior of Peary Land; it was much enveloped in fog, yet he believed he could recognise it as a peak which he sighted from the inland ice in 1895. He named it Mt. Wistar; however, it is not indicated on any of his maps. There is hardly any doubt that the peak he saw from the inland ice in 1895 is the same peak which I saw from a mountain west of Brønlunds Fjord in 1921 and named the Nordkronen, whereas the mountain he sighted from eastern Peary Land in 1900 was probably not Mt. Wistar, but Tordenskjolds Fjæld.

Owing to continuous fog PEARY had to start his return journey on May 22nd after building a cairn and depositing a report in it on Wyckoff Ø. PEARY did not believe that he was south of 83° N. lat.;

however, in 1907 J. P. KOCH, on finding PEARY's cairn, demonstrated that he had been farther south.

The fog continued during the return journey all the way to Lockwood Ø, but the party travelled rapidly, as they could follow their own trails from the outward journey. On May 26th they passed Kap Morris Jesup, and on the 29th Kap Washington, whence they reached Kap Frederick in four days' marches. They went on towards Kap Bryant, and were back at Ft. Conger on June 10th.

PEARY gives the results of the journey in the following words (Bull. Am. Geogr. Soc. Vol. XXXV, 1903, pp. 522—523):

"In this journey I had determined, conclusively, the northern limit of the Greenland Archipelago or land group, and had practically connected the coast southward to Independence Bay, leaving only that comparatively short portion of the periphery of Greenland lying between Independence Bay and Cape Bismarck indeterminate. The non-existence of land, for a very considerable distance to the northward and northeastward, was also settled, with every indication pointing to the belief that the coast along which we travelled formed the shore of an uninterrupted central Polar sea, extending to the Pole, and beyond to the Spitzbergen and Franz Josef Land groups of the opposite hemisphere.

"The origin of the floe-bergs and paleocrystic ice was definitely determined. Further than this, the result of the journey was to eliminate this route as a desirable or practicable one by which to reach the Pole."

Various attacks have been directed against PEARY, among others by GREELY, who maintained that PEARY had not determined the boundaries of Peary Land. This, of course, is a dispute of words; it has later proved that the approximate boundaries of Peary Land given by PEARY are in all essentials correct; the greater number of the corrections made by J. P. KOCH in the southeastern boundaries of Peary Land are due to the lowness of the land here, so that an accurate delineation is very difficult. In 1921 I made certain corrections in the coast line along the north coast of Peary Land; however, these corrections, too, were due in all essentials to the very flat land occurring there, which it is difficult to gain a view of, especially as long as it is covered with snow.

On the whole it must be said that PEARY's map of northern Peary Land are in all essentials correct considering the very small scale on which it is published, and moreover PEARY made various corrections in LOCKWOOD's map (see Pls. 7 and 8). It is to be deplored that PEARY did not note down a greater number of observations from this

journey; however, it should be borne in mind that the journey was a rapid reconnaissance journey, that he often encountered bad weather, and that his only aim was to determine the outline of the coast. In none of the maps published (Amer. Geogr. Soc., London Geogr. Soc., Nearest the Pole) is the travelling route indicated otherwise than as a line along the coast without any details. Thus PEARY's camp sites do not appear from the maps.

JOURNEYS IN GREENLAND ON PEARY'S NORTH POLE EXPEDITIONS 1905–06 AND 1908–09

PEARY'S Journey along the North Coast of Greenland in 1906

PEARY's north pole expedition 1905—06 had no plans of geographical exploration of the north coast of Greenland, however, as events fell out, he came to travel for some distance along the north coast.

PEARY's ship, the "Roosevelt", had pushed as far as Cape Sheridan, where she took up her winter quarters. Shortly after the middle of February the journeys towards the North Pole were started, according to the system which was to prove so successful during the journey in 1909. The weather conditions were unsettled all winter, and towards the end of the winter and in the early spring of 1906 there seems to have been a severe ice-drift in the polar basin.

After surmounting various obstacles, PEARY reached a point in 87°06′ N. lat., nearly 50° W. long., having drifted far eastward. He had to return from this point, heading towards the coast of Greenland, and after a troublesome journey reached Kap Neumayer[1]) on May 12th.

Even before reaching the shore, the party had discovered a sledge-trail, and hoped it was that of a relief party sent out from the ship.

[1]) The name Kap Neumayer was originally given by LOCKWOOD to the cape situated west of the entrance of Wild Sund (i. e. in De Long Fjord). It is indicated on the map published by the Royal Geographical Society (cf. GREELY, Proc. R. G. S. Vol. IV, 1884, and LANMAN, Farthest North, p. 3). However, in GREELY's book "Three Years of Arctic Service" (1886, p. 325) Kap Neumayer is found both in this place and between Kap Benét and Blue Cape a little west of the entrance to Mascart Inlet instead of LOCKWOOD's original name Black Cape. It is this latter Kap Neumayer which is used by PEARY. On the official map (GREELY, 1888, Report on the Expedition, Vol. I, p. 186) the name Kap Neumayer is found near Wild Fjord but is omitted west of Mascart Inlet. Owing to this confusion the present author on his Map of North Greenland (published by the Geodetic Institute of Denmark 1932) has maintained the name Kap Neumayer at Wild Sund, but has re-inserted LOCKWOOD's original name Black Cape at the entrance to Mascart Inlet.

However, it turned out that it was the trail of a sledge drawn by three dogs and accompanied by four men, evidently in a poor condition. PEARY sent some Eskimos eastward to find the party. It proved to be one of the parties who had accompanied PEARY northward, and was commanded by CLARK. During the journey northward the Eskimos of both parties had the feeling of being driven westward, while actually they had been forced eastward.

Shortly after reaching the shore, PEARY's party secured some Arctic hares, whereas a musk-ox hunt in Mascart Inlet was unsuccessful. The two parties, both of which were in a poor condition, now headed towards Kap Salor, from which point they went south of John Murray Ø. From a distance they sighted some musk-oxen on Nares Land, and succeeded in killing seven. Subsequently they went on to Kap Bryant, and onwards along the coast to Repulse Havn, and in the last days of May they were back at the ship at Cape Sheridan.

No geographical investigations were made along the coast of Greenland during this journey, which came to be a struggle for life. The journey is briefly, but dramatically, described by PEARY in "Nearest the Pole", pp. 148—169.

In the first part of the winter of 1916 I lived for about one month in the house of the Eskimo ODAQ, who was one of PEARY's most prominent Eskimo companions during his journeys in 1906 and 1909. He told me many details from the two journeys, and likewise related about the very great difference existing between the ice conditions of the Polar Basin in 1906, when the ice was in violent motion and much cracked, and in 1909, when the ice was in slight motion and consisted of large floes with an even surface, which rendered it possible to cover large distances on the journey to the North Pole. ODAQ further related that during the return journey along the north coast of Greenland (in 1906) PEARY himself was in a miserable condition; during the last few days before the parties reached the ship, PEARY had difficulty in keeping pace with the others, but on approaching the ship he insisted on walking ahead of the party, which he did though it required the greatest exertion. This display of energy strongly impressed the Eskimos. PEARY says himself (1907, pp. 166—167) that he did not wish to send a party back to the ship for relief.

Journeys in 1909

including BORUP's and MACMILLAN's journey to Kap Morris Jesup.

PEARY's North Pole expedition 1908—09 came to touch Greenland to a far greater extent than his expedition in 1906.

In January, 1909, Professor MARWIN had made a journey from the head-quarters of the expedition at Cape Sheridan, Grant Land, to Kap Bryant on the north coast of Greenland. The return journey from Kap Bryant to Cape Sheridan was made in five days, which shows that the ice conditions must have been favourable and that there were no great movements of the ice north of Robeson Kanal at that time. As is well known, MARWIN was the leader of one of the parties which later accompanied PEARY on the first part of his journey towards the North Pole; but he died during his return journey to the head-quarters.

It was PEARY's plan that, in view of the drift of the ice, depots were to be established along the north coast of Greenland so as to ensure a safe return, if PEARY, as was the case in 1906, were to drift eastward to some point on the north coast of Greenland. The depots were to be laid out by MARWIN and MACMILLAN. But owing to MARWIN's death he was now replaced by BORUP, who had likewise led a party on the journey towards the North Pole, and who had already established a depot 80 miles west of Kap Columbia to support PEARY's return journey.

In "A Tenderfoot with Peary" (New York 1911) BORUP has given a brief description of the journey to Kap Morris Jesup (pp. 199—248). Moreover a copy of his diary, on which the following remarks on his journey are based, is found in the Royal Library, Copenhagen.

The main object of the journey, as stated by PEARY (1910, p. 289) was to deposit caches for the North Pole party, in the event that the party should be obliged by the drifting of the ice to come back that way as in 1906. BORUP (p. 206) describes the object as follows: ". . .so we arranged to lay down a series of "Childs'" lunch counters every twenty miles or so from Cape Bryant to Cape Morris Jesup for the Commander, do a little work for the Coast and Geodetic Department, and try to survey Peary Channel."

During BORUP's journey PEARY returned from the North Pole, and immediately sent out two Eskimos towards Kap Morris Jesup to inform BORUP that the depots were not needed. The second object of the journey, the tidal observations at Kap Morris Jesup, was accomplished, whereas the third item on the programme, a survey of the Peary Channel, was not carried out. The tidal observations are summarised by PEARY (1910, App. I, pp. 299—307).

Although the journey was of no great scientific importance, it is of great interest in many respects. The excellent equipment of PEARY's expeditions was, of course, of great consequence, it was one of the chief causes of the rapid and successful journey. PEARY (1910, pp. 290 and 292) briefly refers to the journey, stating that MACMILLAN and BORUP

covered the distance from Kap Morris Jesup to Cape Sheridan, 270 miles, in eight marches, an average of 34 miles per march.

The journey shows that in the winter of 1908—09 there were practically no movements in the ice along the north coast of Greenland. Thus BORUP mentions that in the northern part of Robeson Kanal the sledge trails from MARWIN's journey in January were still visible. Nor did they encounter open water round Blackhorn Cliff. This is in harmony with the reports of the Eskimos who accompanied PEARY to the North Pole, and it likewise appears from photographs of the pack-ice that there was good going to the North Pole that year; the polar basin was filled with large, fairly level ice sheets, which rendered long days' marches possible.

In the northern part of Wulffs Land east of Kap May BORUP's party killed five musk-oxen. (Before we started out on the Second Thule Expedition, MACMILLAN told us that we could rely upon securing musk-oxen on Wulffs Land, and this proved to be the case). Finally, the party killed 43 musk-oxen during their stay at Kap Morris Jesup and saw several more—a point to be taken into consideration in a discussion of the Eskimo migrations around the north of Greenland.

BORUP'S and MAC MILLAN'S Journey.

BORUP and MACMILLAN started from Cape Sheridan on April 19th and reached Repulse Havn on April 21st. Here they encountered various difficulties in the shape of pack-ice, so they did not reach Kap Bryant till the 24th. Their course was now set towards Kap May, which they reached on April 26th after passing the mouth of Sherard Osborn Fjord, where the snow, as usual, was deep. On April 27th they killed five musk-oxen. Next day three Eskimos were sent back, while the remainder of the party proceeded towards Kap Frederick and camped near this cape on April 29th. Next day the party continued to Kap Salor.

So far the days' marches had not been impressive, and the party continued by short marches to Kap Morris Jesup, which was reached on May 7th. In Fig. 22 I have indicated the sites of their camps on the basis of the available material, notably the diary.

Below I shall quote the geographical remarks contained in BORUP's diary.

May 1, 1909.—". . .we noticed an island half way between Beaumont Island & Cape Frederick which was not on the map." Evidently it had escaped BORUP's attention that even BEAUMONT indicated that island and that it was likewise found on LOCKWOOD's map.

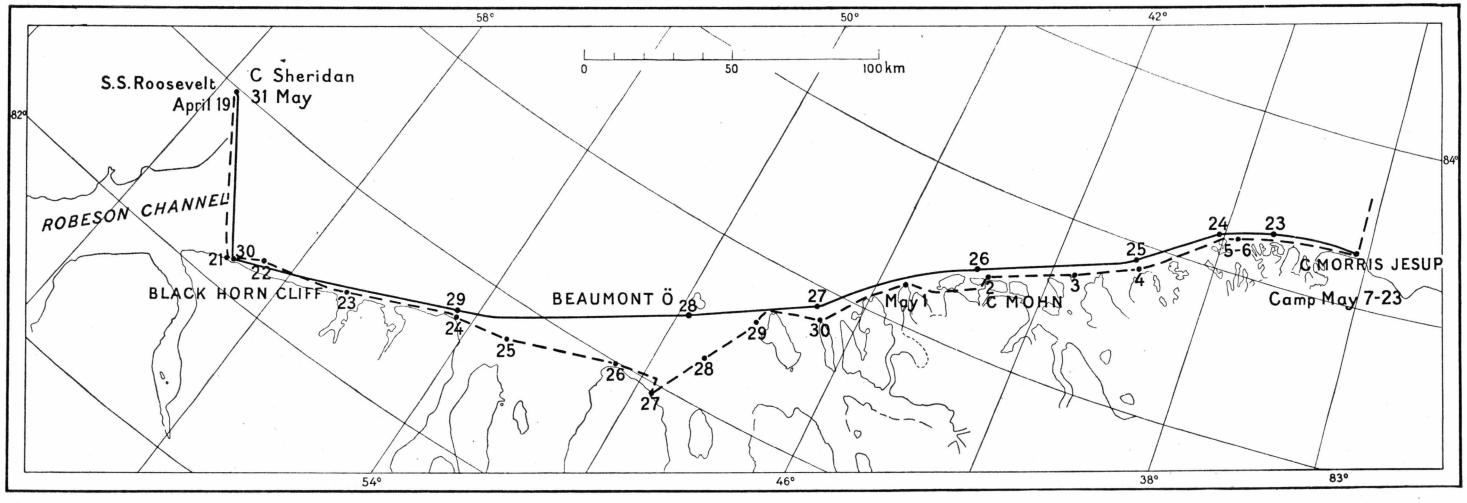

Fig. 22. Borup's and MacMillan's journey 1909 from Cape Sheridan to the southernmost point of Greenland and back. Routes and camp-sites according to Borup's diary.

May 2, 1909.—"The map is wrong. We cut in behind Cape Ramsay Island and instead of being widely separated from the land, the island is barely 600 yds. from the mainland. Again Cape Wykander on the chart is represented as being on the end of a peninsula. This is not so; for I walked throu the little indentation & saw Cape Ramsay on the other side."

May 3, 1909.—"The map is in error again in several places.

"1. There is a Fiord half mile wide just east of De Long Fiord not placed on the chart.

"2. Luigi Amadeo Island is much too long on its northern face.

"3. Mary Murray Island is too far out to sea. We could not see it till well around Luigi Amadeo Island."

May 4.—"Brainard Island is a little bit of a flyspeck compared to Lockwood Island which I think is one of the finest sights on this coast. High precipitous cliffs on the north with a big glacier coming down on the eastern side."

May 5th, Wed.—"We camped in the middle of Benedict Fiord—another great scenic effect. 3 great glaciers coming down to the ice of the inlet and one close in to Cape Cannon not quite reaching the sea ice."

"The map seems to be a little out here. The Mt. east of a large glacier coming down to sea extends further out than is shown on the map.

May 7.—"Crossing the bay east of Cape Cannon in a driving drift Mac and I lost the trail. We regained it after a good deal of trouble in crossing a crevasse at the next headland.

"On the eastern side of this headland a glacier of bluish ice comes down the mountain at a frightfully steep grade and plunges straight into the sea.

"The glacier just beyond at the head of an indentation just west of Sands Fiord is another grand one: It has the usual gradual glacial incline going way back into the mountains. Halfway up on the eastern side it ran against a sheer vertical black cliff the top of which looked like the battlements of a castle.

"On the eastern side of Sands Fiord—another fine panorama—a glacier starting at the very summit of the range comes down into the sea ice at times dropping almost vertically with some wicked looking cracks along the edges.

"The terminal moraines here are something tremendous."

The greater number of these geographical remarks refer to details, but most of them are correct.

I wish to point out here that as far as known to me, no map is available from the journey. The map in Fig. 22 is accordingly based exclusively on the information given in BORUP's diary and his book "A Tenderfoot with Peary".

On May 8th the supporting party arrived bringing a letter from PEARY to MACMILLAN, dated April 28, 1909 (BORUP, pp. 231—232). In the letter PEARY says:

"Arrived on board yesterday. Northern Trip entirely satisfactory. No need of Greenland Depots.

"... Concentrate all energies on tidal observations and line of soundings north from Morris Jesup, and use intended supplies for this purpose.

"A week or ten days' tidal observations and soundings ten miles apart up to 85th parallel will be satisfactory.

.....

"Never mind about any Survey Work. Concentrate all your energies on Jesup and bear constantly in mind, as noted above, that I regard good tidal observations and a good line of soundings from there as second im importance only to the main northern work of the Expedition.

"You should be back much earlier than the first of July.....

"Am anxious to have you back earliest possible date.—Not only on account of open water in the channel, but for tidal observations at Conger."

MACMILLAN accompanied by two Eskimos started northward on May 9th, and returned on May 14th, having pushed northward to 84°16′ N. lat., where they met open water. In the meantime BORUP had made tidal observations. On May 23rd they started on their return journey, reaching Repulse Havn on May 30th, when they met three Eskimos who carried a depot for them. Next day they were back at the ship.

The return journey, which naturally was much affected by the fairly long stay at Kap Morris Jesup and the abundance of musk-oxen secured as well as the favourable ice conditions along the north coast of Greenland that year, is of special interest because it shows how rapidly it is possible to travel along the north coast of Greenland in favourable ice years when the equipment is suitable and hunting successful.

In his diary for May 27th BORUP says:

"Going across Chipp Inlet how Mac. & I longed to go up in it and see how far it went. This was what we had hoped & planned to do on leaving the boat but Commander's "never mind about any survey work" spoiled that trip.

"In a 2 wks. trip we had hoped to reach Navy Cliff. At a 25 mile a day clip it would have been easy—the only thing to fear was deep snow.

"The Inlet is so deep you can't see the bottom of it and looks like a good musk-ox country.

"Markham Island evidently is an island.

"The fiord[1]) which cuts off at right angles to Chipp Inlet to make it an island might run up into De Long Fiord according to Commander."

And on May 28th he says in his diary:

"We camped nearly opposite Beaumont Island.

"The scenery is grand and no mistake. The bottomless fiords of Nordenskiold and Victoria are tempting bait for us and Mac & I are full of plans for coming up to Conger after the Antarctic Expedition and exploring them.

"From Conger as a base this could easily be done with 4 to 6 Eskimos in a year. If things were rushed the fall would be a fine time for then the ice foot is all young ice with no snow. Later on an exploring party might have to contend with deep snow. We have done this Morris Jesup Trip so early that a survey of those inlets would be a cinch.

"The country way in is evidently a musk-oxen one from its rolling aspect—such is the husky verdict.

"In planning for such an expedition one would not have to worry about the Eskimos getting cold feet as was the case on the Polar Sea.

"Again musk-ox could be obtained both at Navy Cliff and Morris Jesup in case the interior did not pan out as a musk-ox country so that all fear of starvation would be dismissed."

In explanation of BORUP's plans for the future as referred to in his diary it should be mentioned that PEARY in his letter to MACMILLAN, which is not quoted wholly in BORUP's book (pp. 231—232) but is quoted in extenso in his diary, says as follows:

"Marvin's death a great shock to me and a great loss to the expedition, to the future and to me personally.

"If your inclinations are that way you must figure his place in the coming Antarctic Work and should regard all your present work as schooling and training for that.

"Remember me to Borup and say to him that if his inclinations are that way and his plans for his immediate future permit there will be work for him in the great National Antarctic Expedition which if I live 5 longer will as certainly place the Stars & Stripes on the South Pole."

It appears from this statement that it was PEARY's plan, after finishing his North Pole expedition, to start a large Antarctic expedition, in which both MACMILLAN and BORUP were to join. However, after the COOK-affair these plans came to nothing.

After their return from Greenland, BORUP and MACMILLAN were active in order to start an expedition with the main object of discover-

[1]) Probably J. P. Kochs Fjord, though not indicated on the maps.

ing and mapping the land which PEARY believed to have seen north of Grant Land, the so-called Crockerland. According to the plan BORUP was to be the leader of the expedition; but shortly before the start from America he was killed by a cano accident. The leadership was then entrusted to MACMILLAN, and the expedition, the so-called Crockerland Expedition, spent the winters of 1913—17 at Etah. However, since the main object of the expedition was to be found north and west of Grant Land, the expedition did not contribute to our knowledge of the geography of Greenland.

SYNOPSIS OF MAPS OF NORTH GREENLAND RESULTING FROM PEARY'S EXPEDITIONS

Cf. Pls. 8 and 17, A, B.

1892. 1) ROBERT N. KEELY and G. G. DAVIS, "In Arctic Seas." Philadelphia 1892.

Map to face p. 13, entitled "Map of Greenland, showing the location of Peary's camp, with the routes of Peary, Nordenskjold and Nansen over the Inland Ice. Compiled from Official sources, for "In Arctic Seas".

Uncoloured map of the whole of Greenland. Inland ice not indicated. PEARY's route of 1892 roughly indicated. No Peary Channel. Independence Bay indicated as a fjord.

2) EIVIND ASTRUP: Løitnant Peary's Grønlandsekspedition 1891—92. Foredrag den 30te november 1892. Det Norske Geogr. Selsk. Årbog, IV, 1892—1893, pp. 25—44. Kort pl. 2.

Uncoloured sketch-map of North Greenland, entitled "Skitse af Nord Grönland". PEARY's route across the inland ice roughly indicated. Glacier crevasses marked at the head of Petermanns Fjord and Sherard Osborn Fjord, and Academy Glacier. No Peary Channel.

1893. 3) Mrs. PEARY: My Arctic Journal, a year among ice-fields and Eskimos, by JOSEPHINE DIEBITSCH-PEARY, with an account of The Great White Journey by ROBERT E. PEARY. Philadelphia 1893. Map p. 241 (cf. Fig. 23).

Uncoloured map, entitled "Sketch Map showing route of the North Greenland Expedition of 1891—92 R. E. PEARY, U. S. N.". The map shows the edge of the inland ice, the Peary Channel, and Academy Land covered with an ice-cap with a marked boundary to the east.

4) CYRUS C. ADAMS: Lieutenant Peary's Arctic Work. Geogr. Journ. Vol. II, pp. 303—316, maps p. 305 and 384. London 1893.

Map p. 305, sketch-map entitled "Greenland showing Peary's proposed work 1893, 4". Outward track and Peary Channel indicated.

Map p. 384, entitled "Map shewing route of the North Greenland Expedition of 1891—92", Natural Scale, 1:3,000,000. Shows PEARY's

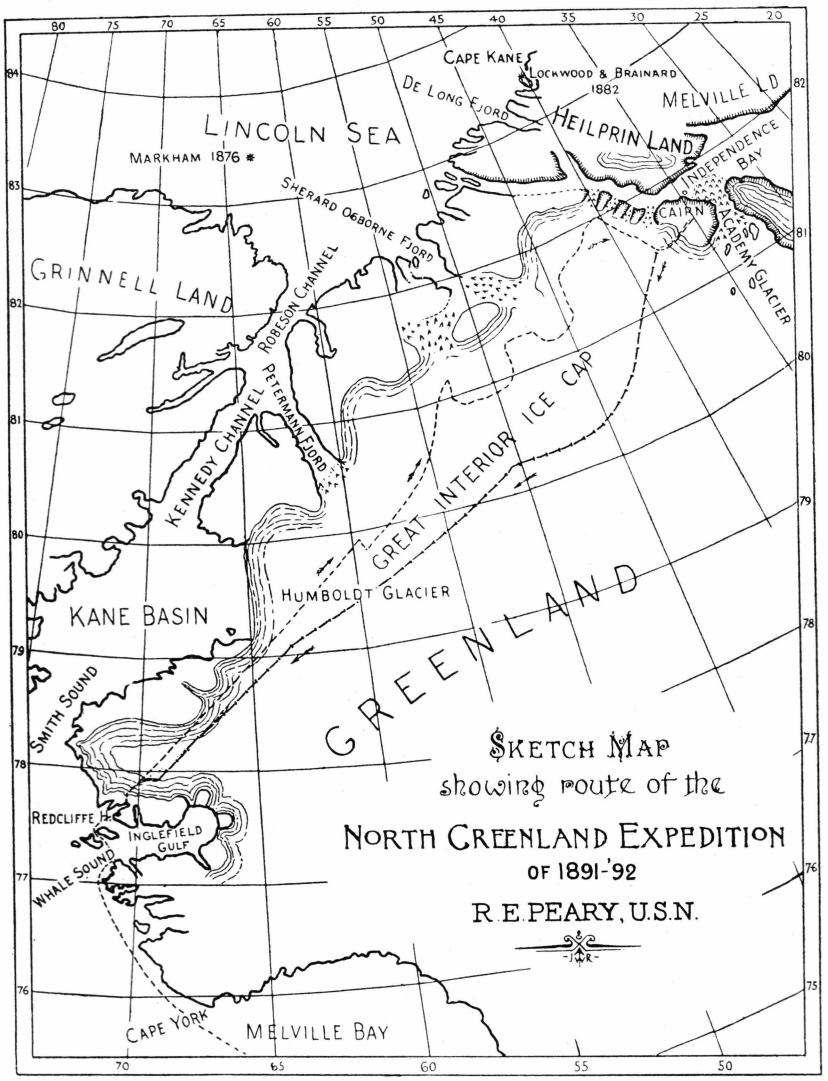

Fig. 23. Copy of PEARY's map published on p. 241 of Mrs. PEARY: My Arctic Journal (cf. p. 138). Nat. size.

routes, the edge of the inland ice (blue), the Peary Channel (blue) (central part of northern branch not indicated), and the seas (blue).

1895. 5) EIVIND ASTRUP: Blandt Nordpolens Naboer. Kristiania 1895. Map facing p. 224.

Map of the whole of Greenland, in colours, entitled "Kart over Grønland". Land areas brown, inland ice blue outlines, sea blue, Peary Channel blue (central part of northern branch not indicated). Travelling routes with camp sites and dates indicated.

1898. 6) R. E. PEARY: Northward over the Great Ice, Vol. II. London 1898. Map facing p. 618.

Circumpolar map entitled "The Arctic Regions comprising the most recent explorations of ROBERT E. PEARY, FRIDTJOF NANSEN and F. JACKSON. By Prof. ANGELO HEILPRIN (drawn by J. W. Ross). The Geographical Society of Philadelphia 1897." This uncoloured map shows PEARY's routes of 1892 and 1895 and the edge of the inland ice. The Peary Channel, but only southern part of northern branch shown; De Long Fjord closed to the south.

7) E. A. PEARY: Journeys in North Greenland. Paper read at the Royal Geogr. Society, December 6, 1897. Map, p. 235. See also map, Geogr. Journ. Vol. II, p. 384. Geogr. Journ. Vol. XI, 1898.

"Sketch map of Greenland showing the journeys of Lieut. E. A. Peary U. S. N. 1886—97".[1]) Map of the whole of Greenland, showing PEARY's routes of 1886, 1892, and 1893—95; further, the Peary Channel (except central part of northern branch), but no inland ice.

8) EIVIND ASTRUP: With Peary Near the Pole. London 1898. Map to face p. 362.

Uncoloured map entitled "Map of Greenland", showing the Peary Channel (dotted lines) and travelling routes with camps and dates.

1903. 9) Hydrographic Office chart No. 2142, published October, 1903.

Title of the map: "North America Polar Regions Baffin Bay to Lincoln Sea Showing the recent discoveries by Civil Engineer R. E. Peary, U.S.N., incorporated with the earlier surveys and examinations made by the U.S.S. Polaris Expedition, in 1871—72, under C. F. Hall, British Arctic Expedition, in 1875—76, under Captain G. S. Nares, B.N., Lady Franklin Bay Expedition, in 1881—84, under Lieutenant A. W. Greely, U.S.A.". Map in colours, showing the edge of the inland ice, the Peary Channel (except central part of northern branch), land areas (brown), seas and sea ice (blue).

10) R. E. PEARY: Four Years' Arctic Exploration, 1898—1902. Read at the Royal Geographical Society, November 10, 1903. Map, p. 724. Geogr. Journ. Vol. XXII, 1903. (cf. Pl. 17, A).

Map in colour entitled "Sketch Map to illustrate the North Polar Explorations of Commander R. E. Peary, U.S.N. Under the auspices of the Peary Arctic Club. Nat. Scale 1:5,000,000 or 78.9 stat. miles to 1 inch", showing PEARY's routes (red) "Surveys of New Coast Line", and "Resurveys of Coast Line", "Routes 1898 to 1902", and "Routes on Inland Ice"; sea in blue colour, Peary Channel (blue) with branch to De Long Fjord.

11) Report of R. E. PEARY, C.E., U.S.N., on work done in the

[1]) On this map a broken line is shown from a little north of Kap Bismarck right up to Kap Glacier.

Arctic in 1898—1902. With 1 map. Bulletin of the Amer. Geogr. Soc. Vol. XXXV, December, 1903, pp. 496—534. (cf. Pl. 17, B).

Uncoloured map entitled "Polar Regions Baffin Bay to Lincoln Sea Illustrating the Explorations of Civil Engineer, R. E. Peary, U. S. N. Incorporated with the earlier surveys. Soundings in fathoms. Heights in feet. Based on the Chart of the Hydrographic Office, Published at Washington, D. C., Oct. 1903. Natural Scale 1:3,168,000", showing PEARY's routes and the Peary Channel (central part of northern branch not indicated).

1909. 12) R. E. PEARY: Nearest the Pole. London 1907. With maps.

Map in colours, entitled "The Polar Regions Showing the Routes and Explorations of Robert E. Peary, U. S. N. From 1892 to 1906." Land areas in brown, sea and ice in blue, PEARY's routes of 1892, 1893—95, 1898—1902, and 1906 in red, inland ice white with a blue margin, a great nunatak indicated in brown south of Sherard Osborn Fjord, further, the Peary Channel (branch extending towards De Long Fjord closed both to the north and south) with full-drawn line.

Circumpolar map in colour, entitled "The North Polar Regions", showing land areas in brown (inland ice not indicated), sea and sea ice in blue colour, PEARY's and NANSEN's routes in red, Peary Channel in blue (northern branch entirely omitted).

1910. 13) ROBERT E. PEARY: The North Pole. London 1910. With 1 map.

Circumpolar map in colour, entitled "Map of the Arctic Regions Shewing Commander Peary's Route to the North Pole", "Commander Peary's Route shewn in Green", "Points reached by other explorers shewn in Red", Scale 1:14,636,160. Land areas brown, inland ice not indicated. Peary Channel (only southernmost part of northern branch) indicated.

1911. 14) GEORGE BORUP: A Tenderfoot with Peary. New York, 1911 (Second edit.). With 1 map.

Uncoloured map entitled "Section of North Circumpolar Map, including Region traversed by Borup". No travelling routes. Inland ice not indicated. The branch channel issuing from the Peary Channel towards De Long Fjord is closed with a full-drawn line.

If we disregard the first two sketch-maps of 1892 (Nos. 1, and 2), we shall find that the succeeding maps (Nos. 3—8 + 10) present a very homogenous material, in agreement with ADAMS's map of 1893 (No. 4) and PEARY's map of 1903 (No. 10), though several of them are rather carelessly executed.

As regards the Peary Channel the maps differ inconsiderably; thus on map No. 3 the east side of Academy Land is more strongly marked than on the other maps. Furthermore, there are deviations in the extension of the local ice caps north of the Peary Channel. On all the maps the channel extending from the Peary Channel to the head

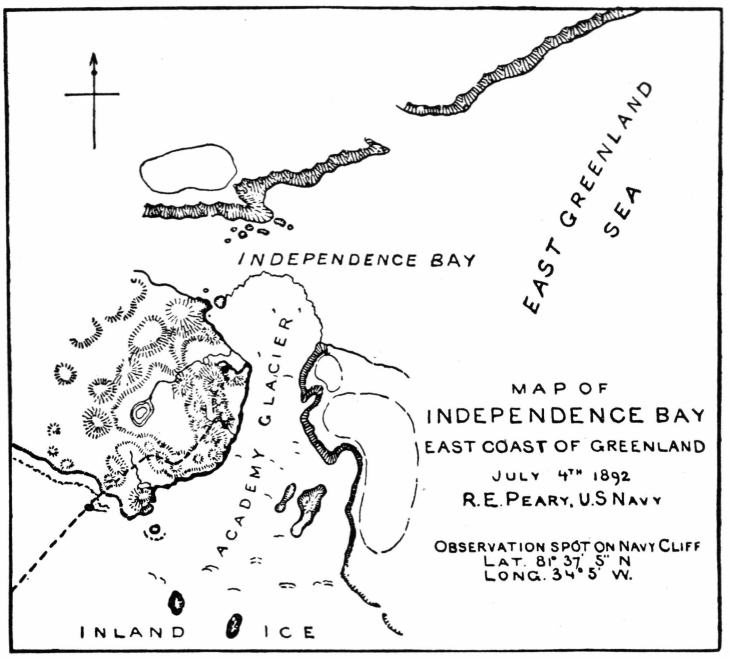

Fig. 24. PEARY's original map from Navy Cliff.

of De Long Fjord is indicated as a possibility, that is to say, the question as to its existence or non-existence is left undecided, with the exception of map No. 10, on which the channel is indicated with dotted lines and the channel area shown in blue. Maps 11—12 are based on the Hydrographic Office chart No. 2142 of October, 1903, though on Map 12 PEARY has inserted a nunatak south of Sherard Osborn Fjord, thus bringing the map in better accordance with the original maps (Nos. 3—8 and 10). In the same way the channel between the Peary Channel and De Long Fjord is closed, and this is copied on map No. 14.

Map drawn from Navy Cliff. (cf. Fig. 24).

R. E. PEARY: The North Greenland Expedition of 1891—92. Amer. Geogr. Soc. Vol. XXIV. Map p. 557. 1892.

Special map (see fig. 24) of Navy Cliff and vicinity, entitled "Map of Independence Bay, East Coast of Greenland, July 4th, 1892, R. E. Peary, U. S. Navy. Observation spot on Navy Cliff. Lat. 81°37′5″ N., Long. 34°5′ W."

A copy of this map is found in Mrs. PEARY's book "My Arctic Journal" (p. 229).

A copy is likewise found in the article by ADAMS (cf. above, 1893, p. 384), insert map in colours, natural scale 1:1,500,000, and in PEARY's book "Northward over the Great Ice", Vol. I, p. 352.

III. DANISH EXPEDITIONS TO EAST AND NORTH GREENLAND

FIRST PERIOD 1906–23

DANMARK-EKSPEDITIONEN TIL GRØNLANDS NORDØSTKYST 1906—08

Leader: L. MYLIUS-ERICHSEN.

Literature.

1) ACHTON-FRIIS: Danmark-Ekspeditionen til Grønlands Nordostkyst. Pp. I—VI + 1—670. Ill. København **1909**.

2) AMDRUP, G.: Report on the Danmark Expedition to the North-east coast of Greenland 1906—1908. Medd. om Grønl. Bd. XLI, pp. 1—270. With 24 plates and four portraits. **1913**,

— Mylius-Erichsen's Report on the non-existence of the Peary Channel; information brought home by Ejnar Mikkelsen. — M. o. G. Bd. XLI, pp. 469-474. **1913.**

3) ASTRUP, EIVIND: With Peary near the Pole. With illustrations and photographs and sketches by the author. Pp. 1—362. London **1898**.

4) BRAND, W.: Stündliche Werte des Luftdrucks und der Temperatur am Danmarks-Havn. Medd. om Grønl. Bd. XLII, Nr. V, pp. 357—445. Ill. **1912**.

5) BRAND, W. und WEGENER, A.: Meteorologische Beobachtungen der Station Pustervig. Medd. om Grønl. Bd. XLII, Nr. VI, pp. 447—560. With 1 map and figs. **1912**.

6) HAYES, J. GORDON: Robert Edwin Peary. A Record of his Explorations 1886—1909. Pp. i—xv + 1—299. With four maps and several illustrations. London **1929**.

7) — The Conquest of the North Pole. Pp. 1—317. With several illustrations, maps and diagrams. London **1934**.

8) HOBBS, WILLIAM HERBERT. The Glacial Anticyclones, the Poles of the Atmospheric Circulation. University of Michigan Studies, Science Series. Vol. 4, **1926**, pp. xx a, b, c 198.

9) — Peary. Pp. i—xv + 1—502. With 27 maps, 13 half-tones, 10 records and diagrams and 36 drawings by the author after photographs by Peary and others. New York **1936**.

10) JOERG, W. L. G.: Revised Survey of the Head of Danmark Fiord, Northeastern Greenland. Geogr. Review, August 1916, p. 159.

11) KOCH, I. P. und WEGENER, A.: Die glaciologischen Beobachtungen der Danmark-Expedition. Medd. om Grønl. Bd. XLVI, Nr. I, pp. 1—77. With 1 pl. and 38 figs. **1911**.

12) KOCH, I. P.: Danmark-Ekspeditionens Kort. Geogr. Tidsskr. Bd. 21, Hft. 5, pp. 167—177. With 7 maps. **1912**.

13) — Survey of Northeast Greenland. Medd. om Grønl. Bd. XLVI, Nr. II, pp. 81—468. With 6 pls. and 67 figs. **1916**.

14) KOCH. LAUGE: Report on the Danish Bicentenary Jubilee Expedition North of Greenland 1920—23. M. o. G. Bd. 70, Nr. 1, pp. 1—232. With 105 figs. and 13 maps. **1926.**

15) MIKKELSEN, EJNAR: Alabama-Expeditionen til Grønlands Nordøstkyst 1909—1912. Medd. om Grønl. Bd. LII, pp. I—VIII + 1—142. **1922.** With 8 pls. 63 figs.

16) MIRSKY, JEANETTE: Northern Conquest. The Story of Arctic Exploration from Earliest Times to the Present. Pp. i—xx + 1—386. With several illustrations and maps. London **1934.**

17) MYLIUS-ERICHSEN, L.: Plan til en dansk Skibs- og Slædeekspedition til Grønlands Nordostkyst. Geogr. Tidsskr. Bd. 18, pp. 195—199, **1906.**

18) PEARY, JOSEPHINE DIEBITSCH-: My Arctic Journal. A Year among Ice-Fields and Eskimos. With an account of The Great White Journey across Greenland by ROBERT E. PEARY. With illustrations and 1 map. Pp. 1—240. New York and Philadelphia **1893.**

19) PEARY, ROBERT E.: Northward over the "Great Ice". With maps, diagrams, and about 800 ills., in two volumes. London **1898.** Vol. I, pp. i—xxvi + 1—521. Vol. II, pp. i—xiv + 1—618.

20) TROLLE, ALF: Rapport over Mylius Erichsens, Hagens og Brønlunds Rejse til Peary Kanalen i 1907 og de Rejser, der dermed staar i Forbindelse. — Manuscript for private eirculation, dated August 11, **1908.** (Cf. M. o. G. Bd. XLI, p. 265. 1913.)

21) — The Danish North-east Greenland Expedition. — Geogr. Journ. vol. 33, **1909**, pp. 40—65. With illustrations and map.[1])

22) WEGENER, ALFRED: Meteorologische Terminbeobachtungen am Danmarks-Havn. Medd. om Grønl. Bd. XLII, Nr. IV, pp. 125—355. With plates I—XVIII and figs. **1911.**

Introduction.

From his earliest youth the Danish journalist and author L. MYLIUS-ERICHSEN took a great interest in Greenland and its exploration (cf. Medd. om Grønl. Bd. 41, p. 37). In the years 1902—04 as a member of the so-called Literary Greenland Expedition he made several long sledge journeys along the west coast of Greenland. He spent the winter of 1903—04 with the Polar Eskimos in the Kap York district, and during these years his interest in an exploration of the unknown parts of Northeast Greenland was aroused. After his return to Denmark he interested the public in these regions, and in 1906 he published a plan for a great expedition with a comprehensive programme (Geografisk Tidsskrift Bd. 18, 1905—06) under the heading, "Plan til en dansk Skibs- og Slædeekspedition til Grønlands Nordøstkyst" (Plan for a Danish Ship and Sledge Expedition to the North-east coast of Greenland). The expedition, which was named the "Danmark Expedition", left Copenhagen on June 24th, 1906. It was one of the greatest expeditions of our century, and yielded some of the richest results.

[1]) The map differs greatly from the official maps of the Danmark Expedition, notably in the distribution of inland ice and sea, and must be regarded as a provisional map.

The main object of the expedition naturally was to explore and map the entirely unknown regions north of Kap Bismarck (77°01′ N. lat.), which was reached by KOLDEWEY and PAYER on a sledge journey on April 11th, 1870. It is true that in 1905 the Duke of Orleans had been ashore in a place farther northward, and from his ship he had sketched the main features of the coast-line almost as far as 78°30′ N. lat. But from this place northward to PEARY's station at Navy Cliff (81°37′ N. lat., 34°05′ W. long.), reached by PEARY on July 4th, 1892, the coast was entirely unexplored, while from Navy Cliff to Kap Clarence Wyckoff (reached by PEARY, May 20th, 1900) the coast was preliminarily sketched by PEARY.

In his plan published in the Geografisk Tidsskrift (cf. above) MYLIUS-ERICHSEN regards an investigation of the Peary Channel as an especially important item of the expedition programme.

Below I shall quote some passages from MYLIUS-ERICHSEN's expedition plan. They run as follows (translated from the Danish):

P. 195. "If Mr. Peary is right in his assumption that Kap Bridgeman is situated on an island—Peary Land—the northern boundary of the continent of Greenland has not been established. On a closer examination Peary-Land will possibly turn out to be made up of several islands separated by sounds. If so, the passage between these islands and the continent of Greenland—the Peary Channel—is probably the route by which the musk-ox, the reindeer, and the wolf, and in their tracks the Eskimo have immigrated from Arctic America to Northeast Greenland and have spread southwards at any rate as far as Scoresby Sund."

P. 196. "An expedition to Northeast Greenland, therefore, must regard it as one of its most important objects to investigate whether or not the Peary Channel exists[1]), and if it does exist, valuable ethnographical observations may probably be made especially along with the zoological and geographical ones."

. . . . .

"The mapping of the whole, almost unknown, northeast coast is an important object, which would in itself be a sufficient cause for an expedition to those regions. The object will partly be to ascertain the northern extension of Greenland, partly to investigate the no doubt numerous widely indented fjords, and to establish the extension of the inland ice, and finally to push northward to the northern limit of that group of islands which Peary assumed to be situated north of the actual continent of Greenland."

[1]) Spaced out by me.

MYLIUS-ERICHSEN's first plan was to establish, by the aid of the ship, a meteorological station and a large depot, possibly north of 78° N. lat., whereas the ship was to have its winter-quarters farther south, perhaps at Kap Bismarck. In February several members of the expedition were to sledge north to this station, from which they were to start on their journeys northward.

The final plan of the expedition, handed over to the committee by MYLIUS-ERICHSEN on the departure of the expedition from Copenhagen on June 21st, 1906, was in the main the same as that of 1905 (cf. Medd. om Grønl. Bd. 41, pp. 52—58).

The most important part of the plan runs as follows (Medd. om Grønl. Bd. 41, p. 54):

"3. 9 men in 3 groups will journey northwards along the coast; of these:

"3a. Two men will go from Independence Bay to the most easterly point reached by Peary, Wyckoff Island[1]) at 83° N. lat., and if possible further north over the ice, whilst

"3b. The leader and 3 men will pass up the Peary Channel partly through de Long Fjord, partly round Nares Land. On the coasts of Independence Bay,

"3c. The 3 men of the third group will make investigations and prepare meat depots by hunting against the return of the two other groups. On April 15th at the latest the groups will meet in Independence Bay and work together round Academy Land, whereupon they will divide into groups and complete the investigation of the coast and fjords down to St. A."

The expedition numbered 28 members. Its ship, the "Danmark", remained for two years in the so-called Danmarks Havn in the immediate neighbourhood of Kap Bismarck (76°46′ N. lat., 18°37′ W. long.).

The very comprehensive scientific programme of the expedition and the mapping of the coast south of 79° N. lat. carried out during the years 1906—08 will not be dealt with here.

The Great Sledge Journey.

On March 28th, 1907, ten men set out from Danmarks Havn with the object of reaching PEARY's two fartheast cartographic stations (Navy Cliff and Kap Clarence Wyckoff, cf. AMDRUP, 1913, pp. 107 and 111—124). Two relief sledges (BISTRUP and RING) returned from a point a little north of 80° N. lat., and two (WEGENER and THOSTRUP) returned from

[1]) "Cape Clarence Wyckoff. Note by editor."

slightly south of 81° N. lat.; both parties did cartographic work during their return journey.

The remaining six men divided into two parties, viz. the 1st party including MYLIUS-ERICHSEN, HØEG-HAGEN, and JØRGEN BRØNLUND, and the 2nd party comprising J. P. KOCH, AAGE BERTELSEN, and TOBIAS GABRIELSEN. The two parties travelled northward together, and on April 28th passed round the easternmost point of Greenland (Nordostrundingen), which to their great surprise they found to be situated as far eastward as c. 11°35′ W. long. On May 1st the two parties parted at Nakkehoved, being certain that the coast now trended westward. The 2nd party, led by J. P. KOCH, was to proceed northward to PEARY's station at Kap Clarence Wyckoff, while the 1st party, commanded by MYLIUS-ERICHSEN, was to travel westward to PEARY's Kap Glacier near Navy Cliff.

As is well known, J. P. KOCH reached Peary Land on May 7th (AMDRUP, 1913, pp. 124—135; J. P. KOCH, 1916, pp. 314—353), and on May 13th found PEARY's cairn with his report at Kap Clarence Wyckoff. He continued northward for two days as far as Kap Bridgman before starting on the return journey.

On May 27th the two parties met, quite by chance, at Kap Rigsdagen. Next day KOCH continued his return journey (AMDRUP, 1913, pp. 135—140) and on June 23rd safely reached the ship.

While thus J. P. KOCH's journey is known in all details, the information about the journey of MYLIUS-ERICHSEN and his companions, the journey whence they never returned, is very fragmentary. MYLIUS-ERICHSEN and HØEG-HAGEN and their diaries were never found, whereas the body of BRØNLUND was found next spring near the depot on Lamberts Land together with his private, rather fragmentary, diary written in Greenlandish, and some landscape sketches and map-sketches made by HAGEN. BRØNLUND's diary is still the most important source of information about the journey. Later two Danish expeditions have brought home three of MYLIUS-ERICHSEN's cairn reports and have gained various experiences in the regions traversed by MYLIUS-ERICHSEN.

After the return of the expedition G. C. AMDRUP worked out the official report on the expedition on the basis of diaries, notes, and personal communications from the various members of the expedition (Medd. om Grønl. Vol. XLI, pp. 1—266, 1913).

It is natural that AMDRUP in this very detailed account discusses at length MYLIUS-ERICHSEN's last journey and the probable causes of the catastrophe which befell him and his companions. In his report, which is worked out with painstaking care, AMDRUP gives an impression of the Danmark Expedition and the last journey of MYLIUS-

ERICHSEN as it might be reconstructed on the basis of information and assumptions available at that time. Later information has caused alterations to be made in this picture at several points, but at that time AMDRUP's report could hardly have been different.

G. C. AMDRUP (1913, especially pp. 213—223) and subsequently EJNAR MIKKELSEN (1922, pp. 89—106) have attempted to reconstruct MYLIUS-ERICHSEN's last journey.

For this reconstruction AMDRUP[1]) had at his disposal (cf. EJNAR MIKKELSEN, M. o. G. Bd. 52, p. 89):

1) JØRGEN BRØNLUND's diary,
2) HØEG-HAGEN's sketch-maps and drawings,
3) MYLIUS-ERICHSEN's verbal communication to J. P. KOCH at Kap Rigsdagen on May 27th, 1907, and finally
4) the opinion of J. P. KOCH regarding the route of the perished party (see Medd. om Grønl. XLVI, No. 2, Pl. IV).

EJNAR MIKKELSEN in addition had the following sources of information at his disposal:

1) MYLIUS-ERICHSEN's cairn report of August 8th, 1907,
2) MYLIUS-ERICHSEN's cairn report of September 12th, 1907, and
3) his own experiences during the journey in 1910 from Dove Bugt across the inland ice and northward through Danmarks Fjord, and his new map of the interior of Danmarks Fjord.

To this have later been added:

1) The experiences of KNUD RASMUSSEN and PETER FREUCHEN during their journey in 1912 from Danmarks Fjord through Independence Fjord and on Vildt Land, and the maps resulting from the journey (cf. also J. P. KOCH's discussion of this map, Medd. om Grønl. Bd. 46, pp. 379—392).
2) MYLIUS-ERICHSEN's report from the cairn at Kap Glacier (brought home by the present author in 1921),
3) Experiences and maps from the journey of the present author in Independence Fjord in 1921, and
4) Experiences and maps from the flight of the present author from near Lamberts Land to Peary Land and back, on August 16th, 1933.

On the basis of the material now at hand I shall attempt to give a new reconstruction of certain parts of MYLIUS-ERICHSEN's last journey.

[1]) Cf. further pp. 179—181 of the present paper.

Mylius-Erichsen's last Journey as it may now be reconstructed.

1. From Nakkehoved to the musk-ox hunting in Gundersteddal, 1st—15th May, 1907.

Thanks to Brønlund's diary this part of the journey is comparatively well known. Entries were made in the diary every day except the 2nd and 11th May.

During the first week the weather was fine, but the snow was deep, and the dogs were very weak. On May 4th Brønlund states that they saw land to the west and north and that they took the land to be Melville Land.—The land they saw to the north was quite correctly Melville Land (the south coast of Peary Land), while the land seen to the west was Valdemar Glückstadts Land.

On May 5th they probably reached Prins Frederiks Øer and camped at the northernmost island. Here Hagen had a cartographic observation station. Brønlund writes that they "saw now distinctly the stretches of land that lay before us" (viz. Valdemar Glückstadts Land), and having reached this land, Mylius-Erichsen decided to go southward into the large fjord which they could see far into from their cartographic station on the northernmost of Prins Frederiks Øer[1]).

During the second week of May the weather was bad, with wind and snow. Only little game was secured, so as early as May 10th they had to kill two dogs to use them as dogs' food. On May 12th Brønlund killed some musk-oxen, probably seven. They had then travelled about 28 km southward along the coast from the place where they first reached Valdemar Glückstadts Land. They remained in Gundersteddal till May 15th.

2. From Gundersteddal to the interior of Danmarks Fjord and back to Kap Rigsdagen, May 15th—27th.

As regards the interior of Danmarks Fjord Hagen's map is incorrect. From about 81°10′ N. lat. almost to its head the fjord is too broad; while the actual width of the fjord as far out as Kap Viborg is only 3—4 miles, the breadths indicated by Hagen are up to 12—14 miles. As both shores are steep, with altitudes of at any rate 300—400 m, there must be an explanation of this deviation; even an amateur-cartographer would not be so much out in his estimate. Finally, Hagen

[1]) There is hardly any doubt that they had a wide view of this fjord, even as far as south of 81° N. lat. On Hagen's sketch-map a thick line at Kap Viborg (on the fair copy this name has been removed to the other side of the fjord) marks a bearing from the cartographic station on Prins Frederiks Øer.

gives the direction of the interior of Danmarks Fjord as practically east-and-west, while it is actually north-and-south with a slight westward trend.

The misdrawing on HAGEN's map was corrected by EJNAR MIKKELSEN, who, however, in his description (Medd. om Grønl. Bd. 52, pp. 77—82) merely gives his observations according to which the interior of the fjord runs in the direction north—south. The conjecture has been set forth that HAGEN turned the interior of the fjord in order to represent the whole fjord on the paper. But if so, it would have been natural for him to point out this fact when he showed his observation journal to J. P. KOCH at Kap Rigsdagen on May 28th. Evidently, however, this was not done, and in the letter from MYLIUS-ERICHSEN to ALF TROLLE sent back with J. P. KOCH, as also in the report deposited by MYLIUS-ERICHSEN at Kap Glacier, the latitude and longitude for the head of Danmarks Fjord are stated in agreement with HAGEN's map.

The question has been dealt with among others by W. L. G. JOERG (Geogr. Review, August, 1916, p. 159), who, however, failed to arrive at a satisfactory solution. He says as follows (p. 159):

"The question naturally presents itself, How is it that Hagen's map, which otherwise has proved so correct in spite of its general and sketchy character, should be unreliable with regard to this region? The facsimile (Pl. V) suggests a possible explanation. The line of sight shown on it radiating from the observation point near Gundersteddal on the western shore of the fiord (see the accompanying figure for place names) include two bearing south-southwest. One of these, if prolonged, strikes Cape Viborg on the eastern side of the fiord. The other, which forms an angle of only 3° with the first, is only half-heartedly drawn and, if prolonged, strikes no prominent point. It might be that, with the primitive means at Hagen's disposal—some of the sights are evidently not even drawn with a straight-edge, but freehand—these two lines were meant to represent the same sight and it was a matter of chance as to which one was used. The position of Cape Viborg was, it seems, determined by the intersection with a sight from an observation point a little farther south, near Pinseskaeret Island. If the first line of sight from Gundersteddal be selected, the sight from Pinseskaeret intersects it at a point which would give Cape Viborg a position 10 kilometers farther north, in close agreement with Mikkelsen's determination. If now the few sights that Hagen was able to take in the uppermost section of the fiord were tied up to the position of Cape Viborg as he had drawn it, instead of where it actually lies, then this alone would account for a shifting of the axis of the upper fiord by about 30° to 40°, or from east-northeast to north-northeast.

"In any case, the fact that the region lies on the outer edge of the area surveyed and that its representation is based on long sights and acute intersections would sufficiently account for the possibility of error. The error consists, it should be noted, mainly in faulty orientation of the whole area; the details are in general correct.

"This latter point is illustrated by the region above the head of the fiord. On Hagen's earlier draft (Pl. V) a valley is shown parallel on the north to the head of the fiord and draining a small lake above. On his later draft (Pl. IV) this lake has lengthened to 75 kilometers and is designated Fyn Lake (Mikkelsen uses "Fyen"; both are native forms for the Danish island of Funen, after which the lake was evidently named). Although Amdrup in his discussion of the maps (op. cit., Vol. 41, p. 222) designates Plate IV as the later and more carefully executed version and has used it as the basis of the official map of the regions explored by the expedition (op. cit., Vol. 46, No. 2, Pl. IV, 1:1,000,000) he makes an exception for the lake and here follows Plate V. Mikkelsen's expedition, however, has shown that Hagen's later chart (Pl. IV) was substantially correct. There is a lake here, some 28 miles long and from 2 to 5 miles wide. It draws its waters from the melting of the inland ice, at which it heads, and is separated by a morainic dam from Danmark Fiord."

In the following I shall attempt to analyse the slight and incomplete material available in order to contribute, if possible, to an elucidation of the disagreements between HAGEN's and EJNAR MIKKELSEN's maps.

The question at once divides into two, 1) the too large width of the interior of Danmarks Fjord, and 2) the erroneous orientation of the same part of the fjord on HAGEN's maps. The following material has been used to throw light on these questions:

1) BRØNLUND's diary (Medd. om Grønl. Bd. 41, pp. 200 et seq.),
2) HAGEN's sketch-map (op. cit., pl. V),
3) HAGEN's fair copy of the sketch-map with names inserted (op. cit. Pl. IV),
4) J. P. KOCH's compilation of HAGEN's map material (Medd. om Grønl. Bd. 46, No. 2, Pl. IV), in the following referred to as "KOCH's map",
5) EJNAR MIKKELSEN's map of the interior of Danmarks Fjord (Medd. om Grønl. Bd. 52, Pl. I).

From BRØNLUND's diary[1]), which is fairly detailed for this part of the journey, it appears that the three men set out from Gundersted-

[1]) BRØNLUND gives the distances in Danmarks Fjord and Independence Fjord in nautical miles.

dal in the evening of May 15th. The dogs must have been well fed owing to the successful hunting. The weather was bad, with "heavy drift snow"; nevertheless they made good progress, and camped in the night of May 16th at the Pinseskæret. The distance covered is about 20 miles according to J. P. KOCH's map, about 21 miles according to HAGEN's map.

During the following four days they remained in camp owing to high wind and clouds. On the 17th they killed 14 musk-oxen, and thus secured food for themselves and the dogs for some time. At last, in the evening of May 19th, the wind lulled. In the morning of the 20th they started towards the interior of the fjord. At first there was a little fog and snow, but later it cleared. Camped late in the evening, having covered 36 miles. At the place where they camped they found a stone-wall and a trap.—I suppose they camped at the meat graves slightly south of Kap Holbæk (as this cape is indicated on Pl. IV, Medd. om Grønl. Bd. 41).

If we measure the distance from Pinseskæret to the camp south of Kap Holbæk on HAGEN's two sketch-maps and on J. P. KOCH's map based on these two sketch-maps, the distance proves to be not 36 miles (as stated by BRØNLUND) but about 42 miles, while according to MIKKELSEN's map, which is a correction of HAGEN's sketch-maps, it is very nearly the same as stated by BRØNLUND, viz. 36 miles. J. P. KOCH indicates on his map that on May 20th the party halted near Kap Viborg (as placed on Pl. V, Medd. om Grønl. Bd. 41). If so, the distance covered on the first day's journey from Pinseskæret will have been about 24 miles. Next day, May 21st, according to J. P. KOCH, they travelled to Kap Holbæk, covering a distance of about 18 miles.

On Fig. 25, based on MIKKELSEN's map, I have indicated the journey from Pinseskæret towards the head of the fjord and back as it must have taken place according to BRØNLUND's diary.

As regards the head of Danmarks Fjord there is a slight disagreement between HAGEN's two maps and J. P. KOCH's map: on HAGEN's sketch-map (Bd. 41, Pl. V) the head of the fjord is indicated in 28° W. long., while on the re-drawn map (Bd. 41, Pl. IV) it is indicated a little farther to the west, and on J. P. KOCH's map a little east of 28° W. long. This is probably because HAGEN on his sketch-map (Pl. IV) has indicated the coast southward from Kap Rigsdagen somewhat farther east than on his map (Pl. V), but on Pl. IV has omitted to remove the head of the fjord a corresponding distance eastward.

At the camp of May 20th BRØNLUND asks himself whether they were in a fjord or a sound (possibly leading to PEARY's Kap Glacier). This remark seems to show that they were aware that the solution of the riddle was near, and actually it came next day. According

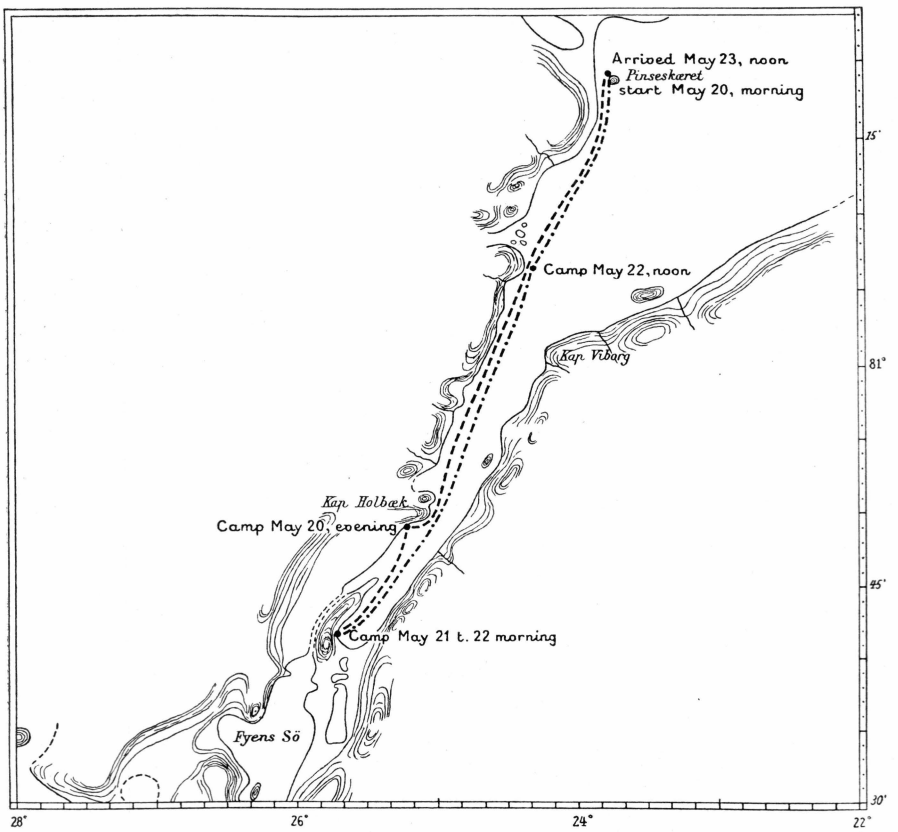

Fig. 25. MYLIUS-ERICHSEN's camps in the interior of Danmarks Fjord, reconstructed on the basis of EJNAR MIKKELSEN's map.

to J. P. KOCH's map, the sledge party has not been at the head itself. However, BRØNLUND's description of the head of the fjord is so detailed, that it must be taken for granted that they have actually been there. HAGEN, too, indicates correctly a number of details and marks the edge of the inland ice to the west. It is true that there are some divergencies between HAGEN's two sketch-maps as regards the land between the head of the fjord and the inland ice, since on his first sketch the distance from the camp at Kap Holbæk to the edge of the inland ice is 28 miles, while on the second copy it is about 52 miles; on J. P. KOCH's map the distance is about 38 miles, on EJNAR MIKKELSEN's map 38 miles.

It must be taken for granted that during their stay at the head of the fjord, viz. the night between May 21st and 22nd, the weather was so clear that they could see the inland ice at a great distance. If it was overcast and the clouds dense, they must have been able to look over fairly long distances below the clouds, but have been unable

to make observations, and notably they have been unable to determine the direction in which they travelled. For some reason or other the party thought they were travelling in an east-west direction, while they were practically travelling in north-south. Still the inner part of Danmarks Fjord has so straight a course that the absence of the sun[1]) would suffice to account for the bend of the fjord on HAGEN's map. From several points along the coast, e.g. near Kap Holbæk, they must have had a wide view towards the north and south.

At Gundersteddal there are two cartographical stations with many bearings. At the Pinseskæret and inside this place there are further two observation stations with several sights, and it seems that HAGEN from one of the stations at Gundersteddal and the station near the Pinseskæret has an intersection to the later Kap Viborg (called Kap Ringkøbing on the sketch). Further, HAGEN had a cartographic station near the meat-graves south of Kap Holbæk, but none of the bearings from this point are seen to intersect any of the bearings from Pinseskæret[2]).

There remains the impression that the journey from Pinseskæret to the head of Danmarks Fjord took place under very unfavourable weather conditions. It was most likely clear, but with low clouds, probably especially east and west of the fjord; the inner part of the fjord may therefore be largely freehand-drawing, based on very few and incomplete observations. This may also account for the wrong orientation of the fjord and its too great width on HAGEN's map.

However unsatisfactory this explanation may be, the question cannot be further elucidated on the basis of the available material. Probably the three men during their journey towards the interior of Danmarks Fjord have had the feeling of being delayed in reaching the goal they had set themselves, viz. to obtain connection with PEARY's cartographic station at Navy Cliff. It is to be hoped that future findings of cairn reports may supply a more detailed explanation.

In the early morning of May 22nd the party started out of the fjord and camped by noon. J. P. KOCH indicates their camp at HAGEN's original Kap Viborg, and this assumption is supported by a remark in BRØNLUND's diary. In the morning of May 23rd they set out again, reaching the camp near Pinseskæret by noon. The journey from Pinse-

[1]) As the midnight sun shines at this time of the year, it may be very difficult, when the fog is dense or the sky is overcast, to decide whether it is day or night.

[2]) Of course we cannot disregard the possibility that HAGEN has only drawn a small number of the bearings he took. It is also possible that he has had cartographic stations which are not marked with bearings on the map; this is the case for the later part of the journey, for instance Hagens Fjord.

skæret to the head of the fjord and back to Pinseskæret thus took them three and a half days. On May 27th they arrived at Kap Rigsdagen.

3. The Journey from Kap Rigsdagen to the Head of Independence Fjord and back to the Summer Camp, May 28th to June 12th.

As regards this journey AMDRUP (Medd. om Grønl. Bd. 41, p. 213 et seq.) has given the reasons for assuming the travelling route indicated on the official map of the Danmark Expedition (see below). However, in a footnote (pp. 7 and 214) he points out that his report was written before EJNAR MIKKELSEN's return with MYLIUS-ERICHSEN's two cairn reports, which actually disproved AMDRUP's theory. EJNAR MIKKELSEN corrects this theory in a chapter called "Attempt to reconstruct the last journey of Mylius-Erichsen" with Pl. II (Medd. om Grønl. Bd. 52, pp. 89—95).

There is no doubt as to the first night of the journey: MYLIUS-ERICHSEN left Kap Rigsdagen in the afternoon or evening of May 28th, reaching an iceberg in the mouth of Hagens Fjord in the morning of May 29th. Here HAGEN drew a sketch (AMDRUP, Bd. 41, Pl. 8). It is not quite clear how long they stayed here; EJNAR MIKKELSEN presumes that their next journey, that is to say, in the night between May 29th and 30th, took them to near Kap Peter Henrik; a cross on HAGEN's sketch-map might indicate this. We know from BRØNLUND's diary that in the evening of May 30th they started towards Kap Glacier (i. e. westwards in a large sound), and that they halted in the early morning of May 31st, having covered 36 miles without sighting PEARY's station at Navy Cliff.

If MYLIUS-ERICHSEN and his party camped near Hugh Lee Glacier on May 31st and started westward in the evening, they had to travel about 25 miles before reaching Kap Glacier, which they did in the morning of June 1st; the sketch of the head of Independence Fjord (AMDRUP, Pl. IX) was drawn on June 1st from the cartographic station on the fjord ice a little east of the cairn.

In the succeeding pages I shall try to give a different explanation from that given by EJNAR MIKKELSEN of the days following June 1st.

When MYLIUS-ERICHSEN and HAGEN built their cairn near Kap Glacier, they were aware that they had linked up with PEARY's mapping; for from their cairn PEARY's cairn on Navy Cliff was distinctly visible through the telescope of the theodolite, and HAGEN's sketch of the head of Independence Bay gives all details in this respect. Thus he indicates Academy Glacier and the land with Navy Cliff and marks Navy Cliff proper by a line.

As far as I can make out, in the night between June 1st and 2nd MYLIUS-ERICHSEN and his party travelled towards Brønlunds Fjord, but did not, as previously assumed (AMDRUP, 1913, pp. 473—474, MIKKELSEN, 1922, pp. 91—92, and Pl. II) remain at the head of the fjord to hunt. The mountain sides in the interior of Independence Fjord are very steep, so BRØNLUND would hardly try to hunt musk-oxen there. How far the party travelled that day, is not quite clear; south of Kap Knud Rasmussen there is an indication of a cartographic station; however, it may be an iceberg to which HAGEN has taken bearings from various stations. Most likely, therefore, they continued as far as Kap Harald Moltke, arriving there in the morning of June 2nd. BRØNLUND writes that in the evening of June 2nd he "went out hunting musk-oxen at a place ca. 8 miles away"; probably he went into Brønlunds Fjord, and if so sighted its head, which is at a distance of 10 miles from Kap Harald Moltke. This explains why MYLIUS-ERICHSEN (report of August 8, 1907) expressly states that they discovered and investigated Brønlunds Fjord during their journey out of Independence Fjord. On his sketch-map HAGEN designates this inlet as a fjord, though he does not indicate its head. From Kap Harald Moltke, which is fairly low, they could not decide whether they were concerned with a fjord or a sound continuing far into the country. On HAGEN's sketch-map two cartographic stations are indicated near Kap Harald Moltke, and some lakelets are shown slightly north of the cape. In other words, the party's stay at Kap Harald Moltke cannot have been quite short.

At noon of June 3rd BRØNLUND returned from his hunting trip without having secured any musk-oxen, and they ate their last supply of musk-ox meat. In the evening the party probably went to the south coast of the fjord to near Hugh Lee Glacier, a rather short journey. BRØNLUND wrote on June 4th that he killed two ptarmigans, and that "a little later he went to the place where the inland ice merges out into the sea, hoping there to meet with seals"[1]). If we disregard the two large glaciers, Academy Glacier and Marie Sophie Glacier, whose fronts are very difficult to approach owing to the great number of bergs stranded before them, the only places in Independence Fjord where the inland ice descends into the sea, are Hugh Lee Glacier and Josephine Glacier. At the former there is a cross on HAGEN's sketch, and I therefore believe that BRØNLUND has attempted to hunt seal near Lee Glacier, and that MYLIUS-ERICHSEN and HAGEN have been hunting on the lowland round the mouth of Astrups Fjord. In the evening MYLIUS-ERICHSEN probably started back along the coast, reaching or passing Kap Grundloven on June 5th. This theory gives

[1]) Spaced out by me.

a satisfactory explanation of the remarks in BRØNLUND's diary, of the two cartographic stations indicated on HAGEN's sketch-map, and of the name Kap Grundloven.

BRØNLUND's diary says nothing about the period June 4th—14th except that the party was compelled to kill a dog to use it as food for the remaining ones, and furthermore, that on June 4th a difficult period set in, during which they encountered "a number of misfortunes which we had never thought of before" (AMDRUP, p. 205), that they rarely secured any game, and that the dogs day by day became increasingly emaciated. We know, too, that the party arrived at the summer camp on June 12th, and in his report of August 8th MYLIUS-ERICHSEN says expressly that they "discovered and explored" both Brønlunds Fjord and Hagens Fjord and discovered some old tent rings (probably the tent rings near Kap Peter Henrik, indicated on Pl. IV).

EJNAR MIKKELSEN (1922, p. 94) sets forth some suppositions regarding the journey from Kap Grundloven and the investigation of Hagens Fjord. However, on a closer study of HAGEN's sketch-map (Pl. V) and his map (Pl. IV) I think it possible to reconstruct with fair probability the progress of the journey.

On HAGEN's map (Pl. V) a small cross marked "lille Bugt" (small bay) is indicated a little east of Kap Grundloven, though the bay itself is not shown in the coast-line. It may be supposed that the cross marks the camp in the morning of June 5th. It would appear that the position of Kap Peter Henrik is uncertain, the name "P. Henrik" being found in two places, the northernmost of which is indicated by a cross at some distance from the shore. If we take this cross to indicate the camp on the inward journey on May 30th, and the southernmost Kap Peter Henrik as the camp on June 6th, the finding of Eskimo tent rings is accounted for; and I agree with EJNAR MIKKELSEN in his view that this undoubtedly took place on the return journey, which likewise seems to appear from MYLIUS-ERICHSEN's report of August 8th. From Kap Peter Henrik the party no doubt proceeded to a point some distance south of Kap Ludovika, arriving there on June 7th, since a cross is found at this point, whence bearings were taken to Kap Bernhard (see AMDRUP, Pl. V), and from this point the southern part of the glacier at the head of Hagens Fjord was likewise visible. HAGEN then, probably, went southwards along the coast and inland to the place called "Hagen's Cairn" (Slutstenen); the figure "50" possibly indicates the altitude of the cairn. From this point HAGEN was able to determine the northern part, too, of the glacier at the head of Hagens Fjord, and accordingly the whole of Hagens Fjord. This supposition is supported by MYLIUS-ERICHSEN's report of August 8th, in which he says that "on the way out through the Fjord we discovered and investigated two side fjords—

'Brønlunds Fjord' towards the northwest and 'Hagens Fjord' towards the south-east and built a cairn with report at the last-mentioned". (MIKKELSEN, 1922, p. 86). No doubt a report is deposited in HAGEN's cairn, and possibly a report by MYLIUS-ERICHSEN is deposited at a point south of Kap Ludovika; however, none of these reports have been secured so far.

In support of the assumption that HAGEN built the cairn "Slutstenen" during the journey out through Independence Fjord and took observations from it, it may be mentioned that on his sketch-map (Pl. V) the cairn is marked by a circle cut across obliquely by a line, which, when continued northward, hits a cross (though indistinctly marked) a little east of Kap Ludovika. If we assume that it took them one day (viz. June 8th) to go to HAGEN's Cairn and back to Kap Ludovika, the cross east of Kap Ludovika may be assumed to indicate the camp in the morning of June 9th. As the day's marches were very short, it must be taken for granted that some hunting has been attempted round Kap Ludovika. Another cross is found about midway between the cross east of Kap Ludovika and Kap Rigsdagen, and some details of the shore line are drawn here. The party probably arrived at this place in the morning of June 10th.

The next cross is found at Kap Rigsdagen (probably marking the camp in the morning of June 11th, which is the same as that of May 28th), and from this place they proceeded to the summer camp, arriving there, as stated by MYLIUS-ERICHSEN, on June 12th.

The cartographic station "Himmelbjerget" was no doubt established from the summer camp, as supposed by EJNAR MIKKELSEN. A proof of this is supplied by the circumstance that this station was marked by a Roman figure (X) similarly to the other cartographic stations round the summer camp. If HAGEN's cairn "Slutstenen" (cf. above) had been established from the summer camp, as assumed by EJNAR MIKKELSEN, it would doubtless have been marked by a Roman figure.

The theory as to the journey out through Independence Fjord as outlined above gives at any rate a satisfactory explanation of all the more or less distinctly marked crosses on HAGEN's sketch-map, supposed to indicate camps and cartographic observation stations, and the dates, too, agree. According to this theory the marches on the journey out of the fjord have been shorter than on the inward journey, which is quite natural, as the dogs were constantly losing strength, and hunting was on the whole unsuccessful. However, it shows something more: it shows that MYLIUS-ERICHSEN was not content, as originally planned, to make a rapid journey to Kap Glacier and back, but that he succumbed to the temptation not only of "discovering" but also of "investigating" both Brønlunds Fjord and Hagens Fjord; and in this he succeeded.

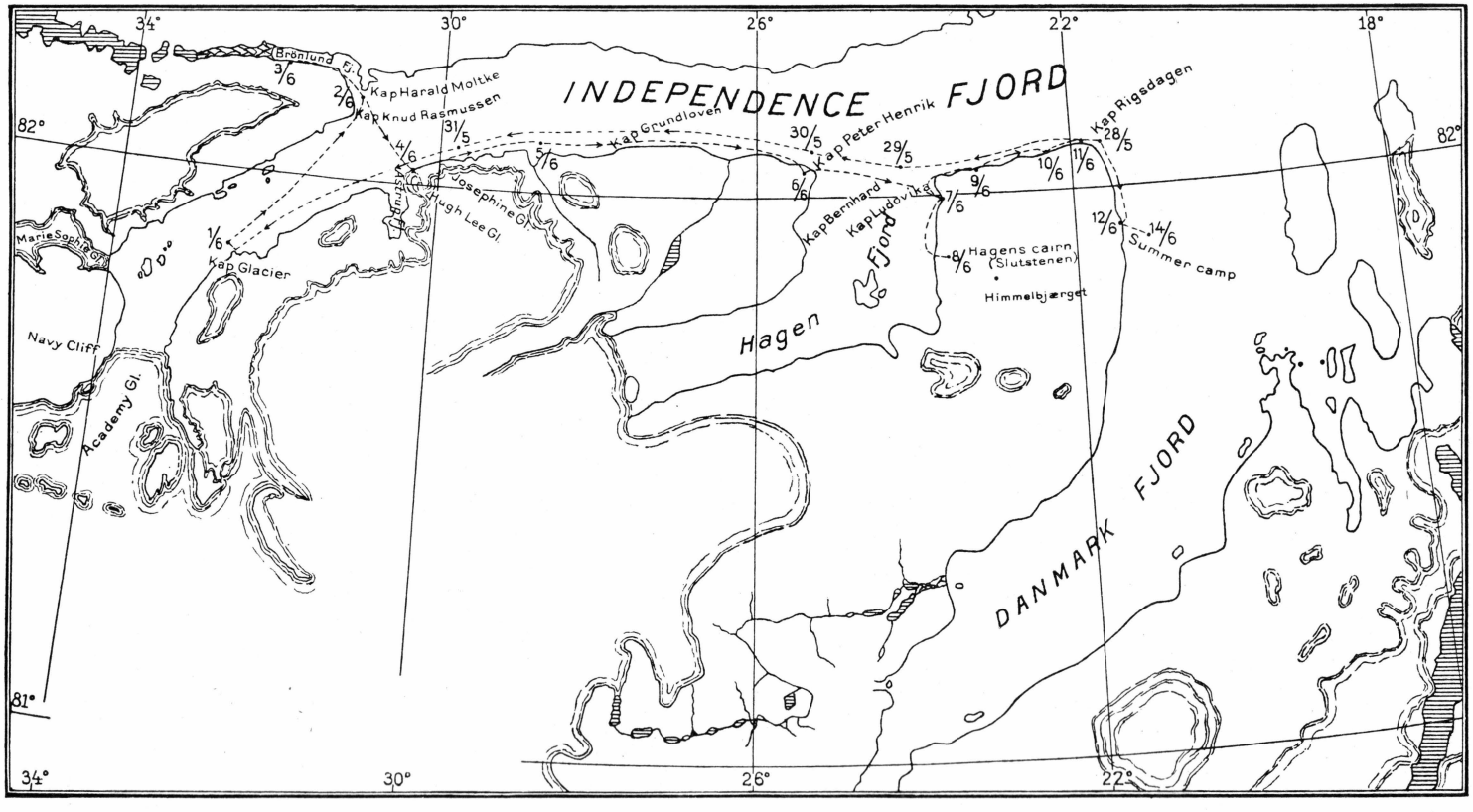

Fig. 26. Attempted reconstruction of MYLIUS-ERICHSEN's journey from Kap Rigsdagen to the head of Independence Fjord and back to the summer camp.

It may be asked: Was it not risky to arrange things so that the journey from Kap Rigsdagen to Kap Glacier and back, which was planned to last for some few days, came to extend over more than two weeks? It should not be forgotten, however, that MYLIUS-ERICHSEN might rightly rely upon successful hunting, as in Danmarks Fjord. The greater part of their provisions were consumed during their journey to the head of Independence Fjord, but here as well as in Brønlunds Fjord hunting was entirely unsuccessful. Probably HAGEN's trip to the Slutstenen was originally made for hunting purposes.

On Fig. 26[1]) I have outlined my theory as to MYLIUS-ERICHSEN's journey into Independence Fjord and back. Whether it is in accordance with the actual facts, cannot be decided till the reports from Kap Ludovika or the Slutstenen or from both places, if such exist, have been secured.

4. The Summer Camp. June 14th—August 8th.

On June 14th the party started on their return journey by travelling out on to the ice of Danmarks Fjord, heading towards the Nordostrundingen—not, as was the plan on parting from J. P. KOCH at Kap Rigsdagen on May 28th, a few days, but more than two weeks later.

The snow on the fjord ice was now in the melting stage, and it was heavy going. After a short march they were forced to return. And now the party came to the fatal decision to spend the summer in these regions and to postpone their return to the ship till the autumn.

Evidently MYLIUS-ERICHSEN did not realise the full importance of this decision. At one point, in particular, their outfit was insufficient, viz. their footwear, which was entirely unsuited for long hunting excursions inland, and they likewise lacked warm and strong boots for the return journey in the autumn. At this point the subsequent three Danish expeditions which have spent the summer along the north coast of Greenland (the 1st and 2nd Thule Expeditions and the Jubilee Expedition) have taken advantage of MYLIUS-ERICHSEN's experiences: they have taken care that footgear as well as other kinds of outfit were in a good state for the return journey.

The expedition further suffered from lack of fuel; only very little kerosene was left, and the fuel supplied by the country in the form of drift-wood and twigs of willow was very scarce.

The animal life of North Greenland is so sparse that a considerable risk will always be incurred in spending the summer up there. However, it was the first time white men spent the summer in these

[1]) Kap Glacier is placed too far to the north, cf. Pl. 11.

regions, and owing to their lack of experience they could hardly imagine the troubles and dangers they were to encounter.

BRØNLUND's diary for this part of the journey is fairly copious, though there may be periods of some few days during which no entries were made. During the third week of June the weather was fine, calm, and summer-like, and the party secured six musk-oxen. Evidently it was during this period that HAGEN drew his two sketch-maps (AMDRUP, 1913, Pls. IV and V).

During the last week of June there came fog, snow, and slush. In the first days of July there seems to have been a period of fine weather, which was probably utilised by HAGEN for mapping excursions (as stated above, his cartographic stations from this period are marked with Roman letters).

In the second week of July rain and snow set in, and about the middle of July their provisions were nearly consumed. On July 15th they killed a big musk-ox, which supplied some fat for fuel. This day, as also July 23rd, BRØNLUND mentions the bad state of their footgear. The month of July ended with constant fog, snow, and rain.

It is characteristic of BRØNLUND, as a Greenlander, to mention in his diary that he shot a seal, but that it sank before he secured it. He was fully aware that its blubber would have solved the difficult fuel problem for them at any rate for some time.

MYLIUS-ERICHSEN evidently expected to experience night-frost so far northward after the middle of July; this appears from BRØNLUND's remark in his diary on July 13th ("We long for the night-frost, which against our expectations has not begun to set in yet") and on July 30th, when he speaks about "a broad belt of melting-ice and snow water between land and the ice". At this point, too, the three men no doubt underestimated the influence of the thaw in these northern tracts. In August they were to meet with further sad experiences of the influence of the thaw on the sea-ice.

The month of August opened with bad weather, a heavy downpour and strong southeast winds, lasting evidently during the first week. On August 6th provisions for only three days were left, the dogs were very weak, and an attempt was made to make boots of the leather bag containing the sextant[1]). They went out to hunt, but returned after twenty-four hours, having secured only two ptarmigans.

5. The Stay on the Sea-Ice. August 8th—25th.

(This period is further described in MYLIUS-ERICHSEN's report of August 8th, deposited in the cairn at their summer camp. After reading

[1]) Probably the theodolite leather bag.

BRØNLUND's diary, which reflects his personal feelings, this official document seems surprisingly courageous and optimistic.)

On August 8th MYLIUS-ERICHSEN made a fatal decision: he decided to try to travel over the sea-ice southwards into Danmarks Fjord to search for better hunting grounds. He failed to consider the fact that the farther one penetrates into an Arctic fjord, the broader will be the belt of open water between the fjord ice and the shore.

By means of ice floes they had their things ferried out to the fjord ice, and they drove southwards, though much hampered by leads of open water, and at last had to camp. However, it was cold, and ice formed on the leads so they hoped that in a few days the new ice would be able to bear; but in this they were disappointed.

On August 12th HAGEN and BRØNLUND managed to get ashore to hunt, but secured only one ptarmigan. They returned to the camp on the fjord ice, and for the following eight days there was continuous thaw and wind. They were entirely without provisions and had to kill the dogs and use them as food for themselves and the remaining dogs. About the middle of August 14 dogs were left.

On August 22nd the weather cleared, and it grew cold. Only eight dogs were left. On August 24th they arrived at a place where they thought it possible to get ashore. Both men and dogs suffered from the sharp ice, which hurt their feet. They drove with only one sledge, carrying the wood of the other for fuel.

6. August 25th—September 12th.

In the morning they succeeded in reaching the land. MYLIUS-ERICHSEN was now walking on his stockings. BRØNLUND succeeded in killing four hares, but when he returned, his comrades had already killed a dog, and thus only seven dogs were left.

In the days August 26th—30th it was fine and clear, and the temperature was below zero. Evidently they were now near Kap Kronborg, for some goods were deposited there for the return journey. They killed 7 hares and 13 ptarmigans, but no musk-oxen, which alone might have saved the dogs. On August 31st they made an attempt to reach Gundersteddal, but did not succeed.

Here BRØNLUND's diary stops; it contains nothing about September and the subsequent time up to October 19th, when he says that they came up on the inland ice, and that the ascent took them four days.

Information about this period may, however, be obtained from MYLIUS-ERICHSEN's report of September 12th brought home by EJNAR MIKKELSEN (1922, pp. 82—83); it enables us to trace the fate of the three men up to this date.

Having at last reached the shore after the long stay on the fjord ice, they pushed across the mountains in small days' marches followed by the dogs to Sjællandssletten. Here they had successful hunting, securing 15 ptarmigan chicks, 15 hares, 1 wolf, and 8 musk-oxen. They found abundant drift-wood, by means of which they prepared their meals. The dogs were well fed, and when they left the place on September 12th, the sledge was loaded with drift-wood for eight days' cooking and more than 150 kg meat, which was estimated to be sufficient food for the men for 16 days and the dogs for 8 days. MYLIUS-ERICHSEN writes that they had contemplated going home across the inland ice from the head of Danmarks Fjord to Nioghalvfjerdsfjorden, but the ice farther towards the interior was still not safe, so they now headed eastward to the outer coast (i.e. around the north of Nordostrundingen), hoping by means of bear-hunting and the depots laid out in the spring to reach the ship safely in 5—6 weeks.

MYLIUS-ERICHSEN further says in the report that on their way into Danmarks Fjord they at last met open water from shore to shore; that is to say that the interior of Danmarks Fjord was free of ice (the same was the case on August 16th, 1933, cf. Pl. 16).

In the official report on the expedition AMDRUP has set forth the supposition that the party ascended the "inland ice" at Antarctics Bugt, this possibility having been discussed between MYLIUS-ERICHSEN and J. P. KOCH (cf. AMDRUP 1913, p. 218), and travelled from this place towards Lamberts Land. This theory was supported by MYLIUS-ERICHSEN's cairn report of September 12th, 1907 (cf. above). During my flight in 1933, however, it proved that the "inland ice" on the Nordostrundingen is only a local ice-cap and that the whole land area between Danmarks Fjord and the outer coast is mostly free of ice. AMDRUP's supposition must therefore now be abandoned.

To understand that this supposition could be set forth it will be necessary to consider the view held by the members of the Danmark Expedition as to the extension of the inland ice.

It is characteristic of a number of early expedition maps from Greenland that whenever the observer's view was barred, he indicated inland ice on the map.

In this respect the maps of the Danmark Expedition form no exception. However, if we read the text by J. P. Koch, which was published some years after the maps, we shall find certain reservations. As early as 1911 J. P. KOCH wrote (KOCH and WEGENER, 1911, chapter "Das Indlandseis von Kronprins Christians Land", p. 51) that not very much can be said about the inland ice along the large fjords visited

by MYLIUS-ERICHSEN during his last journey. He further says that the shores of Danmarks Fjord seem to be free of inland ice, but that the inland ice is not very distant from the head of the fjord, whereas a glacier descends from the inland ice at the head of Hagens Fjord.

On his sketch-map (AMDRUP, Pl. V) HAGEN only marks "Inlandsis" in one place, viz. west of the head of Danmarks Fjord; this is also the case on the later copy (Pl. IV) of the map, though on this map the distance from the inland ice to the head of the fjord is about twice as long. On the latter map no firns are indicated, only some few glacier fronts, while on the sketch-map "Firn" is indicated in several places, viz. on Heilprin Land (seen by PEARY), from south of MYLIUS-ERICHSEN's cairn to south of Astrups Fjord (actually inland ice), south of Hagens Fjord (whether it is an ice-cap or the inland ice cannot yet be decided), and on Valdemar Glückstadts Land south of the Jydske Aas (the size of this ice-cap is still uncertain). Further, south of the head of Danmarks Fjord just south of the Sjællands Fjælde (this is probably the reason why J. P. KOCH indicated the edge of the inland ice so near the fjord on the official map of the expedition; actually there is a small local ice-cap on the Sjællands Fjælde). HAGEN does not indicate whether Kronprins Christians Land is covered by an ice-cap or by the inland ice.

J. P. KOCH (1916, p. 370) explains the principles applied in indicating the border-line between land and inland ice on the map of the Danmark Expedition. It is marked in three different ways, viz.:

1) a continuous line, if there is no doubt as to the course of the border line;
2) a dotted line indicates a higher degree of uncertainty;
3) no line, but a colour transition in the map, if the conception of the position of the border line is so uncertain that it has not been possible to express it in the drawing.

However, persons who copy expedition maps rarely pay regard to such reservations in the text, and this is the reason why boundary lines are given as certain on various maps and atlasses, though on a closer study such lines will prove to be based on mere suppositions and not on actual observations.

It will be seen from the map of the Danmark Ekspedition (northern leaf, Pl. IV) that a boundary between land and inland ice has to a great extent been assumed where no observations were made; thus no inland ice is indicated on Mylius-Erichsens Land; its northern part is largely covered by local ice caps, but this does not agree with J. P. KOCH's

statement mentioned above that the glacier at the head of Hagens Fjord issues from the inland ice. Furthermore it is assumed that the edge of the inland ice nearly reaches the head of Danmarks Fjord, the Sjællands Fjælde being merely indicated as a narrow stretch between the fjord and the inland ice. Likewise the edge of the inland ice is assumed to continue, behind Alexandrine Bjærgene, almost reaching the coast south of Prins Frederiks Øer.

As regards the Nordostrundingen proper, along the ice edge of which the two sledge parties travelled, they had not the slightest doubt that they were confronted with the inland ice, and this is quite natural. The same applies to Amdrups Land. From a little north of Ingolfs Fjord southward to Nioghalvfjerdsfjorden no boundary of the inland ice is indicated, not even by colours.

The Danmark Expedition held the view that the inland ice extended across Kronprins Christians Land and reached the sea over wide stretches of the northern part of this peninsula. This assumption formed the basis of AMDRUP's supposition (cf. above) that MYLIUS-ERICHSEN ascended the inland ice at Antarctics Bugt.

As regards HAGEN's observations of the inland ice it is a fact that he took part in extensive hunting excursions in the highland between Kap Kronborg and Sjællandssletten; I imagine that during these excursions he had a wide view from several places across Kronprins Christians Land, at any rate he could see the summits of the coastal mountain range found in the eastern part of this land. It is therefore quite probable that even during the summer HAGEN was aware that the chances of finding inland ice between the great inland ice and the ice on the northern part of the Nordostrundingen were very small.

It is interesting to note that both TROLLE in the preliminary report of the expedition (manuscript) as well as in his lecture to the Royal Geographical Society, London (1909), and ACHTON FRIIS in his popular book on the expedition (1909, p. 561) set forth the supposition that MYLIUS-ERICHSEN's party ascended the inland ice from the head of Danmarks Fjord, and thence travelled across the inland ice to the depot on Lamberts Land. Two points are, however, certain: 1) MYLIUS-ERICHSEN's party (cf. BRØNLUND's diary) ascended the inland ice on October 19th, the ascent having taken four days, and 2) the depots along the outer coast were untouched; the party cannot, therefore, have taken the latter route.

7. September 12th to October 19th.

The period September 12th to October 19th represents a blank in our knowledge of MYLIUS-ERICHSEN's journey, so we can only make

suppositions as to what actually took place. We know that on September 12th when they started northward for Kap Kronborg to fetch some goods deposited there, the party had one sledge and seven dogs left, that they had abundant supplies of meat and drift-wood for fuel, and that it was MYLIUS-ERICHSEN's intention to travel from Kap Kronborg along the outer coast back to the ship. In the interior of the fjord the ice was not yet safe, while in the outer part there was "new ice, which has to-day at last become safe" (cf. EJNAR MIKKELSEN, 1922, p. 98). How this is to be understood, is not quite clear. It may mean that new ice had now at last formed between Ulvebakkerne and Prins Frederiks Øer.

It must be taken for granted that from Kap Kronborg MYLIUS-ERICHSEN set his course towards Prins Frederiks Øer to proceed thence to the first depot laid out by himself in the spring on Prinsesse Dagmars Halvø, containing 26 kg dog-pemmican and the cooking-box (cf. EINAR MIKKELSEN, 1922, p. 100). The next depot, containing "2 tins of pemmican à 0.5 kg, 1 tin of cabbage and farcemeat à 1.10 kg, and 2 tins of pease meal à 0.25 kg, 2 litres kerosene, and 26 kg dog-pemmican," was deposited at Nordostrundingen.

EJNAR MIKKELSEN did not observe the depot on Prinsesse Dagmars Halvø in 1910; he did not know that it had been established there, but he is of opinion that if it had been there, he would hardly have overlooked it. The Depot at Nordostrundingen was found by EJNAR MIKKELSEN (cf. M. o. G. Bd. 52, p. 100), but the 2 litres of kerosene and the 26 kg of dog-pemmican were missing. EJNAR MIKKELSEN holds the view that MYLIUS-ERICHSEN and his companions must have reached this point, though he fails to understand why they should have left behind five small tins of provisions which must have been especially welcome to them after their having lived for such a long time exclusively on raw or only sligthtly boiled meat.

Personally, however, I am inclined to think that MYLIUS-ERICHSEN and his party never got so far. The circumstance that the depot was not complete may suggest that it has been visited and destroyed by bears.

EJNAR MIKKELSEN (1922, p. 99) points out that if at Prins Frederiks Øer they "had been forced to abandon their project on account of thin ice or for other reasons, and decided to sledge down along the east coast of Danmark's Fjord, they would most assuredly have built a cairn there, and left a report, as these low-lying islands would lie directly on the route of any search-party proceeding towards the western coast of the Danmark's Fjord." The circumstance that no report was found here, may, however, according to MIKKELSEN, be taken as a further proof that the party travelled along the outer coast and ascended

the "inland ice" at Nordostrundingen. As we know now that owing to the absence of inland ice there this cannot possibly have taken place, we have to consider the possibility that the party did not reach the depot on Prinsesse Dagmars Halvø, probably not even Prins Frederiks Øer, but that they were forced by circumstances to make their homeward journey by way of Danmarks Fjord and onwards from the head of this fjord across the inland ice. It must be assumed that they did not travel southwards along the west coast of Danmarks Fjord, for if so, they would have made an addition to the report of September 12th. There remains, then, practically only one possibility, viz. that they succeeded in crossing Danmarks Fjord some distance south of Prins Frederiks Øer, struck level new ice there, and proceeded southwards along the east coast of Danmarks Fjord.

As regards the circumstances which forced the party to resume their previous plan of returning across the inland ice from the head of Danmarks Fjord, it may be suggested that, similarly as during my flight on August 16th, 1933 (cf. Pl. 16), the outer part of the fjord was more or less covered by summering ice, which to a party with a heavily loaded sledge and only some few dogs in a poor condition must have presented almost unsurmountable obstacles[1]), since it would have been a laborious task to get the sledge on to the surface of the sea ice from the many frozen pools on the summer-ice. Or it may be supposed that open water extended far out towards Wandels Hav during the summer, so that even though MYLIUS-ERICHSEN, on leaving the Ulvebakkerne, took the ice to be safe, he may have encountered open water or thin new ice in the middle of the fjord, which forced him to follow a more southerly course. But however this may be, MYLIUS-ERICHSEN must have realised that the journey to Nordostrundingen would be extremely troublesome, and at the same time he must have realised that the ice towards the interior of the fjord was becoming thicker and safer every day so that he might travel on new ice right to the head of the fjord.

To sum up: 1) It must be assumed that MYLIUS-ERICHSEN and his party did not reach Prins Frederiks Øer, 2) that they travelled southwards along the east side of the fjord and that probably one or several reports are deposited along this coast, 3) that the party reached the inland ice at the head of the fjord about the middle of October.

It must be regarded as beyond doubt that during the second journey to the head of Danmarks Fjord and onwards

[1]) Some photographs showing the condition of the surface of the sea-ice at the end of the summer are represented in Medd. om Grønl. Bd. 70, Fig. 61 (p. 133) and Fig. 94 (p. 187).

across Fyens Sø MYLIUS-ERICHSEN was aware that HAGEN's first sketch-map was incorrect as regards the orientation of the inner part of the fjord, and that consequently their journey across the inland ice to the outer coast would be much shorter than at first assumed. Very likely MYLIUS-ERICHSEN has deposited a report in a cairn somewhere in this region which, if once found, may throw light on this problem.

8. From the edge of the inland ice to Lamberts Land October 19th to November-December.

If the journey along the edge of the inland ice were to be made by men and dogs in a good condition, it would hardly present any great difficulties (cf. my map from 1933 (Pl. 16)). Near the edge the ice was probably intersected by thaw-water cracks, but a short distance from the edge the inland ice must have been level and without fissures. The party did not encounter fissures until they approached Lamberts Land, where the glacier narrows between Lamberts Land and Kronprins Christians Land; here large crevasse systems occur, which in the sparse daylight of the season must have caused the exhausted men exceedingly great difficulties.

As to the catastrophe which in November caused the death of the three men we can only form conjectures. There is, however, a possibility that MYLIUS-ERICHSEN has deposited his diaries or a report before ascending the inland ice, considering that the journey across the inland ice might cost their lives.

There are, however, various circumstances connected with the death of MYLIUS-ERICHSEN and his companions which, as far as I know, have never been pointed out before and which may, perhaps, throw some light on the catastrophe. I am thinking of the meteorological observations of the Danmark Expedition. The observations, it is true, were made some distance farther south (though less than 300 km south of Lamberts Land); but it is a well-known fact that the heavy autumn and winter gales blowing along the outer coast, will blow with the same force over such large stretches that a distance of 300 km is of no importance in this connection.

The meteorological reports of the Danmark Expedition (Medd. om Grønl. Bd. 42, notably No. IV by A. WEGENER and No. V by W. BRAND) contain daily observations for November, 1907 (pp. 184—185). WEGENER's remarks on each day's weather (pp. 262—268) supply various information which may be put in relation to the catastrophe. Thus it appears that the first violent winter storm in 1907 commenced on November 14th (cf. p. 262) with a rapid fall of the barometer, a sign

of an impending snow-storm. This broke out in the night of the 15th, reaching its maximum about midnight (30 m per sec.) and caused various damage near Danmarks Havn. In the morning of November 15th the wind abated somewhat (to 20 m per sec.), still it was difficult to keep upright. In the evening it was calm, and the temperature fell rapidly. A fresh barometer decline set in during the succeeding night, and at 7 a.m. in the morning of the 16th a storm broke out again.

P. 334 WEGENER mentions some storms experienced during the Danmark Expedition, and refers them to "gewöhnlichen Depressionen". He expressly mentions the gale on November 15th—16th, 1907, and adds "Doppel-Depression". During November 18th and 19th the wind abated somewhat, but at the same time it grew more cloudy, and in the afternoon of the 19th the sky was entirely overcast. In the evening came gusts of wind, soon increasing to a gale, which in the night of the 20th attained a force of 20 m per second. On the 21st the wind decreased somewhat, but the gale still blew at a height of 300—800 m above sea-level. It was not till the 24th—26th and in part on the 27th that the weather grew calmer. The gale on November 20th is referred (p. 331) to "Hochdruck-Stürme", which are accompanied by precipitation, often beginning before the gale sets in, in other cases during the gale. It was characteristic of the "high-pressure gales" that the wind blew with less force at high altitudes than near the ground.

These meteorological observations show that HAGEN's death occurred simultaneously with the outbreak of the first heavy winter storm, on November 15th. AMDRUP (1913, pp. 218—220) sets forth various considerations concerning the catastrophe itself. Thus he points out their very poor equipment and especially their "miserable foot-gear", and adds (p. 219): "All have most likely been severely frostbitten and this with the general weakness from want and suffering and the sickness resulting therefrom has led to their death rather than the lack of food." I fully agree with AMDRUP in this statement; I know from experience the exhausting effect of an autumn gale on the inland ice when it attains so great a force that the tent affords no protection at all (cf. M. o. G. Bd. 70, p. 40—41).

As regards the question when MYLIUS-ERICHSEN died, opinions seem to differ. AMDRUP is inclined to believe that he died two days after HAGEN, that is to say, on November 17th. If so, the two-days' gale which caused HAGEN's death, should also have caused the death of MYLIUS-ERICHSEN. The camp where the party was overtaken by the gale must be supposed to be the same place where the bodies of the two men were left by BRØNLUND, which according to BRØNLUND was situated about $2^1/_2$ Mil (= c. 20 km) from the depot on Lamberts Land; and it must be supposed that very shortly after MYLIUS-ERICHSEN's

death BRØNLUND set out towards the depot; even though the weather was not particularly good either on the 18th or 19th November, and though his feet were frost-bitten, he may have reached the depot before the evening of the 19th, when another storm broke out. Since the moon was full on November 19th, and BRØNLUND states that he arrived at the depot "by declining moon", this theory does not seem very probable. Personally I regard it as more probable that MYLIUS-ERICHSEN died ten days after HAGEN, all the more so since BRØNLUND writes that he died about (omtrent) ten (two?) days after HAGEN; if he had died only two days after HAGEN, BRØNLUND would hardly have been in doubt.

It appears from the last entry in BRØNLUND's diary that he expects that his body will rather soon be found by members of the expedition and that these will immediately continue their search for MYLIUS-ERICHSEN and HAGEN. BRØNLUND therefore expressly states where the bodies of the other two are to be found, saying: "The bodies of the two others lie in the middle of the fjord in front of the glacier (about 10 miles)". The circumstance that the two bodies were left in the same place suggests that they died in the same camp.

If we suppose that after the storm of November 15th and 16th MYLIUS-ERICHSEN was so exhausted as to be unable to walk any longer, there might be a possibility that BRØNLUND made an attempt to reach the depot to fetch various articles of equipment, and on his return to the camp found MYLIUS-ERICHSEN dead or dying. However, such an attempt would have meant a very great risk: BRØNLUND would hardly have been able to walk to the depot and back to the camp (about 40 km) carrying equipment of any importance and subsequently to help MYLIUS-ERICHSEN to reach the depot. Moreover it would have meant a great risk in view of the unsettled weather conditions to leave the camp with a dying man. In my opinion this theory must therefore be abandoned.

As stated above, the weather was unsettled after the gale of the 15th—16th, and a fresh gale broke out on the 20th. It was not till about ten days after HAGEN's death that the weather calmed. Probably MYLIUS-ERICHSEN died about the same time, and BRØNLUND then had a chance of reaching the depot on Lamberts Land. This agrees with BRØNLUND's last statement, "I arrive here by declining moon". If J. P. KOCH is right in his supposition that BRØNLUND stayed at the depot some days before he died, he must have died about the 1st of December.

The picture of MYLIUS-ERICHSEN's last journey given by me differs on essential points from that given by AMDRUP in 1913, but I feel obliged to add that personal discussions with Viceadmiral

AMDRUP have made me alter my views as to several points and to admit that he was right.

It should be borne in mind that the material available for a reconstruction of the journey is inconsiderable. A great many things concerning the journey may seem strange and incomprehensible, and any criticism must be viewed in the light of the loss of all MYLIUS-ERICHSEN's and HØEG-HAGEN's notes.

All later expeditions to these regions have increased our understanding of the importance of the results of this journey. For they have shown that many of the features observed by EJNAR MIKKELSEN in 1910, KNUD RASMUSSEN and PETER FREUCHEN in 1912, and the present author in 1921 and 1933 must have been known to the three men.

Remarks on HAGEN's two Sketch-Maps (Pls. IV and V).

J. P. KOCH was the leader of the cartographic work of the expedition. He himself had devised the method of the mapping to be done on the sledge journeys, and he had instructed the cartographers of the expedition, including HAGEN, who, being an officer of the General Staff, must be supposed to have drawn special advantage from KOCH's instructions. The expedition had a supply of squared paper, and J. P. KOCH (cf. Survey of Northeast Greenland, 1916) considered it of great importance that on sledge journeys the cartographer could immediately mark down his position on this graduated paper and by means of a small protractor lay down some angles, at any rate from each station, so that the newly-discovered land could be drawn in broad features during the sledge journey. Thus he would always be aware of what had been observed during the expedition, he could compute the distances to known points and determine his exact position. It may be mentioned that J. P. KOCH himself used squared paper during his journey, for instance for drawing the coast of Peary Land (cf. J. P. KOCH, 1916, Pl. VII).

It would seem that HAGEN had no such map when the two parties met at Kap Rigsdagen (cf. AMDRUP 1913, p. 131).

According to information received from Mr. AAGE BERTELSEN it seems, however, that a rough sketch-map of Danmarks Fjord existed at the time J. P. KOCH's and MYLIUS-ERICHSEN's parties met at Kap Rigsdagen. We know that HAGEN in his note-book had sketches of Danmarks Fjord, which he showed to J. P. KOCH, and further, that BERTELSEN and HAGEN discussed whether a copy of the map ought not to be delivered to J. P. KOCH's party in case MYLIUS-ERICHSEN's party should not return; the reason why the latter plan came to

nothing is probably that it was only shortly before the two parties parted that MYLIUS-ERICHSEN finally made up his mind to go to the head of Independence Fjord.

The possibility that a map of Danmarks Fjord, as outlined on HAGEN's sketch-map Pl. V, existed in broad features when the two parties met at Kap Rigsdagen, cannot be entirely rejected; the many bearings from the observation stations might indicate that HAGEN drew various features during their first journey into Danmarks Fjord; that it is rather carelessly done in several places, is probably because of the early season (the month of May), when it was still very cold in the tent. If MYLIUS-ERICHSEN in his letter to TROLLE and in his report deposited in the cairn at the head of Independence Fjord had not stated precisely the latitude and longitude of the head of Danmarks Fjord in agreement with HAGEN's two sketch-maps, it might be assumed that HAGEN was aware of the right orientation of the interior of Danmarks Fjord but had intentionally turned it east-and-west in order to represent the whole fjord on the paper; though, if so, he would hardly have shown it to J. P. KOCH without pointing out this fact.

During the journey into Independence Fjord HAGEN inserted various observations, but not nearly as many as in Danmarks Fjord. On his map Pl. IV, which is a sort of fair copy of Pl. V, he has moved the graduation 1 cm westward, but his calculations are not available. On the basis of observations made in the interior of Danmarks Fjord he must have made some new constructions, since the representation of Fyens Sø and the inland ice differs from that of Pl. V. Some displacements have further taken place near Kap Rigsdagen, and Hagens Fjord is considerably altered. Corrections have likewise been made at the head of Independence Fjord; thus on Pl. IV the distance from MYLIUS-ERICHSEN's cairn to Kap Rigsdagen is about 2 cm longer than on Pl. V. It must therefore be taken for granted that HAGEN in his preparation of the map Pl. IV has used his observations from Himmelbjærget, i. a. as a basis for his considerable alterations of Hagens Fjord, but that he has not subsequently made any corrections in Pl. IV.

HAGEN's two sketch-maps (Pl. IV and V) give roughly the cartographic results gained to and including the summer camp. However, not only the interior of Danmarks Fjord, but also the interior of Independence Fjord are very incomplete.

J. P. Koch's comparison of Hagen's and Freuchen's Maps.

J. P. Koch (Medd. om Grønl. Bd. 46, Chapter 4, Head of Independence Bay, pp. 379—392) makes a careful comparison of Hagen's two sketch-maps (Amdrup, 1913, Pls. IV and V) and his landscape sketch of the head of Independence Fjord (Amdrup, Pl. IX, J. P. Koch, fig. 58) on the one side and Peter Freuchen's map of the interior of Independence Fjord surveyed in 1912 on the other side. This was a very difficult task to J. P. Koch, since it is not indicated on Hagen's landscape sketch whence it was drawn and which details it represents, and during the analysis J. P. Koch discovered that various points did not agree with Freuchen's map. Nor did J. P. Koch know whether Hagen's landscape sketch was drawn from Mylius-Erichsen's cairn or from the observation station on the fjord ice about 3 km from the cairn. It is now evident that it was made from the latter point. J. P. Koch was of opinion that the landscape sketch was drawn from an altitude of about 27 m, since some sikussak ice blocks are seen in the foreground. Very possibly it was drawn from the top of an ice-berg of that height, though generally the bergs detached from Academy Gl. are lower.

As a result of his analysis J. P. Koch arrives (p. 389) at two possibilities, of which he gives preference to the right one, viz. that the mountain top marked by a vertical line on Hagen's map is actually Peary's Navy Cliff. However, before arriving at this conclusion, J. P. Koch noticed various disagreements between Hagen's sketch and Freuchen's map, and that Hagen's maps, notably Pl. IV, owing to erroneous bearings, contain an error of about 14° W. J. P. Koch's analysis further showed that both Peary's, Hagen's, and Freuchen's maps were not altogether reliable. Peary indicates the south coast of Heilprin Land as turning westward almost from the point later called Kap Ejnar Mikkelsen; for from Navy Cliff he was unable to see the south coast of this land west of that cape. Hagen was no doubt aware that he had a view of Navy Cliff, but as regards the point of special interest to him, the entrance of the supposed Peary Channel, he was unable to establish any agreement with Peary's map, since Peary (cf. above) had indicated the south coast of Heilprin Land farther northward and extending in a different direction from that now observed by Hagen. This may account for the fact that Hagen's bearings, for instance to the north side of Marie Sophie Gl., are encumbered with an error of 14 degrees W., as rightly pointed out by J. P. Koch. J. P. Koch concludes his analysis of Hagen's and Freuchen's maps by the following statement (pp. 389—390): "I am, however, inclined to look for the principal cause in the fact that Hagen, who brought with him Peary's

map sketch of 1892 and whose bearings in the interior of the fjord, as indicated, must be supposed to be subject to an error of about 14 degrees, has not been able to bring about the necessary harmony in the connection between his own and PEARY's observations. He has, therefore, forced by circumstances, put off this part of the preparation of the maps, until he had at his disposal a more complete computation of his observations."

This is no doubt correct. The only detail indicated on his sketch-map (Pl. IV) at the head of Independence Fjord is the front of Marie Sophie Gl. at the very margin of the map; however, the direction of the glacier is wrong.

To summarise, J. P. KOCH's analysis was extremely difficult, among other things because MYLIUS-ERICHSEN's cairn is not correctly indicated on FREUCHEN's map, and because HAGEN, as stated above, assumes a more northerly position of Heilprin Land than is actually the case. Thus HAGEN indicates MYLIUS-ERICHSEN's cairn in c. 81°56.3′ N. lat., 31°30′ W. long., while FREUCHEN indicates it in 81°50′ N. lat., 32°00′ W. long.

SOME QUESTIONS CONCERNING "INDEPENDENCE BAY"

On his various maps PEARY draws the coast-line some distance southeastward from Kap Glacier. This detail in PEARY's maps has given rise to a copious literature, and I shall therefore deal with it at some length here.

It will be natural to quote first what PEARY himself says about this part of his map. In his most detailed report on his stay at Navy Cliff (Northward over the Great Ice, Vol. I, p. 345) PEARY says as follows after mentioning Academy Glacier:

"Across the glacier, bounding the fjord on the east, rose a long line of precipitous, bronzed cliffs, higher even than the one on which we stood, and projecting several miles farther out into the bay. They rose four thousand or more feet in sheer height above the glacier, and terminated in a grim promontory sloping steeply to the water. On their huge shoulders these wild cliffs supported a great projecting tongue of the Inland Ice. Some fifteen miles north-east of where we stood, these cliffs ended in a bold cape which I named Glacier Cape. Dark clouds seen over and beyond the ice-cap on these cliffs *seemed to indicate*[1]) that the shore-line trended rapidly away to the east or south-east."

The other detailed report on these features, namely by E. ASTRUP, says (ASTRUP 1898, p. 229):

"To the right, just beneath us, an imposing glacier more than fifteen miles in width was sloping down to the sea-ice in almost fan-shaped regularity.

On the opposite side of this large flood of ice another perpendicular mountain uprose far above that upon which we were standing, its height being nearly five thousand feet. This mountain plateau crowned by a projecting tongue of inland ice terminated in an abrupt and con-

[1]) Italics by me.

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spicuous headland to the north-west[1]) of us, at a distance of about sixteen miles from the Navy Cliff."[2])

As will appear from the above, both PEARY and ASTRUP point out that the cliffs on the opposite side of Academy Glacier were higher than Navy Cliff (in 1921 I determined the altitude of Navy Cliff to be 860 m, while on the east side of Academy Glacier I measured altitudes of 1000, 900, 960, and 1100 m). Further, PEARY observed two small local ice-caps on the land opposite Academy Glacier, but no inland ice which might justify the belief that the land extended far eastward. The clouds he saw he took to indicate the existence of water east of this land, and he therefore drew the coast as trending southeastward over a very short stretch (cf. above).

HOBBS (1936, p. 162) calls attention to PEARY's report on his journey in 1895, in which he states that he could see the south shore of the bay . . . "trending eastward from the cape which confined Academy Glacier on the east". However, this new observation: that the land trended eastward rather than southeastward from Kap Glacier, would seem to have been uncertain; at any rate it is not reflected on PEARY's maps published after 1895.

If we look at PEARY's original map drawn from Navy Cliff (published alike by PEARY 1892, Mrs. PEARY 1893, ADAMS 1893, and PEARY 1898) it will be seen that he indicates the relief as far as Kap Glacier. PEARY states that this cape is situated some 15 miles from Navy Cliff, and ASTRUP gives about the same distance, viz. 25 km. In accordance with these statements I placed Kap Glacier on my map (1932) in about the place indicated by PEARY, viz. in 81°40′ N. lat., 33°00′ W. long. (on my map the distance from Navy Cliff to Kap Glacier is about 23 km). Since PEARY's cairn on Navy Cliff is visible from MYLIUS-ERICHSEN's cairn, which is situated 33 km from Navy Cliff, PEARY and ASTRUP must have had a view of the coast as far as MYLIUS-ERICHSEN's cairn, but for some reason or other they were unable to determine the distance to that point.

An explanation why PEARY marked the coast as trending south-eastward east of Kap Glacier may be gained from PEARY's two aforementioned photographs taken from Navy Cliff, for they show that

[1]) Should be north-east, cf. ASTRUP 1895.

[2]) There is a small discrepancy between PEARY's and ASTRUP's maps, in that on ASTRUP's map, the "ice-cap" beyond Academy Glacier is connected with the inland ice, whereas PEARY indicates two small ice-caps on his map (Op. cit. p. 353), which had been published as early as 1892 and 1893 (in Mrs. PEARY: "My Arctic Journal", p. 229; and ADAMS, Geogr. Journ. 1893, p. 384). In "My Arctic Journal" (p. 228) there is a photograph of "Academy Glacier" taken from Navy Cliff and showing Kap Glacier. In "Northward over the Great Ice" (p. 346) PEARY gives another picture entitled "Academy Glacier and Independence Bay".

at the farthest point visible from Navy Cliff Academy Land issues a cape (it was on the outer portion of this cape that MYLIUS-ERICHSEN built his cairn). The local ice-cap on Academy Land and the shape of the cape suggest that the coast trends southeastward beyond this cape—which it actually does, for it trends towards the small bay into which Saxifraga Valley debouches, and Academy Land with the ice cap at its top slopes down towards this valley.

As stated above, the main object of the Danmark Expedition was to map this unknown stretch of the coast.

However, the large sledge journey came to be quite different from what had been expected. The unknown coast did not extend in a direct line towards Kap Glacier, but trended more and more eastward, so when the two parties reached Nakkehoved on May 1st, and now at last were certain that the coast trended westward, they were about 300 km east of Kap Glacier. The parties therefore parted at Nakkehoved, J. P. KOCH to travel across the sea-ice towards Kap Clarence Wyckoff, and MYLIUS-ERICHSEN to go to Navy Cliff and Kap Glacier.

The question now arises why MYLIUS-ERICHSEN went southward into Danmarks Fjord and not towards Melville Land (the south coast of Peary Land), which was sketched on PEARY's map, and onwards through Independence Bay to Kap Glacier.

It would seem that during the first days after parting from J. P. KOCH, MYLIUS-ERICHSEN has been in doubt as to which route to follow towards Kap Glacier. We know from J. P. KOCH's report (1916, p. 390) that HAGEN carried with him PEARY's map. The picture of the country which MYLIUS-ERICHSEN, standing on Prins Frederiks Øer, must have obtained on the basis of PEARY's map and the landscape before him is shown in Fig. 27.

Viceadmiral G. C. AMDRUP has informed me that of the data available on the expedition (cf. AMDRUP 1913, pp. 264—66) he chiefly based his supposition, that MYLIUS-ERICHSEN travelled into Danmarks Fjord in the belief that it might be a sound leading to Kap Glacier, on the following documents:

1) PEARY's map, according to which it seemed most probable that the coast trended southeastward from Kap Glacier, and that, in consequence, MYLIUS-ERICHSEN might perhaps reach Kap Glacier from the southeast.

2) The circumstance that HAGEN wrote "Fastlandskyst" (continental coast) on the east coast of Danmarks Fjord (cf. AMDRUP, 1913, Pls. V, VI), which would seem to show that HAGEN, too, took Danmarks Fjord to be a sound that might lead to Kap Glacier.

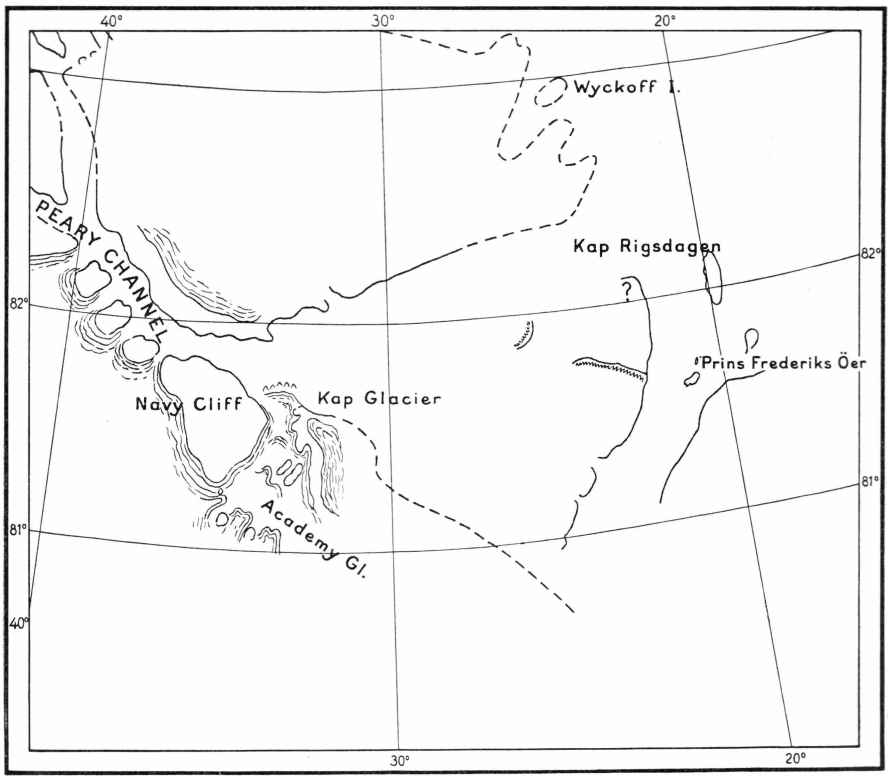

Fig. 27. MYLIUS-ERICHSEN's view from Prins Frederiks Øer — inserted on PEARY's map.

3) BRØNLUND's remark in his diary, "Was it a fjord or a sound we found ourselves in?" (AMDRUP, 1913, p. 203).

4) MYLIUS-ERICHSEN's letter to TROLLE, written at Kap Rigsdagen and brought home by J. P. KOCH (AMDRUP, 1913, p. 133), in which he says about Danmarks Fjord: "my party, acting in the belief that we found ourselves in the Peary Channel".

5) J. P. KOCH's report of the meeting with MYLIUS-ERICHSEN at Kap Rigsdagen on May 27th, when MYLIUS-ERICHSEN told him as follows (translated from the Danish): Not till May 11th did they reach the west coast of Danmarks Fjord, a land which they then took to be Peary Land. — They could hardly avoid this mistake. They were unable to see Independence Sound. When PEARY in 1892, on his journey across the inland ice, halted at Navy Cliff, he believed to observe that the coast of Academy Land trended towards the southeast; accordingly MYLIUS-ERICHSEN must believe that he was to approach Academy Land from the southeast, and it was in good accord with this that the waterway

in which he now was, extended southeastward and then turned towards the west." (ACHTON FRIIS, 1909, p. 398).

Various points of the material brought forward by AMDRUP seem to me to be difficult to understand. In the first place it appears clearly from PEARY'S description in "Northward over the Great Ice" that his remarks as to the southeastward trend of the coast from Kap Glacier are based on a mere hypothesis.

In the first days of May MYLIUS-ERICHSEN and his party had clear weather at any rate as far as the camp at Prins Frederiks Øer, which is evident i. a. from the fact that from this station HAGEN took bearings to Kap Viborg (cf. AMDRUP, 1913, Pl. V), that is to say, far into Danmarks Fjord, as also southeastward to Kronprins Christians Land and to Prinsesse Thyras Ø. It appears from Brønlunds diary that the observations from Prins Frederiks Øer were probably made in the days May 5—6th. We know from BERTELSEN'S sketch (M. o. G. B. 46, Nr. 2, facing p. 317) that from the camp of the other party on May 6—7th J. P. KOCH could distinctly see and take observations to Kap Rigsdagen. The distance to Kap Rigsdagen from that camp and from Prins Frederiks Øer is the same. Even from the next camp, marked K. 7/5, (cf. the map of the Danmark Expedition, northern leaf) J. P. KOCH took bearings to Kap Rigsdagen, or more correctly to a point a little west of the cape (cf. J. P. KOCH'S sketch-map, M. o. G. Bd. 46, Nr. 2, Pl. VII). J. P. KOCH states (p. 353) the height of Kap Rigsdagen to be "about 200 m". One now puts oneself the question: if on May 6th and 7th J. P. KOCH could distinctly see and take bearings to Kap Rigsdagen from the sea-ice to the northeast, was it not possible for MYLIUS-ERICHSEN to see and take bearings to Kap Rigsdagen from a point at the same distance to the east. If so, MYLIUS-ERICHSEN must have realised that the land in front of him (Valdemar Glückstadts Land) ended at Kap Rigsdagen, whence the coast probably turned westward.

If MYLIUS-ERICHSEN was unable to see Kap Rigsdagen itself, he must at any rate have observed that the land sloped northward from the high Kap Kronborg and Jydske Aas and disappeared in the horizon somewhere south of Kap Rigsdagen. But in this case there would seem to him to be sea-ice almost from Prins Frederiks Øer to that part of the coast of Melville Land indicated by PRARY with a full-drawn line. In other words, no matter whether or not MYLIUS-ERICHSEN could sight Kap Rigsdagen from Prins Frederiks Øer, it must have seemed to him that he could travel directly from these islands across the sea-ice to the south coast of Melville Land. This is, of course, not in harmony with the points mentioned by AMDRUP, in particular not with the statement that on setting foot on Valdemar Glückstadts Land MYLIUS-ERICHSEN

believed he was on Peary Land. Considering that HAGEN carried with him PEARY's map, this remark is at any rate quite ununderstandable.

Even though the material referred to by AMDRUP is ununderstandable in many respects, it seems to show that MYLIUS-ERICHSEN was of opinion that the easiest route to Kap Glacier was by way of Danmarks Fjord. A more careful study of PEARY's maps and descriptions would, however, have shown him that by travelling directly to Melville Land, possibly via Kap Rigsdagen, he would much sooner have come to the areas mapped by PEARY. In my opinion, the want of game no doubt was an essential cause why he chose the route towards the interior of Danmarks Fjord.

Mr. AAGE BERTELSEN, J. P. KOCH's companion on the journey to Kap Bridgman, has written in his diary that when KOCH's party met MYLIUS-ERICHSEN's party at Kap Rigsdagen, the members of the latter party were in good health and their dogs were in a good condition as a consequence of their successful musk-ox hunting in Danmarks Fjord. HAGEN was somewhat disappointed because they had not obtained connection with PEARY's mapping, that is to say, that they had not reached Kap Glacier, while MYLIUS-ERICHSEN found consolation in the fact that they had mapped the large Danmarks Fjord.

When MYLIUS-ERICHSEN after having mapped Danmarks Fjord, met J. P. KOCH's party at Kap Rigsdagen on May 27th, KOCH had just made an observation and "sighted a cape, probably Cape Knud Rasmussen, very far off towards the west" (AMDRUP 1913, p. 130). Further, (p. 131) "KOCH was sure, that he had seen the Academy Glacier and the inner part of Independence Sound and had carried out a number of preliminary surveys for the determination of the course of the coast line". In other words, he had had a full view of Independence Fjord.

Thus there can be no doubt that J. P. KOCH from some place or other during his journey sighted the south coast of Peary Land over a long stretch. Further, he could see the promontory between Brønlunds Fjord and Independence Fjord (Kap Knud Rasmussen), possibly Vildt Land (the land with Navy Cliff), and the inland ice. KOCH must likewise have had a clear view of Kap Bernhard and the entrance of Hagens Fjord as a depression surrounded by high mountains on either side, and the high south coast of Independence Fjord from Kap Grundloven towards the interior of the fjord. Thus even if MYLIUS-ERICHSEN's party had returned with J. P. KOCH's party, Independence Fjord as well as the mouths of Brønlunds Fjord and Hagens Fjord, would have been known in broad features.

As is well known (AMDRUP, pp. 131—132), MYLIUS-ERICHSEN first decided to return with J. P. KOCH, but next day changed his mind

and decided to continue for two or three days westward into Independence Fjord, hoping to reach Kap Glacier and then to return along the outer coast a few days after J. P. KOCH's party.

In his letter to TROLLE (AMDRUP 1913, pp. 133—134) MYLIUS-ERICHSEN says:—

"My party acting in the belief that we found ourselves in Peary Channel had discovered and penetrated into the head of one of East Greenland's largest fjords, which runs in south of the land where we are at present and reaches the inland ice, for which the glacier behind Academy Land forms the northern outlet." And further (AMDRUP, p. 134): "We now seek to end the journey of our party by a 40 miles tour towards Cape Glacier. We will then have established a connection with PEARY's point and will return with satisfactory results . . . . . We should like to travel with KOCH's party towards the south, but duty calls us 2 or 3 days to the west, so we must separate again after 24 hours . . . ."

In order to understand MYLIUS-ERICHSEN's strange remark, that they were in the Peary Channel, it must be called to mind that in his expedition plans MYLIUS-ERICHSEN so strongly pointed out the importance of the Peary Channel as a migration route for men and animals from the north coast of Greenland to the east coast (cf. above). Standing at the mouth of Danmarks Fjord, it may have seemed equally probable to him that either Independence Fjord or Danmarks Fjord was the sound which separated "the mainland of Greenland" from the "detached land-masses" northeast of it. From his conversations with HAGEN at Kap Rigsdagen Mr. BERTELSEN received the impression that HAGEN at first supposed that it would be possible to go to Kap Glacier by way of Danmarks Fjord, but that it rather soon occurred to him that this large fjord had no connection with the Peary Channel.

In the Chapter entitled "Last journey of Mylius-Erichsen, Høeg-Hagen and Jørgen Brønlund" (AMDRUP, 1913, pp. 213—220) AMDRUP says (p. 213) that "on May 11th they followed the coast southwards in the belief that they now found themselves in Independence Bay". Further he says that on May 21st, they reached the head of the fjord (viz. Danmarks Fjord) "and now learned to a certainty that it was not Independence Bay but another enormous fjord, about 200 kilometers in length"; this is quite correct. However, AMDRUP's (p. 214) supposition that on May 29th "they drove into Hagens Fjord in the belief that this fjord was a continuation of Independence Bay (see Pl. V and VIII)", and that on June 1st "they sighted the glacier in the head of Hagens Fjord and still believed that they found themselves in Independence Bay and that it was the head of this bay they saw (see

Pl. IX)"[1]), is untenable, as has been shown by information subsequently obtained. It should, however, be borne in mind that it was the view generally held by the members of the Danmarks Expedition that MYLIUS-ERICHSEN on his way to Kap Glacier turned into Hagens Fjord.

AMDRUP says (p. 214): "To understand why MYLIUS-ERICHSEN first took Danmarks Fjord and then Hagens Fjord to be Independence Bay, it must be remembered that on all his charts[2]) from these regions round here PEARY states that from Academy Glacier the coast bends almost in the direction S. E., whereas according to what has been found out by the Danmark Expedition, it turns on the contrary almost in the direction N.E.

"As the entrance to Danmarks Fjord and to Hagens Fjord lie further north than the Academy Glacier and as MYLIUS-ERICHSEN was entitled to suppose from PEARY's chart, that he would come to Academy Glacier from a point S.E. of the glacier it was quite natural that MYLIUS-ERICHSEN steered into these fjords which, as far as he could see, first went southwards and then turned towards the S.W. MYLIUS-ERICHSEN, who was each time of opinion that he found himself in Independence Bay, thus assumed that this Bay would go further south than Academy Glacier and that it would at the same time turn west and north-westwards up to the Glacier; in other words, that it would describe a curve between the mouth of the fjord and Academy Glacier. In this way everything would fit in with PEARY's charts."

AMDRUP adds (p. 214): "This mistake on PEARY's chart thus became of extremely fateful importance to MYLIUS-ERICHSEN and his companions. For it was owing to this long journey into Danmarks Fjord and Hagens Fjord, that their retreat was begun too late and had to be given up on account of the comparatively sudden melting of the snow. And we know that their inforced summer in the north led to their death."

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[1]) AMDRUP adds to the above statement on June 1st: "They have probably not discovered their mistake till the first days of June when they rounded Cape Peter Henrik on the western side of Hagens Fjord." Furthermore AMDRUP in a footnote (p. 204) to BRØNLUND's remark, that now at last they "sighted the place we wanted to see" (viz. Navy Cliff), makes the following comment: "It was the glacier in the head of Hagens Fjord which they mistook for Academy Glacier. The latter they cannot have sighted until the 7th or 8th June, if we take it for granted that they passed Cape Grundloven on June 5th (Grundlovsdag = Constitution Day)." And on p. 223 AMDRUP writes as a note to Pl. IX, "Head of Independence Bay 1/VI 1907": "At this time they were probably in Hagens Fjord but believed they were in Independence Bay, a belief still shared by Hagen when he made his sketch. The sketch thus in reality represents the head of Hagens Fjord." On the basis of MYLIUS-ERICHSEN's cairn report brought home by EJNAR MIKKELSEN. AMDRUP corrected this view (cf. AMDRUP 1913, p. 473).

"[2]) ROBERT E. PEARY: "Northward over the Great Ice", Vol. I, p. 352. "Field work of the Peary Arctic Club 1898—1902", Bulletin of the Geographical Society of Philadelphia, Vol. IV, No. 1, January 1904. "Nearest the Pole", The accompanying chart."

Peary's Map and Mylius-Erichsen's Death.

It has later proved that Amdrup's supposition regarding Mylius-Erichsen's journey to Kap Glacier cannot be maintained. And however appalled Denmark was by the fate of Mylius-Erichsen and his companions, it is an injustice towards Peary to make him responsible for their bad luck.

This statement in the official report of the Danmark Expedition could not escape comment in various publications written partly by Peary's enemies, partly by persons who had no knowledge of what actually did take place. Unfortunately Amdrup's additional report (1913, pp. 471—474), in which he quotes the reports by Mylius-Erichsen brought home by Ejnar Mikkelsen and adds some brief corrections to his great official report, has generally been overlooked. Thus, according to Gordon Hayes (1929, pp. 39—40), Sir Clements Markham (The Lands of Silence, p. 373) says that Mylius-Erichsen's party "had been misled by Peary's erroneous map", and further: "Peary's point at the place he calls 'Navy Cliff', where he says he saw the sea and called it 'Independence Bay', is over a hundred miles from the sea or any bay. He may have seen the end of the long, narrow fjord which Erichsen discovered, but his channel across Greenland does not exist." These two statements by Sir Clements Markham are quoted by Gordon Hayes under the heading "Inaccurate Charting".

Further, Gordon Hayes says (1929, p. 40): "Peary's incorrect map very nearly cost the lives of Mikkelsen and his companion, who intended returning through the mythical 'Peary Channel'." This statement, however, is untenable (cf. p. 196).

When Gordon Hayes (1929, p. 42) says that "Peary's map of his discoveries in this district (Northward over the Great Ice, vol. I, p. 353) was so grossly incorrect as to be misleading and dangerous", we must ask: To whom was it dangerous?

Peary cannot be reproached for combining a point of the coast south-east of Kap Glacier and Kap Bismarck by a dotted line, for according to the general practice a dotted line[1]) indicates that the course of the coast line is unknown. It cannot be said either that the "Peary Channel" has involved any danger to any of the subsequent expeditions. When Mylius-Erichsen parted from J. P. Koch at Kap Rigsdagen, he had no plans of travelling through the Peary Channel. J. P. Koch's plans of travelling through the Peary Channel to West Greenland in the spring of 1908 he gave up without knowing anything about the Peary Channel. Ejnar Mikkelsen's plan of going through the Peary Channel was an alternative

[1]) On map p. 235 (Geogr. Journal 1898) the dotted line extends right up to Kap Glacier.

item on his programme, and when he learned from MYLIUS-ERICHSEN's cairn report that the Peary Channel did not exist, he was not in a condition to venture to take that route even if the channel had existed. KNUD RASMUSSEN and PETER FREUCHEN reached the head of Independence Fjord so late that even if the Peary Channel had existed, the thaw would have forced them to ascend the inland ice as soon as possible. To KNUD RASMUSSEN and myself, on the Second Thule Expedition, the circumstance that the northern outlet of the Peary Channel, viz. Nordenskiölds Fjord, was barred by ice was a severe blow, since we had been hoping that we might go by this fjord to the regions more rich in game found by the First Thule Expedition; but we did not find that PEARY was to blame for this misfortune; we were fully aware of what had been observed and what was supposed.

In 1934 GORDON HAYES in his book "The Conquest of the North Pole" continues his criticism of PEARY. In a chapter entitled "MYLIUS-ERICHSEN in Greenland" he says (pp. 57—58): "Mylius-Erichsen's main object was to link up with Peary and complete his discoveries in North-East Greenland. Peary was the only explorer who had been there (pp. 88, 89, also Chart No. 2, inset). He left a record on Navy Cliff in lat. 81°37′ N. and long. 34°5′ W., and charted a large bay, that he named Independence Bay, the S. side of which he showed extending, with the coastline beyond it, indefinitely (as to distance) in a south-easterly direction; ("Northward over the Great Ice", I. 352; "Field work of the Peary Arctic Club", 1898—1902; "Bulletin of the Geog. Soc. of Philadelphia", IV, No. 1, Jan. 1904; "Nearest the Pole", chart). This is important because it was one of the main factors in the loss of 3 lives."

On p. 67 GORDON HAYES writes, on the basis of AMDRUP's official report, that on May 29th MYLIUS-ERICHSEN entered Hagens Fjord, thinking that at last he had found PEARY's Independence Bay, but that the head of the actual Independence Fjord was not reached til June 1st.[1]) Although the book did not appear till 1934, GORDON HAYES has evidently only studied AMDRUP's report of 1913 without noticing that in 1922 MIKKELSEN (M. o. G. Bd. 52, pp. 89—106, and Pl. 2) had given a detailed explanation why MYLIUS-ERICHSEN after leaving Kap Rigsdagen did not go into Hagens Fjord, but went directly to Kap Glacier. And on p. 68 GORDON HAYES quotes the statement in the "official report on the Danmark Expedition" (quoted above p. 184) that "this

[1]) GORDON HAYES here mixes up AMDRUP's theory: that the party travelled into Hagens Fjord and arrived at the head of Independence Fjord about a week later—with EJNAR MIKKELSEN's theory: that they did not go into Hagens Fjord, but went directly to the head of Independence Fjord, arriving there on June 1st. If they commenced their exploration of Hagens Fjord on May 29th, they could not, as a matter of course, arrive at the head of Independence Fjord on June 1st.

mistake on Peary's chart thus became of extremely fateful importance to Mylius-Erichsen and his companions . . . .".

JEANNETTE MIRSKY in her otherwise good synopsis (Northern Conquest, London 1934) likewise wrote about MYLIUS-ERICHSEN and the Danmark Expedition on the basis of AMDRUP's report. Thus she says (p. 262) that MYLIUS-ERICHSEN "followed the coast-line[1]), expecting thus to reach Peary Channel", and on p. 263 that they travelled into Hagens Fjord. On p. 256 she says: "But it also remains to be said that no other great Arctic explorer was guilty of such inaccuracies as Peary." And after mentioning "Crocker Land", she continues: ". . . but a far more serious mistake was his inaccuracy about the northeast outline of Greenland, for it led to the tragedy of the Danmark Expedition."

Mr. AAGE BERTELSEN, the only surviving member of the two parties who made the large sledge journey northward in the spring of 1907, has informed me that as far as is known to him, no member of the Danmark Expedition has ever set forth the supposition that PEARY's map should have been a concurrent cause of the tragic death of MYLIUS-ERICHSEN and his party.

It will be evident from the above that PEARY is not to blame for the way in which he represented Navy Cliff and surroundings on his maps, and that MYLIUS-ERICHSEN's tragic death has no relation at all to PEARY's map.

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[1]) i. e. into Danmarks Fjord.

THE DANMARK EXPEDITION AND THE PEARY CHANNEL

It is known now that in the morning of June 1st MYLIUS-ERICHSEN reached a small basalt cape from which he had a full view of the head of Independence Fjord; that a large cairn was built here, partly of stones so big that they could hardly be carried by one man alone; and that a report (brought home by me in 1921) was deposited in this cairn. The report runs as follows (translated from the Danish):

"Danmarks Ekspeditionen til Grønlands Nordøstkyst 1906—08.

June 1st, 1907, c. 81° 55′ N. lat.

"To-day, with first-lieutenant of the Danish Infantry N. P. HØEG-HAGEN and the Greenlander JØRGEN BRØNLUND, on three sledges dragged by 23 dogs, I reached this naze, where astronomical place-determinations were made, and it was ascertained that we were at the north coast of the Academy Land discovered by ROBERT E. PEARY with the Academy Glacier and the Navy Cliff land to the west and Heilprin and Melville Land to the north. Our closer investigations showed that Independence Bay is a fjord, since the entrance, supposed by PEARY, of a Peary Channel does not exist. For Heilprin Land and Navy Cliff Land are one and the same land with a local glacier in a small bay, which bay PEARY from his observation point at the back part of Navy Cliff must have taken to be the entrance to a sound, several of the islets indicated by PEARY in the interior of this bay are one single continuous strip of low coast-land, situated quite close to the outer margin of the said glacier.

With nine companions I left, on March 28th last, the 'Danmark', the ship of the expedition, in Danmarks Havn near Cape Bismarck (76°46′ N. lat.). Having travelled northward for 26 days, first-lieutenant of the Danish Navy HENNING BISTRUP and the Norwegian ship's captain KARL JOHAN RING returned from 80°9′ N. lat. Four days later the

Danish ship's captain GUSTAV THOSTRUP and the German Dr. phil. A. WEGENER returned from 80°46′ N. lat., both parties with cartographical and other tasks along the Northeast Greenland coast southward to the ship's harbour. Finally after 35 days' journey my party at 81°50′ N. lat. separated from first-lieutenant of the Danish General Staff I. P. KOCH, the artist AAGE BERTELSEN, and the Greenlander TOBIAS GABRIELSEN, who headed towards Cape Bridgman, while my party went westwards. On May 28th my party met with Lieutenant KOCH's party in about 82°4′ N. lat., 22° W. long. KOCH's party, then on its return journey, had reached Cape Bridgman with PEARY's cairn and had taken out his report. In the meantime my party had discovered and travelled through a fjord about 20 Danish miles[1]) long, which in the direction northeast—southwest cuts into the country south of Academy Land as far as about 80°42′ N. lat., 28° W. long.

"After a sledge journey of 66 days and a distance covered of about 215 Danish miles (c. 860 miles) my party returns today, all in good health and with depots laid out to secure the return drive, which is supposed to take about one month. During the last month we and our dogs have been living chiefly on game (21 musk-oxen, 27 hares, and 5 ptarmigans killed).

"Here at the northern end point of our journey I have hoisted the Danish flag over the cairn built for this report, and in the name of the Danish King, His Majesty King Frederik VIII, have taken possession of for the Danish State the mapped and investigated stretches of the Northeast Greenland coast.

"L. MYLIUS-ERICHSEN.
"Leader of the Danmark Expedition."

As regards information about the head of Independence Fjord supplied by HØEG-HAGEN the following material is at hand:

1) A drawing, dated June 1st, 1907, entitled "Head of Independence Bay" (AMDRUP 1913, Pl. IX; originally drawn in two parts; J. P. KOCH 1916, p. 379, reproduced the sketches as one, which he has supplied with figures; in the following I therefore refer to the latter).
2) A sketch-map, on which MYLIUS-ERICHSEN's cairn, as also two cartographic stations, one near the cairn, one on the fjord ice northwest of the cairn, are indicated. The head proper of the fjord is not represented as it would come outside the paper. (AMDRUP 1913, Pl. V).
3) A sketch map with names. The graduation has been moved one cm towards the east; on this account there is more space on the map, which is a copy of the preceding one, and though the head itself is

[1]) Ca. 80 miles.

not indicated, some islets, marked "Peary's Islets", and a glacier are shown; the glacier descends into the sea and is called Marie Sophie Gl. (named after MYLIUS-ERICHSEN's wife). (AMDRUP 1913, Pl. IV).

It appears from HAGEN's sketch-maps that he made observations partly from the cairn and partly from a station on the fjord ice at a small distance from the former.

On comparing HAGEN's sketch with mine drawn from the cairn, it will be seen at once that HAGEN's sketch has been drawn from the station on the fjord ice, since he has been looking up along Academy Gl. itself while from the cairn only the front of the glacier is visible.

HAGEN's sketch is very carefully made, and PEARY's cairn, which he sighted in the telescope of the theodolite, is marked by a line. And his other sketch map shows, as far as the space permits, two of the islands and part of the large northern glacier that descends into the fjord.

Of the available material concerning the head of Independence Fjord the following has been supplied by MYLIUS-ERICHSEN:

1) The report written at the cairn near Kap Glacier on June 1st, 1907, which says: "... it was ascertained that we were at the north coast of the Academy Land discovered by ROBERT E. PEARY with the Academy Glacier and the Navy Cliff Land to the west and Heilprin and Melville Land to the north. Our closer investigations showed that Independence Bay is a fjord, since the entrance, supposed by PEARY, of a Peary Channel does not exist. For Heilprin Land and Navy Cliff Land are one and the same land with a local glacier in a small bay, which bay PEARY from his observation point at the back part of Navy Cliff must have taken to be the entrance to a sound, several of the islets indicated by PEARY in the interior of this bay are one single continuous strip of low coast-land, situated quite close to the outer margin of the said glacier."

2) The report deposited in Danmarks Fjord, dated August 8th, 1907: "We drove westward with 23 dogs until the 1st of June, and reached PEARY's Cape Glacier, discovered that the Peary Channel does not exist; Navy Cliff is connected by fast land with Heilprin Land. We re-named Independence Bay the Independence Fjord, and built a cairn (with report) on a low headland near Cape Glacier . . . ."

There seems to be some disagreement between HAGEN's sketch and the view held by MYLIUS-ERICHSEN concerning the conditions at the head of Independence Fjord: HAGEN draws Marie Sophie Gl. with its front descending into the fjord (both on the croquis and on the sketch map), whereas MYLIUS-ERICHSEN is of opinion that it does not

descend into the fjord; and several of the islands indicated by HAGEN are regarded by MYLIUS-ERICHSEN as a continuous strip of low coast land in front of the glacier's edge; this made MYLIUS-ERICHSEN conclude that Heilprin Land and Navy Cliff Land were one and the same land. At this point HAGEN is right: the islands do exist, and Marie Sophie Gl. descends into the fjord.

In excuse for MYLIUS-ERICHSEN's view it may be pleaded that owing to the many ice-bound bergs it may be difficult, from the cairn and the fjord ice, to gain a full view of the relation of the glacier front to the islands. It may probably be taken for granted that the cairn was built and some observations were made there before the party camped on the fjord ice, where they had their actual cartographical station. From these two stations they have had a full view of the conditions at the head of the fjord, at any rate the main features. At both stations they must have received the impression that Marie Sophie Gl. issued from the north, probably from the "firn" (ice-cap) which HAGEN indicates on Heilprin Land and which was also seen by PEARY, and the thought that this glacier might move through a channel, filling it entirely along a short stretch, has probably hardly occurred to MYLIUS-ERICHSEN. At the place where the supposed channel was to open out into the fjord, the head of the fjord was closed by a glacier.

THE ALABAMA-EXPEDITION 1909–12

Under the leadership of EJNAR MIKKELSEN

Cf. Pl. 15.

Literature.

1) AMDRUP, G.: Report on the Danmark Expedition to the North-east coast of Greenland 1906—1908. Medd. om Grønl. Bd. XLI, **1913**, pp. 1—270. With 24 plates and four portraits.

2) — Mylius-Erichsen's Report on the non-existence of the Peary Channel; information brought home by Ejnar Mikkelsen. — M. o. G. Bd. XLI, pp. 469—474. **1913**.

3) HAYES, J. GORDON: Robert Edwin Peary. A Record of his Explorations 1886—1909. Pp. i—xv + 1—299. With four maps and several ills. London **1929**.

4) MIKKELSEN, EJNAR: Tre Aar paa Grønlands Østkyst. Pp. 1—300. With 1 map and several figs. København **1913**.

5) — Lost in the Arctic. Pp. i—xviii + 1—400. With 1 map and numerous illustrations. London **1913**.

6) — Expedition to North-east Greenland 1909—12. Geogr. Journal, vol. xli, **1913**, pp. 313—324, plates and map.

7) — Tre Aar i Nordøstgrønland. "Atlanten", Medlemsblad for Foreningen "De Danske Atlanterhavsøer" **1913**.

8) — Alabama-Expeditionen til Grønlands Nordøstkyst 1909—1912. Medd. om Grønl. Bd. LII, pp. I—VIII + 1—142 and 185—213. With pls. and figs. **1922**.

The Progress of the Expedition.

As stated in a previous chapter, the written material found on BRØNLUND's body was very sparse, since besides his own diary only two sketch-maps and some landscape sketches made by HAGEN were found, but otherwise none of MYLIUS-ERICHSEN's and HAGEN's sketches or notes.

Soon after the return of the Danmark Expedition various plans were put forward for sending out an expedition in search of the bodies of MYLIUS-ERICHSEN and HØEG-HAGEN in order to secure further information about their last journey, although BRØNLUND's statement about the place where they were to be found, left no great hopes of a successful result. It was assumed that in addition to cairn reports they

had probably left sketch-maps or diaries either in Danmarks Fjord or at the point where they ascended the inland ice, which was assumed to have taken place at Antarctics Bugt on the outer coast.

EJNAR MIKKELSEN, who had recently led an expedition to the regions north of Alaska, applied to the committee of the Danmark Expedition offering to undertake such a research. His plan was to push as far northward as possible along the east coast of Greenland in a small vessel. Similarly as set out in MYLIUS-ERICHSEN's original plan for the Danmark Expedition, a depot was to be established at the most northerly point attainable by ship, and subsequently the ship was to take its winter-quarters so far south that it might get free of the ice next year. In the autumn the depot was to be removed northward to Lamberts Land, to serve for the journey to Danmarks Fjord.

Next spring five men were to go to the depot, and three of them were to proceed by dog sledges to the head of Danmarks Fjord in order to search the western shore of the fjord, it being hoped that reports from MYLIUS-ERICHSEN might be found there. The return journey, which was to take place round the Nordostrundingen and southward along the east coast of Greenland, might be facilitated by the aid of the depots of the Danmark Expedition, all of which were to be opened and searched for possible records.

Alternately, however, it was EJNAR MIKKELSEN's plan to investigate the Peary Channel. His expedition plan says as follows (Medd. om Grønl. Bd. 52, p. V):

"In case the records are found at Cape Holbæk or Cape Kronborg, the future plans for the expedition will depend on the condition of men and dogs at that time.

"If everything goes well, and if we have sufficient provisions left, a journey westward into the Peary Channel can be contemplated, in order to investigate whether this Channel goes through the whole country or not, but sufficient care is to be taken, that the main results of the Expedition are not again exposed to loss."

The expedition left Copenhagen on June 20th, 1909, heading for the Faroes, where the dogs of the expedition were to be taken on board. However, the dogs were sick, and had to be killed, so the expedition was forced to go to Angmagssalik to buy fresh dogs. This caused such great delay that the ship did not push beyond Shannon Ø, on the eastern side of which its winter-quarters were established on August 27th.

From the end of September to the middle of December, 1909, a sledge journey was made to Lamberts Land, where the party stayed from October 31st to November 4th. BRØNLUND's body was searched

and buried, but no further documents, in addition to those secured by J. P. KOCH in the spring of 1908 (cf. AMDRUP 1913), were found.

The circumstance that the head-quarters of the expedition came to be situated so far southward in some degree changed the plans, so that no depot was established on Lamberts Land in the autumn.

On March 3rd, 1910, the large sledge journey to Danmarks Fjord started from Shannon Ø, and on March 24th the party ascended the inland ice west of Danmarks Havn. The party later divided into two, only EJNAR MIKKELSEN and IVER P. IVERSEN proceeding towards Danmarks Fjord. On May 13th they descended from the inland ice to the land near Fyens Sø south of Danmarks Fjord. On May 22nd one of MYLIUS-ERICHSEN's reports was found in a cairn at the Ulvebakkerne on the west side of Danmarks Fjord, and shortly afterwards a second report was found at the summer camp. On May 27th EJNAR MIKKELSEN reached Kap Rigsdagen, and here it was definitely decided (see below) to give up the journey to the Peary Channel, among other reasons because it was stated in one of MYLIUS-ERICHSEN's reports that the channel did not exist. The return journey was therefore made along the outer coast, according to the plan.

The journey became extremely difficult. On June 10th they reached the depot on the Nordostrundingen, and after a stay at Mallemukfjæld they passed Lamberts Land on August 15th. Not till September 19th did they reach Danmarks Havn, where they made a long stay. On November 25th, 1910, EJNAR MIKKELSEN and IVERSEN were back at the head-quarters on Shannon Ø, where they learned that the ship had been forced down by the ice, and that the remaining members of the expedition had gone home onboard a Norwegian sealing vessel which called at Shannon Ø on July 27th.

EJNAR MIKKELSEN and IVERSEN remained in the house on Shannon Ø till October 16th, 1911, their stay being only interrupted by a journey to some distance north of Danmarks Havn in order to fetch the depot and some notes left there on the long sledge journey. On July 19th, 1912, they were taken on board the Norwegian steamer the "Sjøblomsten" at Bass Rock, and arrived at Aalesund on July 28th.

The Results of the Expedition.

As stated above the main object of the expedition was to secure information about MYLIUS-ERICHSEN's last journey. Its scientific program was mostly geographical.

Yet EJNAR MIKKELSEN's journeys, especially the very long and difficult, but successfully accomplished journey from Shannon Ø to Danmarks Fjord, onwards around the Nordostrundingen and along

the outer coast back to Shannon Ø, have supplied important contributions to our knowledge of the geography of Northeast Greenland. The results of the expedition are as follows:

1) The finding of MYLIUS-ERICHSEN's two cairn reports, dated August 8th and September 12th, 1907, respectively.
2) A sketch-map of the northeastern Dronning Louise Land, surveyed by LAUB, and various nunataks west of the Hertugen af Orleans Land between 77°45′ and 78°35′ N. lat., discovered and surveyed by EJNAR MIKKELSEN.
3) A sketch-map of the hitherto unknown ice-free land west of Hovgaards Ø and Holms Land.
4) Mapping of the interior of Danmarks Fjord.
5) General information about ice conditions, the nature of the inland ice, hunting and sledging conditions, meteorology, etc., in Northeast Greenland, based on observations during three years.

The Map of Kronprins Christians Land.

The mapping of the ice-free land west of Hovgaards Ø and Holms Land was done from two stations on the inland ice, viz. Station IV in 79°27′4″ N. lat., 26°09′ W. long., and Station V in 80°04′8″ N. lat., 26°51′ W. long. (cf. Medd. om Grønl. Vol. 52, pp. 74—77). On the map of the Danmark Expedition no observations as to the width of the coastal land and the inland ice behind it are indicated from and including Amdrups Land to Nioghalvfjerdsfjorden. From the aforementioned two stations EJNAR MIKKELSEN looked down across a vast area of land and took several bearings, the most important of which are inserted on his map (Pl. I), while his landscape sketches made from the two stations are represented on Pl. VI. He says (p. 77) that the position of the two stations "is rather correct, with longitudes and latitudes taken in the same spot". And he continues:

"The sights are however very long—45 miles and more—but their accuracy may be tested approximately by the azimuths taken to the northern and southern extremity of Lambert's Land, which give the same north-south extension of this land, as shown by the surveyings of the Danmark-Expedition.

"The land east of Kronprins Christian's Land's Inlandice is laid down on the basis of azimuths both from station IV and V, and the coast is thus rather accurate, as we could get cross-bearings to some points. The northernmost bearing from station IV may be erroneous, as the land, to which the sight was taken, was so low that it was difficult to see exactly where it ended, but it may here be stated that the

stations are in any case much elevated above the land, which was to be surveyed, and as we could look down upon it, many details were visible, which would otherwise have been hidden."

EJNAR MIKKELSEN's observations were incorporated in the official Danish map of Greenland in four leaves, whose northeastern leaf was re-edited with the latest corrections in 1918.

However, EJNAR MIKKELSEN's basis for drawing ice-free land areas west of Hovgaards Ø and Holms Land was very slight; this appears distinctly from his text and from his map (Pl. I) and his landscape sketches (Pl. VI). His map supplies a typical example of the difficulty of mapping a land from the inland ice when only the highest and most prominent mountain summits are visible. It appears from Pl. I that not very many bearings were taken, and that it was difficult to take bearings to the same points from the two stations. The map, therefore, is very sketchy, which EJNAR MIKKELSEN fully admits. What he took to be a land boundary towards the inland ice and some few isolated nunataks have later proved to be high plateaus and mountain peaks situated in a vast ice-free land. It is very difficult, therefore, to identify the details of EJNAR MIKKELSEN's map. It seems, however, that the largest of Holms Nunataks is identifiable with the westernmost of the two ice-capped peaks on the Skallingen, and that the large depression in which EJNAR MIKKELSEN believed he saw a glacier is the depression occupied by a lake draining into Ingolfs Fjord. As regards C. H. Jørgensens Nunatak and Brockmeyers Nunatak it is impossible to identify them with any features now known.

When EJNAR MIKKELSEN published his popular report on the journey, "Tre Aar paa Grønlands Østkyst", English edition "Lost in the Arctic", both appearing in 1913, he had not yet computed his astronomical material from the inland ice journey and therefore draws the travelling route too far to the west, and retains the interior of Danmarks Fjord as indicated on HAGEN's map. On the map accompanying the popular report, therefore, in addition to the aforementioned land with nunataks, some details south of Danmarks Fjord are indicated which are not found on the final map. Possibly EJNAR MIKKELSEN noticed some details round Kap Steglich-Petersen (cf. his preliminary map in "Lost in the Arctic").

From Station V EJNAR MIKKELSEN sighted the land east of Fyens Sø and took some few bearings. He says (p. 77):

"The land west of Kronprins Christian's Land's Inlandice is laid down on the basis of sights taken from station V, the distance from there to the land, and furthermore three sketches of the coastline. From station V it was impossible to see the low foreland lying at the foot of the mountains, and the sights taken from this station

are all to mountains some distance inland. The outlines of the forelands are roughly sketched from the *kroki* made from our last camping-site on the Inlandice, 5 miles from its edge and 700 metres above sea-level."

On his map, as on the maps of the Danmark Expedition, the inland ice is retained as a tongue extending across Kronprins Christians Land to the Nordostrundingen.

The Map of the Interior of Danmarks Fjord.

EJNAR MIKKELSEN's most important mapping was his correction of the interior of Danmarks Fjord. He describes this mapping (pp. 77—78), and it is represented on Pl. I, on which HAGEN's mapping is indicated by a dotted line so that the difference in the two maps is distinctly visible.

As far as I can see, EJNAR MIKKELSEN's map of the interior of Danmarks Fjord is correct. His determinations of longitude on the inland ice as well as at Station VI between Kap Holbæk and Kap Viborg seem to be correct. His map of Fyens Sø and the interior of Danmarks Fjord gives many good details.

As regards the southern portion of Fyens Sø, however, I obtained another picture in 1933 than that given by EJNAR MIKKELSEN. I inserted these features on the basis of observations made from airplane a little north of Kap Holbæk, and in Pl. 16 I have maintained my conception of the country round Fyens Sø even though apparently there is rather great disagreement between EJNAR MIKKELSEN's and my maps. Actually, however, the disagreements need not be very great; for EJNAR MIKKELSEN's journey was made at the beginning of May, when the land was still covered with the winter snow, while my flight took place on August 16th, when the snow had completely melted. And as the terrain round Fyens Sø is very flat (I received the impression that it was made up of swamps and low-lying clayey soils), it may easily, when seen from an airplane at some distance and if it is flooded with water, look like land; and reversely, in the spring flat clayey plains will easily appear as lakes. No doubt Najas Øer are actually morainic ridges not particularly high. Thus both EJNAR MIKKELSEN's map and my map are understandable considering the seasons at which they were drawn. Future investigations must decide which map is the more correct.

EJNAR MIKKELSEN and the Peary Channel.

According to the instructions of EJNAR MIKKELSEN's expedition (Medd. om Grønl. Bd. 52, p. IV) his main purpose was "to find the journals and observation material, which MYLIUS-ERICHSEN and HØEG-HAGEN most likely—accordingly to what is known—have left at Cape

Kronborg or Cape Holbæk". If no records should be found in Danmarks Fjord, the return journey was to take place along the outer coast of Greenland around the Nordostrundingen southwards to Lamberts Land, all the depots of the Danmarks Expedition along this stretch to be opened and searched for records. If some reports were found in Danmarks Fjord, and men and dogs were in a good condition, he might leave provisions for the return journey at Kap Rigsdagen and proceed with light sledges westward into the Peary Channel "in order to investigate whether this Channel goes through the whole country or not", however, with the following reservation: "but sufficient care is to be taken, that the main results of the Expedition are not again exposed to loss" (cf. p. 193).

Since the expedition did not ascend the inland ice from Lamberts Land, as intended, but from the interior of Dove Bugt, the journey became much longer than planned, and since moreover various other difficulties had to be surmounted, EJNAR MIKKELSEN arrived at Danmarks Fjord so late in the season that he contemplated going through the Peary Channel (see below) to Ft. Conger and spending the summer there. However, on reaching Kap Rigsdagen, he evidently realised that too much of the strength of the expedition would be spent on investigating the Peary Channel (cf. "Lost in the Arctic", p. 195, and Medd. om Grønl. Bd. 52, pp. 87—88), so he decided to return along the outer coast, according to his instructions.

To MYLIUS-ERICHSEN's report of August 8th, stating that the Peary Channel "does not exist", EJNAR MIKKELSEN attaches the following remarks ("Lost in the Arctic", 1913, pp. 193—194):

"... the sentence "Peary's Channel *does not exist*" entirely upsets the plan we have been contemplating for the last month or so, viz. of going through Peary's Channel westward to Robertson Channel. This we wished to do partly in order to reach "new land", but chiefly because we should thus be enabled to get into touch with human beings sooner, and doubtless also with less difficulty than by going back along the east coast of Greenland.

"Now, however, we must make a virtue of necessity, and follow out our instructions to the letter, for we dare not risk the long journey northward round Peary Land, more especially as our crossing over the inland ice has cost us more provisions and more dogs than we had calculated.

"It gives one a feeling of uncertainty, thus suddenly to encounter an obstacle which effectively prevents the carrying out of one's plans; reason argues that one must make the best of the altered conditions, but the force of habit is so strong that one continues to search for possible ways of removing the unexpected check.

"So with us now—we think in a circle, the centre of which is the fact that Peary has stood on Navy Cliff and declared that the straits were open! How is it possible? The only explanation we can find is that he must have been so high up that the low land which connects Navy Cliff with Heilprin Land appeared to him as the surface of an ice-covered sound, and that the islands he has charted as lying across the straits are the bare tops of some small hills.

"Brönlund's diary also suggests this, and Mylius Erichsen's report states it as a fact; but Høeg Hagen had *not* marked it on his map, which is otherwise so accurate, and this it is which leads us to doubt."

In the official report of the expedition (Medd. om Grønl. Vol. 52, 1922) EJNAR MIKKELSEN says after quoting MYLIUS-ERICHSEN's report of August 8th, 1907 (p. 87):

"That which interested us most in the report found was MYLIUS-ERICHSEN's statement as to the non-existence of Peary Channel, as the many gales and the consequent delay on the Inlandice had forced us to consider it most prudent to go through this channel and down along the NW coast of Greenland, until we met the Eskimos. This we thought was our only chance of escaping a summer somewhere on the coast.

"This plan was now impossible, as we could not think of going an unknown distance overland where bare land might stop the sledges any moment, and we had consequently to follow the exact wording of the orders from the Committee, in which it was stated that . . . "If "the journals are not found in the vicinity of Cape Holbæk or Cape Kron-"borg, then the homeward journey must be made along the outer coast "of NE Greenland, round Nordostrundingen to Lambert's Land. The "journey will be facilitated by the depots left on the coast by the Dan-"mark-Expedition. The coast must be carefully examined, and all depots "opened in search of journals or information."

The orders further stated: "The Committee must emphatically "point out that the aforesaid journey towards the west through Peary "Channel is only to be attempted, provided conditions are so favourable "as to practically exclude the possibility of losing the results obtained."

THE FIRST THULE EXPEDITION 1912

Leader: KNUD RASMUSSEN.

Cf. Pl. 10.

Literature.

1) FREUCHEN, PETER: General Observations as to Natural Conditions in the Country traversed by the Expedition. Medd. om Grønl. Bd. LI, pp. 341—370. With 6 figs. Copenhagen **1915**.

2) — Meteorological Observations. Medd. om Grønl. Bd. LI, pp. 413—425. Copenhagen **1915**.

3) — Min Grønlandske Ungdom. Pp. 1—325. København **1936**.

4) — Arctic Adventure: My Life in the Frozen North. Pp. i—ix, 1—467. Ill. with photographs and maps. New York **1935**.

5) RASMUSSEN, KNUD: Foreløbig Beretning om "Den første Thule-Ekspedition" 1912—13. Geogr. Tidsskr. **1914**, Bd. 22, Hft. V, pp. 183—198. Ill. w. maps and figs.

6) — Om den II. Thuleekspedition over Indlandsisen til Adam Bierings Land og Fundet af Savik-Meteoren. Geogr. Tidsskr. **1914**, Bd. 22, Hft. VI, pp. 203—204.

7) — Report of the First Thule Expedition 1912. Medd. om Grønl. Bd. LI, pp. 283—340. With 3 maps and several figs. **1915**.

The Progress of the Expedition.

In 1910, one year after PEARY had brought his expeditions to an end, KNUD RASMUSSEN and PETER FREUCHEN went to the Kap York district in order to establish a trading post for the Eskimos living there. In addition the station was to serve as a base for scientific expeditions.

The first item on the scientific programme was an investigation and mapping of the supposed Peary Channel (cf. Geogr. Tidsskr. 1914, Hft. 5, Bd. 22, p. 183; Medd. om Grønl. Vol. LI, 1915, p. 286).

KNUD RASMUSSEN, who on the Literary Expedition to West Greenland (1902—04) and in subsequent years had spent several winters among the Kap York Eskimos, was specially qualified for solving these problems. As a member of the Danmark Expedition 1906—08 PETER FREUCHEN was fully familiar with the cartographical material of that

expedition, and with the uncertainty which prevailed as to the observations made by MYLIUS-ERICHSEN from Kap Glacier, since HØEG-HAGEN's sketch-map leaves this question undecided.

KNUD RASMUSSEN and FREUCHEN originally intended to travel along the north coast of Greenland as far as Nordenskiölds Fjord to penetrate through this fjord into the Peary Channel. In 1911 on arrival of their ship they received a special inducement to undertake the journey, learning that no news had been received about the fate of EJNAR MIKKELSEN, who in 1910 had set out from Shannon Ø to go by way of the inland ice to Danmarks Fjord, and possibly onwards through the Peary Channel. However, at the last moment the plans of the 1st Thule Expedition were entirely altered. Heavy gales from the north had broken up the sea-ice, rendering travelling on it in the northern Kap York district impossible; it was therefore decided to ascend the Clements Markham Gl. and to cross the inland ice, heading directly for Danmarks Fjord, where the party might expect to obtain information both about the last journey of MYLIUS-ERICHSEN and about EJNAR MIKKELSEN. From Danmarks Fjord they would proceed through Independence Fjord to Kap Glacier and the Peary Channel, and in case they found a report from EJNAR MIKKELSEN stating that he had gone to Fort Conger, they intended to go to that point after mapping the Peary Channel (cf. Geogr. Tidsskr. 1914, p. 185).

The expedition, which in addition to KNUD RASMUSSEN and PETER FREUCHEN included two Eskimos and was based entirely on Eskimo equipment, ascended the inland ice on April 14th with several auxiliary sledges. After a rapid and skilfully achieved journey they reached the east coast of Danmarks Fjord on May 9th.

At the time the expedition left Denmark, the maps of the Danmark Expedition had not yet been published, and the available map material was therefore very primitive (cf. Medd. om Grønl. Vol. LI, p. 303). They thought they discerned the head of Danmarks Fjord (Geogr. Tidsskr. 1914, p. 188; Medd. om Grønl. Vol. LI, p. 348), and on FREUCHEN's map the edge of the inland ice round it is therefore represented by a full-drawn line. However, what they saw, was doubtless merely an indentation of the edge of the inland ice and not the head of the fjord.

On June 1st they came down on to the sea-ice of Danmarks Fjord after a troublesome descent and a journey through the Zig-Zag Dalen, and on June 4th they reached MYLIUS-ERICHSEN's summer camp, but found no report either from MYLIUS-ERICHSEN or from EJNAR MIKKELSEN. Later it proved that EJNAR MIKKELSEN had taken out MYLIUS-ERICHSEN's report, but had failed to leave a copy of it or a report of his own journey (Medd. om Grønl. Vol. LI, pp. 317, 356).

The journey then took them past Kap Rigsdagen and onwards to the mouth of Hagens Fjord, where FREUCHEN made a correction in the map, indicating Kap Ludovika as a projecting cape (actually it does not project so far out as shown on FREUCHEN's map). Subsequently they crossed Independence Fjord, reaching Peary Land on June 6th, where they had successful hunting and fine weather.

FREUCHEN (Medd. om Grønl. Vol. LI, p. 359) gives the following description of Brønlunds Fjord: "From Cape Harald Moltke a good view is obtained out over Brønlunds Fjord. This seems to be drawn somewhat too large on HAGEN's map, the part which curves off towards the west behind Cape Knud Rasmussen soon after leading up into a valley. This last was, it is true, covered with snow, and thus difficult to distinguish from the fjord itself, low and even as it is; it continues, however, far out to the west. Cape Harald Moltke itself is formed by the raised terrace above referred to."

It should be noted that the head of Brønlunds Fjord cannot be sighted from Kap Harald Moltke itself. The description, which is entirely correct, is therefore evidently based on observations from a more easterly point on the south coast of Peary Land or from a point inland north of Kap Harald Moltke. Later PETER FREUCHEN gives a somewhat different description of the fjord, saying (p. 360): "The range breaks off sheer towards Brønlunds Fjord, and continues westward as far as Chr. Erichsens Bræ, which fills the valley at the inner end of Brønlunds Fjord. The icebergs in the fjord had not drifted farther in than the point where this sharp break occurs. The inner portion of the fjord is therefore probably shallow."

FREUCHEN's map is in accordance with the latter description.

The First Thule Expedition and the Peary Channel.

Having passed the mouth of Brønlunds Fjord, the party proceeded along the north coast of Independence Fjord. Evidently they had contemplated to cross the fjord in order to find MYLIUS-ERICHSEN's cairn, but this plan was given up (Medd. om Grønl. Vol. LI, pp. 321 and 362) since travelling on the melting ice would be very difficult, and moreover they did not know precisely where to look for MYLIUS-ERICHSEN's cairn (Op. cit., p. 321). They realised that he could not have been at Kap Glacier itself, the packed ice-bergs in front of Academy Glacier rendering it impossible to reach the cape.

In his description of the south coast of Independence Fjord FREUCHEN mentions the steep cliffs forming the coast from Astrups Fjord to Kap Glacier and adds (p. 362): "An exception is formed by the ravine which breaks through into the fjord a little before the 22nd

degree is reached, affording a channel for a big river coming down from the interior." On his map FREUCHEN indicates a large delta projecting into Independence Fjord, and in the outer part of the delta a cairn; evidently he assumed that MYLIUS-ERICHSEN's cairn was situated there, not having noticed (from the north side of the fjord) that a small bay, but no delta, is found at this place, and that MYLIUS-ERICHSEN's cairn was built on a small basalt cape farther westward.

About the discovery of the head of Independence Fjord KNUD RASMUSSEN writes as follows (Op. cit., pp. 321—322): "For some days now the appearance of the country about the base of Independence Fjord had gradually given us the impression that Independence Bay must be a fjord, having no connection with Nordenskjölds Inlet. We could not, however, yet come to any final conclusion; anyone who has travelled in Greenland will know how deceptive the apparent form of a landscape may be, with overlapping ness and point that render it impossible to judge what lies behind without actual investigation of the spot.

"Not until the 17th of June did we reach the glacier which forms a barrier at the base of Independence Fjord. We made at the same time an excursion up into the hills, and looking down, saw an open stretch of snowless land just where the map showed the dotted line of a channel. Greenland was thus in unbroken connection with Peary Land."

In "Geografisk Tidsskrift" (Bd. 22, p. 191) KNUD RASMUSSEN says (translated from the Danish): "However, as is well known, as early as June 17th we were to run our heads against a mountain wall, which was the head of Independence Fjord, and which forced us to change our plans completely.

"It is easily understood that as travellers we first of all felt the great joy at the discovery: Greenland connected by land with Peary Land. For the Peary Channel, as will be known, was retained on Høegh-Hagen's map from the Danmark Expedition. And even though we had set out to map a channel, we had not been unprepared for the possibility that this channel did not exist. But that we were to encounter the connecting land just below that Navy-Cliff whence Peary twenty years ago had proclaimed his famous channel—this we had not anticipated."

FREUCHEN says (Medd. om Grønl. Vol. LI, pp. 361 and 362): "From Little Diabasholm, the highest point of which lies but 20 metres above the sea, an excellent view is obtained out over the base of Independence Fjord; even from here it appears unlikely that the Peary Channel should exist." And p. 362:

"From here, further progress westward through Independence Fjord was impossible. On making a reconnaissance, however, we found that it would be possible, though with considerable difficulty, to carry our gear up to a tongue of ice which jutted out from Chr. Erichsens Bræ down in a south-easterly direction towards Cape Schmelck, about 750 metres above sea level. We could then drive along Chr. Erichsens Bræ to Skelelven, from where we should then have to lower or carry our gear down to Nyeboes Bræ. In the course of this reconnaissance I reached as far as the hill 940 metres high north of Nyeboes Lake. Here for the first time I was able to look out over Valmuedalen, and saw that it was free from ice. From this moment, all idea of a Peary Channel filled with glacier ice had to be relinquished. I had already previously observed that Nyeboes Bræ led up to the inland ice, and could thus not be supposed to mask any such channel."

It appears from these descriptions that for several days they had suspected that the head of the fjord was closed by a glacier, and that they expected that a portion of the Peary Channel might be barred by glacier ice, which was quite natural, since according to PEARY four glaciers descend into the channel at right angles to it. It was only by the discovery of Valmuedalen and by ascertaining that Nyeboes Bræ[1]) led to the inland ice that it was definitely proved that the Peary Channel did not debouch into Independence Fjord.

FREUCHEN says about Valmuedalen (p. 364): "There is no doubt

[1]) J. P. KOCH (1916, pp. 390—92) discusses the name Marie Sophie Bræ and states (p. 392) that the circumstance that on FREUCHEN's map of the interior of Independence Fjord "there is a glacier on Heilprin Land, which as regards position and direction harmonizes well with the part of the Marie Sophie Bræ shown by HAGEN on Pl. IV (Medd. om Grønl. XLI) however makes it the most natural solution to rest content with the conception that FREUCHEN's Glacier I and the Marie Sophie Bræ are one and the same."

Immediately below this statement we find an "Editor's note", in which it is said that in the opinion of the Kommission for Ledelsen af de geologiske og geografiske Undersøgelser i Grønland the name "Marie Sophie Bræ" was probably originally used about the great glacier at the head of Independence Fjord, and that the Committee "have decided that in future publications issued by them, the name "Marie Sophie Bræ" will be placed at the end of the glacier at the bottom of Independence Fjord, and that the name "M. Ib Nyeboes Bræ" will be used for that part of the glacier lying behind, which Mylius-Erichsen had presumably not seen."

The Committee are no doubt right in their assumption. However, on publishing my "Map of North Greenland", I found it inconvenient to operate with two names for one and the same glacier; I therefore gave the name M. Ib Nyeboe Glacier to the glacier—probably the southernmost of the four glaciers shown by PEARY to descend into the Peary Channel—which descends between Holger Kiærs Nunatakker and Adam Bierings Land and strikes Marie Sophie Gl. (cf. further Medd. om Grønl. Bd. 65, p. 302, with map Fig. 41, p. 303, and pp. 320—322).

that this must be the hollow which PEARY and ASTRUP looked out over in 1892 but without being able to see down into it."

It took the expedition ten days to have the goods of the expedition carried across Kap Schmelck to Valmuedalen, where they stayed from June 29th to July 12th. They had successful hunting, but owing to bad weather they did not push very far into the valley and accordingly they failed to ascertain its northwestward extension.

Subsequently the party travelled on Nyboes Bræ in the course of three days to the west side of the land with Navy Cliff, arriving there on July 15th. FREUCHEN accompanied by an Eskimo made an excursion to Navy Cliff, which they reached on July 23rd, and here secured PEARY's report. The report is reproduced in facsimile (Medd. om Grønl. Vol. LI, opposite p. 326) and is quoted p. 326. KNUD RASMUSSEN adds:

"As will be seen from the above, Admiral Peary makes no mention here of any channel, and even calls the place Independence Fjord. It must therefore have been at a later date that the idea arose as to a channel between North Greenland and Peary Land. In any case, it is found marked on all American maps under the name of Peary Channel. It is also impossible to see the base of the fjord from the point on Navy Cliff where the cairn was built: all that can be seen is that the ice from the fjord runs farther on inland. This, with the fact that a hollow runs through Valmuedalen over towards Nordenskjölds Inlet on the west, explains how the theory originated."

FREUCHEN says about the view from Navy Cliff (p. 369):

"A good view was obtainable from the spot out over the fjord, where the ice still lay unbroken; an explorer looking out from there, and not considering it necessary or advisable to proceed farther, might well imagine that the fjord extended farther to the west."

On the land with Navy Cliff, which was named Vildt Land (i.e. Game Land) the expedition had successful hunting, but during the greater part of its three weeks' stay there the weather was bad. On August 8th they started on their return journey across the inland ice with three sledges and 27 dogs.

On September 3rd they sighted land, which they first took to be the mountains north of Melville Bugt, and they therefore followed a more northerly course; however, next day they discovered that they were north of Inglefield Gulf, so they travelled back of the heads of this fjord and of Wolstenholme Fjord southward to Thule, which they reached on September 15th with eight dogs alive.

The Maps of the 1st Thule Expedition.

As regards FREUCHEN's map attention should be called to some remarks on his observations which he has set forth in his article "Meteorological Observations" (Medd. om Grønl. Vol. LI, pp. 415—425, 1915).

The instrument used for observations was a "Kleinster Reise-Theodolit" "made by HILDEBRAND of Freiburg in Saxony". On p. 416 FREUCHEN relates that on June 17th, in Independence Fjord, he fell into a fissure filled with a slushy mess of snow and water; he dropped the theodolite, which lay about twenty minutes at the bottom of the fissure before he secured it. "After this, it was found that the excentricity for the vertical circle had altered a little, while some black smudges had appeared on the scale of the horizontal, rendering it difficult to read in places".

Furthermore, FREUCHEN points out that after reaching Zig-Zag Dalen, that is to say, immediately after their descent from the inland ice, he suffered more or less from snow-blindness, "which must doubtless have considerably affected the accuracy of the observations".

FREUCHEN likewise describes the difficulties in making accurate determinations of longitude on such a journey, when the observations depend on more or less unreliable watches.

Finally, there was a fourth source of error, which FREUCHEN points out (1915, p. 350). It is always very difficult during protracted foggy periods in the spring, when one can hardly decide whether it is day or night, or one may forget to draw one's watch on long hunting excursions, to know the date. During his aforementioned attack of snow-blindness FREUCHEN made "a mistake in the date", which was not corrected till after the return of the expedition. In a footnote (M. o. G. Bd. LI, p. 370) KNUD RASMUSSEN explains why the dates in his and FREUCHEN's travelling reports differ by one day.

Cartographically the error in date was of no particular importance at the height of summer, but in the late summer the error in the declination will increase day by day, and the errors in FREUCHEN's latitude observations were in consequence the greater. There can be no doubt that this was a concurrent cause of the deflected course of the expedition during the return journey across the inland ice, which took them more than 100 km farther northward than planned, a mistake which added considerably to the length of the journey and cost the lives of several of their dogs.

FREUCHEN writes as follows (1915, p. 370):

"In conclusion, I should mention that the maps, which had to be completed before my departure from Denmark, would not have been

finished in time had it not been for the valuable assistance kindly rendered, in the first place in Greenland, by Frk. MIMI POULSEN of Upernivik, in copying and colouring, and ultimately in Denmark, by my former comrade from an earlier expedition, Hr. BENDIX THOSTRUP, who undertook the final work of preparing them for the press. To both I wish to express my very sincere thanks."

In "Foreløbig Beretning om "Den første Thule-Ekspedition" 1912—13" (Geogr. Tidsskr. Bd. 22, Hft. V, pp. 183—198, 1914) two maps are found. One of them (p. 184) is a map of the whole of Greenland, which shows the various inland ice routes, that of the First Thule Expedition in a continuous heavy line. On this map the heads of Nordenskiölds Fjord and De Long Fjord are left open, Vildt Land is represented in accordance with FREUCHEN's map (p. 190), the position of the Peary Channel is roughly indicated, and Adam Bierings Land is accordingly reduced to about half size. The suggestions of the Peary Channel on the map are not connected northward with either Nordenskiölds Fjord or De Long Fjord. The map, which is entitled "Kort over Grønland med Angivelse af de vigtigste Rejser paa Indlandsisen samt af den første Thule-Ekspeditions Slæderouter mellem Independence Fjord og Holstensborg" (Map of Greenland, showing the most important journeys on the inland ice and the sledge routes of the 1st Thule Expedition between Independence Fjord and Holstensborg), is on a very small scale, and its only purpose is probably to show the travelling routes of the expedition.

The other map (p. 190) is entitled "Danmarks Fjord og Independence Fjord med Omgivelser. Skitsen er tegnet dels efter Danmarks-Ekspeditionens Kort (den spinkle Tegning), dels efter Opmaalinger under den første Thule-Ekspedition (den kraftigere Tegning)". (Danmarks Fjord and Independence Fjord with surroundings. The sketch was drawn partly on the basis of the map of the Danmarks-Ekspedition (the fine line), partly on surveys made on the 1st Thule Expedition (the heavy line)". It will be noted that the map is called a "sketch".

The preliminary report is dated May 20th, 1913; thus it was evidently delivered to the Geographical Society hardly more than a week after the return of the expedition. It would seem that FREUCHEN has drawn the two maps in Greenland before he returned to Denmark, and that fair copies were made during the first days after his return. After a few months' stay in Denmark both FREUCHEN and KNUD RASMUSSEN went to Greenland again. KNUD RASMUSSEN, however, returned to Denmark in the autumn, whereas FREUCHEN continued to the Kap York district in order to set out again towards Northeast Greenland to complete the mapping of the connecting land between Independence Fjord and Nordenskiölds Fjord (cf. KNUD RASMUSSEN: "Om den II. Thule-

ekspedition over Indlandsisen til Adam Bierings Land og Fundet af Savik-Meteoren" (Geogr. Tidsskr. Bd. 22, pp. 203—04, 1914).

The final report on the expedition (KNUD RASMUSSEN 1915) first contains a sketch map (facing p. 286) of the whole of Greenland, entitled "Map showing routes of the various expeditions which have crossed the inland ice". On this map Nordenskiölds Fjord as well as De Long Fjord are closed with a distinct coast line—which is not quite correct, since the First Thule Expedition had no opportunity of making observations in these two fjords.

The map Pl. 12 is entitled "Chart showing altitudes on the inland ice in metres, direction of wind and length of each day's journey". On this map Nordenskiölds Fjord and De Long Fjord are left open to the south, but apart from certain vague details concerning the northern course of the Peary Channel, the channel is not indicated, the map, as stated in its title, being only meant to show the routes of the expedition across the inland ice.

The map Pl. 11 is entitled, "Map of the connecting land between Peary Land and Greenland drawn by PETER FREUCHEN". On this map nothing is shown concerning that part of the Peary Channel which was not observed by the expedition. The map is a somewhat enlarged copy of the aforementioned sketch map published in the preliminary report (p. 190). In the final report it appears as the final map of the expedition without anything being stated as to its identity with the sketch map of the preliminary report.

The two former maps of the First Thule Expedition must be regarded as not very carefully executed sketch maps, whose only purpose is to show travelling routes on the inland ice.

It is deplorable that FREUCHEN during his short stay in Denmark before he again started out had no opportunity of revising his observations, and that his sketch-map therefore came to appear in the official report as a final map. In the text FREUCHEN gives many good descriptions of the coast stretches he passed on the expedition, and he made a large number of botanical, zoological, geological, and geographical observations of great value. On my journey in 1921, during my stay at the head of Independence Fjord and on Vildt Land, FREUCHEN's sketch-map was of great use to me.

The reader is further referred to the mention of the First Thule Expedition in FREUCHEN's book "Min grønlandske Ungdom", English edition: "Arctic Adventure" (pp. 196—219), where FREUCHEN gives a very interesting description of his stay in Northeast Greenland in the summer of 1912, adding further details concerning the difficulties under which his mapping was done. After describing their ascent of Nyeboes Gl., FREUCHEN says (pp. 213—14) about the Peary Channel:

"For two days we climbed, and we realized that we must now be at the very spot from which Peary had looked down upon the Nyboe Glacier. It, and the presence of Poppy Valley and various other formations, had seemed to him sufficient reason for believing that there was a channel. Nevertheless, he did not state positively that there was a channel—he only said there seemed to be one. He had actually *seen* Independence Bay; he *knew* there was a similar inlet to the west; and he had every reason to believe that the two inlets met to produce a single, continuous passage. From here we could see the mountains on both sides, and anyone, I believe, would have proclaimed it to be a sound. It is rather interesting to read the Peary and Astrup accounts. Peary *thinks* there is a sound. Astrup states that there is one[1]). The younger and more impetuous man was not so cautions as his master."

[1]) This is not quite correct; as pointed out above, ASTRUP states that there was a *depression* (cf. p. 214).

DANISH VIEWS ON THE HEAD OF INDEPENDENCE FJORD

Literature.

1) Amdrup, G.: Report on the Danmark Expedition to the North-east coast of Greenland 1906—1908. Medd. om Grønl. Bd. XLI, **1913**, pp. 1—270. With 24 plates and four portrays.

— Mylius-Erichsen's Report on the Non-Existence of the Peary Channel; Information brough home by Ejnar Mikkelsen. Medd. om Grønl. Bd. XLI, **1913**, pp. 469—474.

2) Astrup, Eivind: Blandt Nordpolens Naboer. With photographs, sketches, and charts. Pp. i—vi + 1—319. Kristiania **1895**.

3) Bruun, Daniel: Peary Land landfast med Grønland, belyst ved "Danmark-Ekspeditionen", Ejnar Mikkelsen og Knud Rasmussen. Geogr. Tidsskr. **1913**, Bd. 22, Hft. III, pp. 85—92.

4) Erichsen, L. Mylius-: Plan til en dansk Skibs- og Slædeekspedition til Grønlands Nordostkyst. Geogr. Tidsskr. Bd. 18, **1906**, pp. 195—199.

5) Koch, J. P.: Survey of Northeast Greenland. Medd. om Grønl. Bd. XLVI, Nr. II, **1916** pp. 81—468. With 6 pls. and 67 figs.

6) Mikkelsen, Ejnar: Lost in the Arctic. Pp. i—xviii + 1—400. With 1 map and numerous illustrations. London **1913**.

7) — Alabama-Ekspeditionen til Grønlands Nordøstkyst 1909—1912. Medd. om Grønl. Bd. LII, p. I—VIII + 1—142. With pls. and figs. **1922**.

8) Rasmussen, Knud: Foreløbig Rapport i Geogr. Tidsskr. **1913**, Bd. 22, Hft. II, p. 41.

On June 1st, 1907, standing near Kap Glacier, from which he had a view of Navy Cliff, Mylius-Erichsen wrote in his report of June 1st[1]): "The entrance, assumed by Peary, of a Peary Channel does not exist". Further he postulated that the glacier closing the head of Independence Fjord was "a local glacier", that the land with Navy Cliff and Heilprin Land were one and the same land with a local glacier in a small bay (cf. p. 188) and that several of the islands situated in front of the glacier formed a continuous low foreland.

[1]) Brought home by the present author in 1921.

These observations are summarised in MYLIUS-ERICHSEN's report of August 8th, 1907[1]), in which the sentence quoted above is modified into "The Peary Channel does not exist".

HAGEN's sketch-map (AMDRUP 1913, Pl. IV) and his landscape sketch (Pl. IX), found at BRØNLUND's body in 1908, give a somewhat different picture; thus HAGEN indicates no foreland, but PEARY's islands are maintained as islands, and a glacier (Marie Sophie Gl., named after MYLIUS-ERICHSEN's wife) descends into the sea west of the cape behind the islands. In 1912 J. P. KOCH, preparing the maps of the Danmark Expedition, indicated the cape with the islands in front of it and a small glacier issuing from a small local ice-cap on Heilprin Land and descending into the sea (see Pl. 9).

During their stay at Kap Rigsdagen in 1910 EJNAR MIKKELSEN ("Lost in the Arctic", p. 194) and his travelling companion IVERSEN discussed the correct understanding of MYLIUS-ERICHSEN's report; they supposed that is was in part based on observations made by BRØNLUND, who had possibly been driving about with his sledge near the head of Independence Fjord, but that HAGEN had only indicated on his map the details he had seen himself.

In 1913, almost simultaneously with the publication of the official report of the Danmark Expedition, AMDRUP, in an additional note entitled "Mylius-Erichsen's report on the non-existence of the Peary Channel, information brought home by EJNAR MIKKELSEN" (1913, pp. 469—474) gave some corrections to the official report, regarding MYLIUS-ERICHSEN's last journey. Thus AMDRUP sets forth the supposition that MYLIUS-ERICHSEN and his companions stayed at the head of Independence Fjord from June 1st to June 4th (pp. 473—474), saying as follows ". . . there is every probability that MYLIUS-ERICHSEN and his companions remained at the head of Independence Bay right to the 4th of June. They have thus had plenty of time to survey the head of this Fjord." This assumption cannot hold good, for if so, they would have had no time for the exploration of Brønlunds Fjord, which is known to have taken place. In conclusion AMDRUP says as follows (p. 474): "It will be seen from the foregoing, that the honour of discovering, that the Peary Channel does not exist, belongs to MYLIUS-ERICHSEN, and that the honour of making this discovery known to the world falls to EJNAR MIKKELSEN."

In 1913 there seems on the whole to have been some confusion as to the extent of the investigation of the head of Independence Fjord made by MYLIUS-ERICHSEN and HAGEN. Thus in a brief report on the 1st Thule Expedition and its results (Geogr. Tidsskr. 1913, Bd. 22,

[1]) Brought home by EJNAR MIKKELSEN in 1912.

Hft. II, p. 41), it is said (translated from the Danish): "Where it was previously assumed that the Peary Channel was situated, we find a large ice-free hinterland rich in game." In an editorial note to this report the following passage occurs (translated from the Danish): "On this journey it was ascertained among other things that Greenland is connected by land with Peary Land. The existence of the Peary Channel has previously been doubted, and the two travellers[1]) thus have the honour of having solved the riddle. On a map sent to the Society the travelling route and the land connection are inserted."

In the same year DANIEL BRUUN (Geogr. Tidsskr. 1913) published an article entitled "Peary Land landfast med Grønland, belyst ved "Danmark-Ekspeditionen", Ejnar Mikkelsen og Knud Rasmussen" (Peary Land contiguous to Greenland, elucidated by the "Danmark-Ekspeditionen", Ejnar Mikkelsen, and Knud Rasmussen). In this article he sums up what was known at that time and what was assumed about MYLIUS-ERICHSEN'S and his companions' stay and observations near Kap Glacier. Having quoted BRØNLUND'S diary for the first days of June, DANIEL BRUUN says as follows (p. 89) (translated from the Danish):

"As will be seen, the three men were in a miserable condition, and just at the moment they reached their goal and needed all their strength, they had to fight for life. Whether Høeg-Hagen nevertheless succeeded in making a map—however sketchy it may be—which could prove that Peary had been in error, and that the Peary Channel could not run right through the country, is doubtful, and must at any rate be left undecided. The only thing that appears from MYLIUS'S report of August 8th is that the channel did not exist."

On starting out in 1912, KNUD RASMUSSEN and FREUCHEN, as stated above, did not have the map of the Danmark Expedition at their disposal. They had only seen HAGEN'S sketch-map, which did not extend westward beyond the cape with the islands in front, and which gave merely an incomplete and ambiguous picture of part of Marie Sophie Gl.; and since EJNAR MIKKELSEN had failed to leave a copy of MYLIUS ERICHSEN'S report secured at Danmarks Fjord, they knew nothing during their expedition about MYLIUS-ERICHSEN'S statements about the head of Independence Fjord. They therefore took it for granted, as KNUD RASMUSSEN says (Geogr. Tidsskr. 1913, p. 191), that "the Peary Channel was maintained on Høegh-Hagen's map of the Danmark Expedition".

DANIEL BRUUN concludes his article as follows (p. 92):

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[1]) KNUD RASMUSSEN and PETER FREUCHEN.

"The question of the Peary Channel is thus fully solved. It cost the lives of MYLIUS-ERICHSEN, HØEG-HAGEN, and BRØNLUND[1]); EJNAR MIKKELSEN brought home the first news about the discovery, while KNUD RASMUSSEN and FREUCHEN gave the solution the firm foundation which it required."

Consequently DANIEL BRUUN's statement quoted above, that "the question about the Peary Channel has thus been fully solved", can only apply to the supposed outlet of the channel into Independence Fjord and not to the remaining part of the channel.

It is deplorable that MYLIUS-ERICHSEN in his report of August 8th deposited at Danmarks Fjord used the categorical expression, "the Peary Channel does not exist", instead of that used in his report of June 1st (cf. above) that the *entrance*[2]) of the channel does not exist. As a matter of fact MYLIUS ERICHSEN could say nothing about the existence or non-existence of the Peary Channel as a whole, he could only say that its mouth was barred by a glacier.

This may be illustrated by the following examples. If we imagine that the mouth of a large artificial canal, for instance the Panama Canal or the Suez Canal, has been barred by deposition of sand or owing to a land-slip, a captain who is to go through it with his ship may rightly say: the canal does not exist. Yet as a geographical feature the canal will still exist. ASTRUP had established the Peary Channel as a geographical concept even though it did not perhaps appear as a waterway along its whole course. This has been most clearly expressed by ASTRUP in his book "Blandt Nordpolens Naboer" in which he says (p. 206) (translated from the Norwegian): "At any rate it is a fact that between these two fjords there exists a continuous broad cleft bounded by mountain walls several thousand feet high, and the only point as to which there may be some doubt for the time being is whether this depression along its middle courses is situated above or below sea-level."

It will be seen from the above that three Danish expeditions (the Danmark Expedition, the 1st Thule Expedition, and the Alabama Expedition) had established that no channel debouched at the head of Independence Fjord. However, the three expeditions had not solved the question of the Peary Channel as a geographical feature as defined

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[1]) This expression is rather unfortunate. On starting from Kap Rigsdagen MYLIUS-ERICHSEN's only aim was to establish connection with PEARY's observation station on Navy Cliff, while he had no intention of exploring the Peary Channel. The existence or non-existence of the Peary Channel was therefore without any influence on the fate of MYLIUS-ERICHSEN and his travelling companions.

[2]) Italics by me.

by PEARY and ASTRUP, or as it was defined in MYLIUS-ERICHSEN's expedition plans, viz. as a route for Eskimos and animals wandering around the north of Greenland from west to east.

The form which the question of the Peary Channel had assumed came to play an important part during the subsequent American discussions about the non-existence of the channel and the attacks on PEARY, which resulted in the cancelling and withdrawal of the Admiralty Chart No. 2142 (see below).

ATTACKS ON PEARY

Literature.

1) Amdrup, G.: Report on the Danmark Expedition to the North-east coast of Greenland 1906—1908. Medd. om Grønl. Bd. XLI, **1913**, pp. 1—270. With 24 plates and four portrays.

2) — Mylius-Erichsen's Report on the Non-Existence of the Peary Channel; Information brought home by Ejnar Mikkelsen. Medd. om Grønl. Bd. XLI, **1913**, pp. 469—474.

3) Caraway, Thaddeus H.: The Attack on Dr. Frederick A. Cook. Congressional Record, sixty-third congress, third session Washington, Thursday, March 4, **1915**, Vol. 52, pp. 6279—6286.

4) Fess, Simeon D.: The North Pole Aftermath. Congressional Record, sixty-third congress, third session, Vol. 52, No. 71, pp. 6273—6279. **1915**.

5) Helgesen, Henry T.: Map of the Arctic Regions. Extension of Remarks of Hon. Henry T. Helgesen, of North Dakota, In the House of Representatives, Thursday, February 25, 1915. Congressional Record, sixty-third congress, third session, Vol. 52, No. 71, pp. 5277—5279. **1915**.

6) Helgesen, Henry T.: Speech in the House of Representatives, January 13, 1916. Washington **1916**, pp. 1—31.

7) Hydrographic Office, Chart No. 2142. North America Polar Regions, Baffin Bay to Lincoln Sea, showing the recent discoveries by Civil Engineer R. E. Peary, United States Navy, etc. **1903**.

8) Peary, R. E.: Northward over the Great Ice. With maps, diagrams, and illustrations. Vols. I—II, pp. i—xxvi + 1—521, and i—xiv + 1—618. London **1898**.

The embittered dispute between Peary and Cook about the discovery of the North Pole, which had on several occasions been dealt with by the American Congress also, was resumed with renewed intensity when the Danish expeditions under the leadership of Mylius-Erichsen, Ejnar Mikkelsen, and Knud Rasmussen returned with the news about the non-existence of the Peary Channel. As these attacks resulted in the withdrawal and cancellation of the official map issued by the Hydrographic Office, which i. a. was copied on the official Danish map of the whole of Greenland (1906), and the material is difficult of access, I shall quote them *in extenso* here. Thus the Congressional Record under

the heading "Map of the Arctic Regions. Extension of Remarks of Hon. Henry T. Helgesen, of North Dakota, In the House of Representatives, Thursday, February 25, 1915" contains the following remarks:—

"Mr. HELGESEN. Mr. Speaker, I wish to make some observations in regard to the following House joint resolution, which I have just introduced, being a resolution to correct certain maps issued by the United States Navy Department—Hydrographic Office:

"Whereas the maps of the Arctic regions issued by the United States Navy Department erroneously show waterways that do not exist and lands that are really deep sea, while lands that do exist are omitted altogether; and
"Whereas such false chartings on the United States maps, especially those numbered 2142 and 2560, issued by the Hydrographic Office, are a menace to navigation and exploration and should not be distributed; and
"Whereas the taxpayers of this country should not be compelled to pay for maps with erroneous chartings; and
"Whereas these maps issued by the Navy Department are the authority on which the geography of the Arctic regions is taught in our schools, as they bear the official stamp of the Govermnent: Therefore be it *Resolved, etc.*, That the Secretary of the Navy report to Congress the reason why the distribution of these erroneous maps is not discontinued and why corrected maps of the Arctic regions are not issued by the Navy Department.

"The report of the nonexistence of Crocker Land sent back to civilization by the members of an expedition outfitted for the express purpose of exploring that land has aroused considerable interest in the subject of Arctic geography. This alleged Crocker Land was the reputed discovery of Civil Engineer Robert E. Peary, who claimed to have first seen it in 1906.

"In view of the inconsiderate disappearance of this mythical land, a brief consideration of Mr. Peary's various discoveries may prove both interesting and timely.

"The Navy Department (Hydrographic Office) publishes two large maps, Nos. 2142 and 2560, which contain false statements; i.e., they chart waterways where none exist and lands where only sea is found. These maps are issued to mariners of all nations; they are also the authority upon which geography is taught in our schools throughout the land, as they bear the official stamp of the Government; therefore they should be corrected.

"The erroneous charting complained of is due to the reports made by Engineer Robert E. Peary, who has reported to his own credit the following alleged "discoveries" as the results of his various Arctic expeditions:—

"1. The discovery of Peary Channel, a cross-country waterway dividing the extreme northern portion of Greenland.
"2. The discovery of East Greenland Sea, a supposed sea northeast of Greenland.
"3. The establishment of the insularity of Greenland.
"4. The discovery of Jesup Land.
"5. The discovery of Crocker Land.
"6. The discovery of the North Pole.

"Let us analyze briefly these alleged discoveries, the subjects of which Mr. Peary has caused to be placed on the maps of the Arctic regions.

"First. The Peary Channel: This "channel" Mr. Peary describes at length in his book, Northward Over the Great Ice, and shows it on all the maps used in his own books. The "channel" has been named in honor of Mr. Peary as its discoverer. (See maps Nos. 2142 and 2560 referred to above.)

"The Danish explorer, Ejnar Mikkelsen, in his book, Lost in the Arctic, published in New York in 1913, which is an English translation of the official report of the Government expedition of Denmark, quotes the following report, signed by L. Mylius Erichsen, leader of Denmark's expedition to the northeast coast of Greenland, 1906—1908:

"We drove westward with 23 dogs until the 1st of June (1907), reaching Peary's Cape Glacier, and discovered that the Peary Channel does not exist, Navy Cliff being connected by land with Heilprin Land. We rechristened Independence Bay, calling it Independence Fjord.

"The above report was confirmed by Mikkelsen (pp. 192—193 of Lost in the Arctic), Brönlund, and Høeg Hagen, and is also verified by Knud Rasmussen. Three independent expeditions have established the fact beyond dispute that Peary Channel does not exist. Why does the Navy Department issue maps with false statements thereon? Why must taxpayers pay for falsely plotted maps?

"2. East Greenland Sea: Erichsen's expedition established the existence—verified by the expeditions of Rasmussen and Mikkelsen—of land occupying the longitudinal space from the point called "Academy Glacier" at 34° west longitude eastward to 12° west longitude, which space Peary had mapped as "East Greenland Sea". The various portions of this land Erichsen's expedition has christened "Kronprinz's Christians Land", "Erik S. Henius Land", and so forth. Therefore East Greenland Sea can no longer stand to Mr. Peary's credit, since it does not exist. Yet this East Greenland Sea is shown on all of Peary's maps. (See his book Nearest the Pole.)

"3. The establishment of the insularity of Greenland: As Mr. Peary did not explore the extreme northeastern portion of Greenland, as is proven by the fact that he stated a sea existed where is only high land, and that the waters of a broad channel flowed where is also dry land, he must leave the honor of proving the insularity of Greenland to the later and more thorough Danish explorers, Erichsen, Mikkelsen, Rasmussen, and the members of their expeditions. The reports of these expeditions have been officially accepted and published by the Danes, and are accepted throughout the world by explorers, scientists, and geographers."

Mr. HELGESEN then proceeds to mention Jesup Land and Crocker Land, and concludes his speech as follows (p. 5279):

"Mr. Peary has been quoted as saying that an explorer's achievements should be rated by his previous experience, his morality, his mental and physical ability.

"Rated by this standard, which Mr. Peary has himself established, what is the natural and logical deduction relative to his various "discoveries"?

"Granted that Mr. Peary has had many years of Arctic experience; granted, for the sake of argument, that his moral character may be above reproach; admitting that his mental faculties are keen, is it not a fact that an abnormal condition of physical sight which causes a man to behold an open sea where is really high land; to imagine a broad channel of swiftly flowing water which is actually land connecting two other portions of land; to discern the lofty pinnacles of an unexplored "continent" at two different times and from two different places, thus eliminating the "mirage" theory, which "continent" is now conclusively proved to be an unbroken expanse of Arctic pack ice; I repeat, must we not concede that a man who is unable to distinguish land from ice or swiftly flowing water from land is unquestionably in error in his supposition that he had stood at that point on the earth's surface where in every direction he looked south, when his mental condition was such as to lead him to the self-delusion that he could make a round trip of 1,000 miles by estimate alone over the Arctic ice without knowing in what direction his compass needle pointed?"

On March 4th, 1915, two members of the House of Representatives extended remarks upon PEARY's work, thus Hon. SIMEON D. FESS, of

Ohio, under the heading "The North Pole Aftermath" (pp. 6273—6279), and Hon. THADDEUS H. CARAWAY, of Arkansas, "The Attack on Dr. Frederick A. Cook" (pp. 6279—6286). Mr. CARAWAY begins his speech as follows:

"Mr. Speaker, under the leave granted me to extend my remarks, I wish to have inserted in the Record the hearings before the Committee on Education, of which the gentleman from Georgia, Hon. DUDLEY M. HUGHES, is chairman. These hearings were held on the 26th day of January, this year, and contained statements, if true, that disclose a most heinous attack upon the reputation af a gentleman whom I have been convinced has been much maligned, Dr. Frederick A. Cook.

"It further discloses, if true, a bit of inside magazine making the public should know. In view of statements made in behalf of each claimant to the honor of having discovered the North Pole and the lack of opportunity to present his proof upon the part of Dr. Frederick A. Cook, and a total lack of evidence offered in behalf of Admiral Peary, and in the interest of history this question should be reopened and thoroughly investigated, and with that desire I place in the RECORD the hearings before the above committee.

....."

The hearings are reproduced on pp. 6281—82. I shall quote the following passages which have reference to Greenland.

P. 6281 Mr. BROWN remarks as follows about the Peary Channel:

"... There are some people who have worked for years at their own expence. A few have published books and pamphlets which they have given away, and have paid their own postage on their own publications. When Admiral Peary returned from his trip to the west of Grant Land, up there (indicating on map) it was of such interest that the Government got out this beautiful map at once. His addition to our knowledge of the Arctic regions by that particular trip was not very great, but this beautiful map was gotten up, from which I read:

""North American polar regions, Baffin Bay to Lincoln Sea, showing the recent discoveries of Civil Engineer R. E. Peary, United States Navy, incorporated with the earlier surveys and examinations made by the U. S. S. Polaris Expedition in 1871—72 under Capt. C. F. Hall; British Arctic Expedition in 1875—76 under Capt. G. S. Nares, Royal Navy; Lady Franklin Bay Expedition in 1881—1884 under Lieut. A. W. Greely, United States Army."

"This beautiful map was gotten up to perpetuate and bring out his contribution to our knowledge at that time. Admiral Peary got a hearing before Congress in 1911 and received a very good acknowledgement of his work. Now, since this map has been published, within the last year or two, facts have shown the non-existence of Peary Channel. It appears upon this map, which was evidently published in 1903.

"The CHAIRMAN. By what authority was that map printed?

"Mr. BROWN. It was published—I read from the map:

""By the United States Department of the Navy, Bureau of Navigation, published at Washington, D. C., October, 1903, at the Hydrographic Office. W. H. H. Southerland, commander United States Navy, Hydrographer."

"Mr. TOWNER. Upon what data was that made?

"Mr. BROWN. It says:

""Showing the recent discoveries by Civil Engineer R. E. Peary, United States

Navy, incorporated with the earlier surveys and examinations made by the U. S. S. *Polaris* Expedition in 1891—92[1]) under Capt. C. F. Hall; British Arctic Expedition in 1875—76 under Capt. G. S. Nares, Royal Navy; Lady Franklin Bay Expedition in 1881—1884 under Lieut. A. W. Greely, United States Army."

"The Greely Expedition was a United States enterprise and the expenses were paid by the United States Government. The expenses of the British Arctic Expedition were paid by the Government of Great Britain. The expenses of the Hall Expedition I am not sure about. I do not know whether the expenses were paid by the Government or by some private collections. I do not like to say. I can not tell. I do not know.

"Mr. TOWNER. Upon what data was that map drawn? Who gave the facts to the department upon which the map was based?

"Mr. BROWN. The data is recited in this statement, and I suppose they got it there. It says:

"Showing the recent discoveries by Civil Engineer R. E. Peary, United States Navy, incorporated with the earlier surveys and examinations made by the U. S. S. *Polaris* in 1891—92 under Capt. C. F. Hall; British Arctic Expedition in 1875—76 under Capt. G. S. Nares, Royal Navy; Lady Franklin Bay Expedition in 1881—84 under Lieut. A. W. Greely, United States Army."

"The reports of those four expeditions. Now, this feature here that has recently been completed—

"Mr. TOWNER (interposing). I do not quite understand what you mean when you say upon the report of those four expeditions. Was there an official report made to the Government upon which this map was drawn, by Capt. Peary?

"Mr. BROWN. His addition was geographical only. His expedition was a private enterprise.

"Mr. TOWNER. Did he make any official report to the Government?

"Mr. BROWN. His expedition was a private enterprise. The United States Navy published this map and they used his material.

"Mr. TOWNER. Do you mean to say that Capt. Peary made no official report to the Government?

"Mr. BROWN. At this time, 1903, his expedition was a private enterprise.

"Mr. TOWNER. Do you know whether or not he made any report to the Government on which that map was based.

"Mr. BROWN. He made a report to the world at large.

"Mr. TOWNER. Everybody knows that.

"Mr. RUPLEY. You will find in the report of the committee on the confirmation of Capt. Peary that they required him, by holding up his confirmation for some considerable time, to make a full report of his expedition.

"Mr. BROWN. In what year?

"Mr. RUPLEY. I do not know.

"Senator POINDEXTER. In 1910.

"Mr. TOWNER. He did make an official report to the Government?

"Mr. BROWN. This map was printed in 1903.

"Mr. RUPLEY. The committee on confirmation required him to make a report before confirmation.

"Mr. BROWN. My belief is that they never asked him for an official report, but I would not like to say about that.

"Mr. RUPLEY. But upon what data or facts was this map made?

"Mr. BROWN. His additions to it were copied from something he had published

[1]) 1871—72.

previously, as a private speculation. It is my belief that the Government never did ask for an official report, until this last expedition. That is my belief.

"The CHAIRMAN. Is there anything further which you desire to say?

"Mr. BROWN. I think I have covered the question which Mr. Smith asked me to answer.

"Mr. RUPLEY. You were speaking of some land?

"Mr. BROWN. I was speaking of Peary Channel up here (indicating).

"Mr. TOWNER. You said there were two explorers who doubted the existence of the channel?

"Mr. BROWN. The Dane, Rasmussen; and Mikkelsen, I think a Swede or a Norwegian.

"(Some newspaper clippings are inserted here, as follows):—

"BRASHEAR DESERTS COOK—INTRODUCED HIM ONCE AT PITTSBURGH—HAS LOST ALL FAITH.

(Special to the New York Times.)

PITTSBURGH, *Dec.* 10

"I have lost all faith in Dr. Cook." This statement was made to-day by Dr. John A. Brashear, the Pittsburgh astronomer and scientist, who is a member of the National Geographical Society; when Dr. Cook was in Pittsburgh and lectured, Dr. Brashear introduced him to the audience in Duquesne Garden, and indorsed his claims.

"In the statements made by Capt. Loose and George Dunkle, those two men not only make themselves out falsifiers, but cast doubts on Dr. Cook's veracity. If the midnight-sun observations made by Dr. Cook were made at all, they were made at 81 degrees and some minutes of latitude and not at the place he said they were made."

(From the New York Press. May 7, 1913.)

"RASMUSSEN SUCCEEDS—EXPLORER AFTER THREE YEARS RETURNS FROM GREENLAND—FOUND LAND FREE FROM ICE.

COPENHAGEN, *May* 6.

"A message from Thorshavn, Faroe Islands, announces the success of Knud Rasmussen's Greenland expedition, which returned there yesterday after a three years' absence. In Peary Land the Danish explorer found large numbers of seal and musk oxen, which provided ample supplies; where the Peary Channel was supposed to be he found a large tract of land free from ice. Game was abundant and the party halted for a month before starting on the return journey, over 600 miles covered at an average rate of 31 miles a day. Rasmussen depended entirely on his Eskimo outfit, and took with him no tinned provisions.

(From the Knickerbocker Press, May 7, 1913.)

"PEARY "CHANNEL" DRY LAND, RASMUSSEN SAYS—DANISH EXPLORER CAMPS FOR A MONTH WHERE MAPS SHOW ARM OF ARCTIC SEA.

(By special cable.)

COPENHAGEN, *May* 6.

"Capt. Rasmussen, a Danish explorer, who has just reached the Faroe Islands, after a trip through Greenland, reports that he has discovered that the supposed Peary Channel is actually land. He followed the coast line to Independence Bay, which narrows to the form of the so-called Peary Channel, but on arriving at the latter point he found a large ice-free tract of land with plenty of game. The party

halted there for a month. They experienced continuous storms, but the excellent hunting compensated for this discomfort. Afterwards they continued their journey westward at the rate of 31 miles a day until they reached the destination of the expedition. They did not carry any provisions but depended entirely on the outfit of the Eskimos.

"Mr. TOWNER. They are Arctic explorers?

"Mr. BROWN. Yes, sir; the MacMillan expedition is up in the Arctic now, and a report has come back from his expedition that Crocker Land does not exist.

"Mr. TOWNER. That is a contradiction of Admiral Peary's statement regarding it?

"Mr. BROWN. Yes, sir; it is a contradiction.

"Mr. SMITH. As to the existence of Peary's Channel, and also the existence of Crocker Land?

"Mr. BROWN. The nonexistence of Peary's Channel has been determined by the Swede, Mikkelsen, and the Dane, Rasmussen; and the nonexistence of Crocker Land has been reported—of course, the men are not yet back—reported through a member of the MacMillan expedition, sent out by the McGill University of Canada, I think it is, and the American Museum of Natural History in New York City.

....."

At the beginning of 1916 Mr. HELGESEN reverted to the question as to the Government maps of Arctic regions. He says as follows (Speech of Hon. Henry T. Helgesen of North Dakota in the House of Representatives, January 13, 1916.—Washington 1916, pp. 1—31):

"Mr. Chairman, my subject is one in which all civilized nations of the world are interested, namely, exploration, discovery, the study of the physical features of the globe upon which we live, and the accurate presentation of the results of such explorations, discoveries, and study on our Government maps and charts.

"Scientists, historians, geographers, and educators assure me that they are deeply interested in a movement which will result in official national action on this subject of accurate Government maps, charts, and historical and geographic statistics. This is a matter of vital interest, especially to our educators, who represent the millions of children in our schools, as our Government maps and charts are quoted as the highest authority by map makers; it is of interest to historians, for the reason that their records should present truths and not fables. It is a matter of concern to the navigators of the world, not only those who hold the precious lives of travelers in their charge, but those who sail the seas in the interests of commerce, as one and all are dependent on the accuracy of the maps and charts supplied them.

"Our Government should therefore use every resource at its command and every means in its power to make our own official maps and charts as accurate as is humanly possible.

"With this end in view, I shall discuss briefly a few of the discoveries and reported discoveries north of the Arctic Circle.

"Mr. Chairman, in the last session of Congress I introduced a resolution in this House asking for the correction of our Government maps and charts of the Arctic regions. That resolution read as follows:—

"Whereas the maps of the Arctic regions issued by the United States Navy Department erroneously show waterways that do not exist and lands that are really deep sea, while lands that do exist are omitted altogether; and

"Whereas such false chartings on the United States maps, especially those numbered 2142 and 2560 issued by the Hydrographic Office, are a menace to navigation and exploration, and should not be distributed; and

"Whereas the taxpayers of this country should not be compelled to pay for maps with erroneous chartings; and

"Whereas these maps issued by the Navy Department are the authority on which the geography of the Arctic regions is taught in our schools, as they bear the official stamp of the Government: Therefore be it *Resolved etc.*, That the Secretary of the Navy report to Congress the reason why the distribution of these erroneous maps is not discontinued and why corrected maps of the Arctic regions are not issued by the Navy Department.

"This resolution was introduced by me on February 25, 1915. As the Congress adjourned on March 4, 1915, the remainder of the last session was too short to permit of action on a matter of such far-reaching import as that embodied in the resolution. I therefore took the subject in hand with the interested departments of our Government, namely, the Navy Department and the Coast and Geodetic Survey, with the result that I am informed by the Secretary of the Navy, the Hon. Josephus Daniels, in correspondence which I shall quote later, that Hydrographic Office (Navy Department) chart No. 2142 has been officially canceled and withdrawn from issue, and that Hydrographic Office (Navy Department) chart Nr. 2560 is in the hands of the engravers for necessary corrections.

"To illustrate the importance of this action by the Navy Department and to demonstrate the fact that this cancellation and these corrections are not matters of small moment, but practically revolutionize the history of modern exploration and discovery, as depicted on our maps and charts, I shall explain more fully the two charts mentioned in my resolution of February 25, 1915:

"Chart No. 2142 bears the tittle, "North America Polar Regions, Baffin Bay to Lincoln Sea, showing the recent discoveries by Civil Engineer R. E. Peary, United States Navy," and so forth.

"A prominent feature of this chart is a broad channel extending from Nordenskiöld Inlet on the northwest coast of Greenland to a point called Independence Bay, depicted on this chart as opening into a body of water called East Greenland Sea, at about 32° west longitude. This channel is represented on the chart as separating the northern portion of Greenland from the mainland, and is shown on the chart as Peary Channel.

"This Peary Channel and East Greenland Sea are among the earliest of Mr. Peary's claimed discoveries; and are rated among the most important of modern explorations, as by the discovery of the "channel" Peary claimed to have established the insularity of Greenland.

"The alleged discovery of this channel was made by Peary on his Arctic expedition of 1891—92. With one companion, Eivind Astrup (since deceased), Peary traveled eastward across the Greenland ice cap to the point he called "Navy Cliff". In his book, "Northward over the Great Ice," pages 334, 335, 336, Peary says:

"Our observation point was a giant cliff, almost vertical, overlooking the bay, and a great glacier that entered the bay on our right. Some 15 miles northeast of where we stood the cliffs ended in a bold cape, which I named Glacier Cape. Dark clouds seen over and beyond the ice cap seemed to indicate that the shore line trended rapidly away to the east or southeast. Looking to the west we saw the opening of the fiord that had barred our northern advance. It was this fiord whose western entrance we had descried afar off days before. Now we know that we had paralleled its course across the northern end of the mainland from Robeson Channel clear to the Arctic Ocean off the shores of northeast Greenland.... It was evident that this channel (Peary Channel) marked the northern boundary of the mainland of Greenland.

"As Peary stated that this channel "marked the northern boundary of the mainland of Greenland", it was supposed to prove the insularity of Greenland, although this question had been practically decided 10 years earlier by Lockwood and Brainard of the Lady Franklin Bay expedition under Gen. Greely in their explorations of the true northern coast of Greenland.

"For 20 years Mr. Peary posed as the discoverer of the Peary Channel, the discoverer of the East Greenland Sea, and the discoverer of the insularity of Greenland.

"But in 1906—1908 an expedition was organized and equipped by the Danish Government to explore the unknown portion of the east coast of Greenland. This expedition was led by L. Mylius-Erichsen, a successful and daring explorer, who in 1902—1904 led the Danish Literary Greenland Expedition. Erichsen planned to explore the east coast of Greenland as far north as Independence Bay and then follow Peary Channel through to the west coast. While the main scientific objects of the expedition were attained, Mylius-Erichsen, First Lieutenant Niels Peter Hoeg-Hagen, and Jorgen Brönlund lost their lives on the northern sledge trip. The body of Brönlund was found by other members of the expedition before their return to Denmark, and Brönlund's diary told of the death of his companions several days earlier, but although careful search was made no trace of the bodies of Mylius-Erichsen and Hoeg-Hagen was found at that time. In 1909, however, an expedition was sent out by the Danish Government to search for the bodies of Mylius-Erichsen and Hoeg-Hagen, as well as their diaries, observation books, and other records. This expedition was led by Capt. Ejnar Mikkelsen, who returned to Denmark in 1912 with the records of the ill-fated party. A summary of Mikkelsen's report is embodied in volume 41 of Meddelelser om Grønland, 1913, which also contains the Report on the Denmark Expedition to the Northeast Coast of Greenland, 1906—1908, under Mylius-Erichsen. I quote from pages 472—474:

"The second report (of Mylius-Erichsen) was found on the summer camp and read as follows:

"We drove westward with 23 dogs until the 1st of June, and reached Peary's Cape Glacier; discovered that the Peary Channel *does not exist;* Navy Cliff is connected by fast land with Heilprin Land. We renamed Independence Bay Independence Fjord and built a cairn (with report) on a low point near Cape Glacier.

"August 8, 1907." (Signed) MYLIUS-ERICHSEN.

"It will be seen from the foregoing that the honor of discovering that the Peary Channel does not exist belongs to Mylius-Erichsen, and that the honor of making the discovery known to the world falls to Ejnar Mikkelsen.

"The nonexistence of Peary Channel was not all that was learned of Peary's explorations by the Denmark expedition. On page 214 of the above-mentioned volume we read:

"To understand why Mylius-Erichsen first took Danmarks Fjord and then Hagens Fjord to be Independence Bay, it must be remembered that on all his charts from these regions around here Peary states that from Academy Glacier the coast bends almost in the direction southeast, whereas according to what has been found out by the Danish expedition, it turns on the contrary almost in the direction northeast. This mistake on Peary's part thus became of extremely fateful importance to Mylius-Erichsen and his companions. For it was owing to this long journey into Danmarks Fjord and Hagens Fjord that their retreat was begun too late and had to be given up on account of the comparatively sudden melting of the snow. And we know that their enforced summer in the north led to their death.

"As stated in the above-quoted paragraph, chart No. 2142, based on Peary's reports, shows the coast of Greenland bending away sharply to the southeast. To my mind, the fact that three explorers had lost their lives owing to the incorrectness of this chart, was more than sufficient reason for its cancellation.

"But, some one may object, we have only the uncorroborated word of these men against Mr. Peary's, that the Peary Channel does not exist, and that the charting of the east coast of Greenland was not correctly given by him. Let me quote from the International Yearbook for 1913, published by Dodd, Mead & Co., of New York:

"An important advance in the exploration of the vast interior of Greenland had been made by three traverses of the inland ice sheet, Knud Rasmussen, with the Dane, Freuchen, and two Eskimos of Smith Sound, started on April 6, 1912, across the inland ice from Inglefield Gulf, West Greenland, to Danmark Fjord and Independence Bay on the east coast..... Just to the north of Peary's Navy Cliff, the party looked in vain for

the Peary Channel, which was supposed to form the northern boundary of Greenland. Instead of the channel they found an ice-free upland, abounding in game.

"The nonexistence of Peary Channel from sea to sea has been proven, for the ill-fated Mylius-Erichsen discovered this fact, which was later verified by Rasmussen.

"The indisputable proof of the nonexistence of the Peary Channel automatically deprives Mr. Peary of the honor of two other of his claimed discoveries, namely, the insularity of Greenland and the East Greenland Sea. As Greenland is not bounded on the north by Peary Channel, the claimed discovery of a channel which does not exist could not prove the insularity of Greenland, which had already been satisfactorily determined by the explorations of the members of the Greely expedition in 1882.

"The discovery of the East Greenland Sea by Mr. Peary was another claimed result of his 1891—92 expedition. The area extending from about 82°10′ north latitude and 31° west longitude to about 12° west longitude was mapped by Mr. Peary as the East Greenland Sea. This area was discovered by Lieut. J. P. Koch, of the Mylius-Erichsen expedition, to be dry land. Koch's discovery was confirmed by the later expeditions of Mikkelsen and Rasmussen, and the territory named by Mr. Peary "East Greenland Sea" is shown on the latest map published by the National Geographical Society as "Amdrup Land", "Erichsen Land", and so forth."

Mr. HELGESEN then discusses PEARY's "Jesup Land". The following remarks have reference to Greenland (p. 10):

"Let us now examine Hydrographic Office chart Nr. 2560, mentioned in my resolution of February 25, 1915, as one of the charts requiring cancellation or correction. On this chart, corrected to January 22, 1915, we find "Jesup Land" changed to "Axel Heiberg Land" and moved to its proper position. We also find the "East Greenland Sea" occupied by "Amdrup Land" and "Erichsen Land", while the northeastern boundary of Greenland has been moved eastward some 20 degrees of longitude, but the fictitious "Peary Channel" is still shown on chart Nr. 2560 as the northern boundary of the mainland of Greenland."

After a mention of the "Crocker Land" and Peary's soundings made on his journey towards the North Pole, inserted on the Hydrographic Office chart No. 2560, Mr. HELGESEN reverts to questions with reference to Greenland and says as follows (pp. 22—25):

"The assertion is sometimes made that any denial of the authenticity of Mr. Peary's claims is an attempt to pervert history. Mr. Chairman, it is this very perversion of history that I desire to prevent. Is it a perversion of history to deny Peary's claims when they are repudiated and canceled not only by the laymen but by the expert scientists of those two departments, namely, the Navy Department and the Coast and Geodetic Survey? The Coast and Geodetic Survey and the Navy Department (Hydrographic Office) have repudiated and canceled Mr. Peary's "Peary Channel", thereby denying his claim also to the discovery of the insularity of Greenland. The Coast and Geodetic Survey and the Navy Department (Hydrographic Office) have repudiated and canceled Mr. Peary's "East Greenland Sea", where high land has been found to exist. The Coast and Geodetic Survey and the Navy Department (Hydrographic Office) have repudiated and canceled Mr. Peary's claimed discovery of "Crocker Land", which has been found to be only a broad expanse of the Polar Sea. The Coast and Geodetic Survey and the Navy Department (Hydro-

graphic Office) have repudiated Mr. Peray's claimed discovery of "Jesup Land", and on our charts have placed "Axel Heiberg Land" in its stead, which land is shown where it actually exists, and not where the fictitious "Jesup Land" was placed by Mr. Peary.

"My resolution requesting the correction of our Government charts and maps of the Arctic region led to careful investigations by the Coast and Geodetic Survey and the Navy Department, which investigations have resulted in the cancellation of Hydrographic Office chart No. 2142 and the correction of Hydrographic Office chart No. 2560, as witness correspondence between Secretary of the Navy Daniels and myself, from which I shall quote.

"The first letter from the Hydrographic Office read in part, as follows:—

MARCH 29, 1915.

MY DEAR MR. HELGESEN: I have received a copy of House joint resolution 431, introduced in the House by you on the 25th ultimo, relative to certain charts issued by this office, with particular reference to Hydrographic Office charts Nos. 2142 and 2560, and I note that you find objections to the same in that they are supposed not to be correct.

"If you will kindly inform me what faults you find or objections you have to the two charts above mentioned, and any other charts, I assure you the information will be carefully considered and every weight given it

"Very sincerely, "THOS. WASHINGTON,
Captain, United States Navy, Hydrographer.

"I replied to this letter, giving my objections to charts Nos. 2560 and 2142, as I have stated them in this speech, together with other information too voluminous to quote now, and on April 28, 1915, I received a letter from the Secretary of the Navy, which reads:

APRIL 28, 1915.

"MY DEAR MR. HELGESEN: I have the honor to acknowledge the receipt of your letter No. 216 of the 14th instant, addressed to the hydrographer, and certain information relative to Hydrographic Office charts Nos. 2142 and 2560 covering portions of the Arctic regons.

"Relative to Hydrographic Office chart No. 2142 I have to state that * * * the chart has been withdrawn from issue and canceled.

"The department will be pleased to receive any information you may be able to give it in connection with the contemplated revision of the polar charts.

"Sincerely, yours, "JOSEPHUS DANIELS.

"After further correspondence relative to Hydrographic Office chart No. 2560, Secretary Daniels wrote me under date of September 17, 1915, a letter from which I quote:

SEPTEMBER 17, 1915.

"MY DEAR MR. HELGESEN: I have the honor to acknowledge the receipt of your communication of the 1st instant.

"In further reference to the removal of Crocker Land from Hydrographic Office chart No. 2560, I have to state that the plate of that chart has been taken in hand, with the purpose of removing Crocker Land and also for the removal of Peary Channel, which the expedition of Mylius Erichsen found not to exist, together with any other features which further search of records may show should need to be amended.

"Sincerely, yours, "JOSEPHUS DANIELS.

"The above correspondence shows that the Navy Department has repudiated the Peary "discoveries", as already mentioned by me.

"The Coast and Geodetic Survey in 1911 published a volume entitled "Arctic Tides", which mentions the Peary Channel and Crocker Land. My resolution led to correspondence with the Coast and Geodetic Survey, which department, after due and careful investigation, has issued a "corrective slip", which is inserted in every copy of the publication, which "corrective slip" reads as follows:

CORRECTIVE NOTES TO ARCTIC TIDES.

"Recent explorations have shown that Peary Channel mentioned upon page 95 and shown upon the chart of cotidal lines as separating the extreme northern portion of Greenland from Greenland proper, does not exist; also that Crocker Land, mentioned upon pages 92 and 95, if existent, does not lie in the position indicated upon this chart.

"And now the Coast and Geodetic Survey has officially repudiated all possibility of determination or verification of the fictitious line of soundings claimed to have been made by Peary on his expedition whereby he asserts that he reached the North Pole, and by such official repudiation the Coast and Geodetic Survey had officially destroyed Peary's last and only basis for his claim to the attainment of the North Pole.

"I again quote from the letter of December 18, 1915, written by the Superintendent of the Coast and Geodetic Survey to me:

"This bureau has never at any time received any data from any member of the Peary expedition of 1908—1909 which would enable a determination or verification of the geographical position of the soundings referred to in the profile of soundings furnished by Mr. Peary as a result of his 1908—1909 expedition to be made.

"The geographical positions of these soundings therefore can not be verified by the survey, and each and every one of them can be accepted only as submitted

"E. LESTER JONES,
"Superintendant Coast and Geodetic Survey.

"Can such a repuaditive decision made by the scientists of the Coast and Geodetic Survey, that department of our Government under whose orders Mr. Peary served on his last expedition—a repudiative decision reached only after careful study and thorough consideration of all the available data—be termed a perversion of history? Rather would it be a perversion of history, a perversion of geography, a perversion of science, were these fictitious results of false claims of discovery and achievement allowed to remain unchallenged on our Government maps and charts.

"That this action of the Navy Department and of the Coast and Geodetic Survey, resultant of my resolution of February 25, 1915, has been accepted as conclusive by the largest firm of map and atlas publishers in this country is evidenced by the following letter received by me from Rand, McNally & Co., of New York, Chicago, and London, England:

"Mr. H. T. HELGESEN, CHICAGO, *December* 13, 1915.

"DEAR SIR: Your favor of the 5th is received, and we are pleased to inform you that our new series of maps—the Goode map—will, we believe, meet your requirements in the line of accuracy in every detail.

"The map of the world in this series, which recently came from the press, does not show the fictitious "Crocker Land", nor the fictitious "Peary Channel". We believe that as far as authenticity is concerned these maps far surpass any series of maps on the market to-day.

"Appreciating the kindly spirit of your information, and assuring you that we are glad at all times to receive data for the purposes of maintaining accuracy in our maps, we are,

"Very truly, yours, RAND, MCNALLY & CO.

"We have therefore the word of this leading firm of atlas and map publishers that the maps which omit "Crocker Land" and the "Peary Channel" are the most authentic of any maps on the market at this time.

....."

P. 26. Mr. HELGESEN deals with the names on the maps, among others Peary Land. He concludes his speech as follows (pp. 30—31):

"Hydrographic Office chart No. 2142, which I asserted should be canceled, has been canceled and withdrawn from circulation. Hydrographic Office chart No. 2560, which I insisted should be corrected, is now being corrected in line with the suggestions made by me. And, Mr. Chairman, these cancellations and corrections have not been made as the result of snap judgment or hasty or ill-considered action, but only after careful study of the facts and data which I presented.

"In conclusion, Mr. Chairman, I shall state that the Government, through the Hydrographic Office (Navy Department), should at once publish a new and

accurate chart of the Arctic regions, in order that the authenticated discoveries of an American Government expedition, under the leadership of an honored officer and veteran of our Army, Maj. Gen. A. W. Greely, may be perpetuated; and that the map makers and scientists of the world may know that the fictitious "discoveries" of Robert E. Peary, heretofore shown on our maps, have been repudiated and canceled by the sworn officers and scientists of our Navy Department and of our Coast and Geodetic Survey, with the end in view that scientific truth shall prevail and that history shall not be perverted."

It will be seen that in the interval between his two speeches, on February 25th, 1915, and on January 13th, 1916, Mr. HELGESEN had succeeded in his efforts to have the Hydrographic Office (Navy Department) chart No. 2142 cancelled and withdrawn.

Let us consider for a moment this chart. Its full title reads as follows: "North America, Polar Regions, Baffin Bay to Lincoln Sea. Showing the recent discoveries by Civil Engineer R. E. Peary, U. S. N., incorporated with the earlier surveys and examinations made by the U. S. S. Polaris Expedition, in 1871—2, under Captain C. F. Hall, British Arctic Expedition, in 1875—6, under Captain G. S. Nares, R. N., Lady Franklin Bay Expedition, in 1881—4, under Lieutenant A. W. Greely, U. S. A. Soundings in fathoms. Heights in feet." Below the title is a picture showing "Peary's Cairn on C. Morris Jesup 83°30′ N. lat. Probably the most northern land on the Globe." The drawing shows some dogs and two men (Henson and an Eskimo) supporting an American flag planted at the top of the cairn. At the top of the map there is a panorama showing the north coast of Peary Land from Kap Bridgman to Kap Washington and entitled "View of the north coast of Greenland from point A (Lat. 83°50′ N.) looking south (true), May 16, 1900." A point some distance north of Grant Land bears the inscription: "Peary, April 21, 1902, Lat. 84°17′, Var. 99½ W.", and north of Kap Morris Jesup, the extreme northern point of Greenland, a point marked "Peary, May 16, 1900, Lat. 83°50′, Var. 61½ W.". From the latter point dotted lines extend to Kap Washington and Kap Bridgman, indicating the part of the coast shown on the above-mentioned landscape sketch. Finally, a point on Wyckoff Ø is marked "Peary, May 22, 1900". At the bottom the chart bears the following text:

U. S. Department of the Navy, Bureau of Equipment
Published at Washington, D. C., Oct., 1903.
AT THE HYDROGRAPHIC OFFICE
W. H. H. Southerland, Commander, U. S. N. Hydrographer.
Drawn by E. F. B.
No. 2142.

It will be seen that on this official map not only has the greatest regard been taken to PEARY's mapping up to 1903, but the map is in

a way an acknowledgement of his work. It is strange, however, to compare this map with the map published by PEARY almost at the same time (one month later) in London (Geogr. Journ. Vol. 22, 1903, Map, p. 724). This map agrees in all essentials with PEARY's earlier maps (though it is carried up to date, e.g. the results of the SVERDRUP Expedition are inserted). The inland ice from Humboldt Gl. to the Peary Channel is marked in accordance with PEARY's assumptions, but not in agreement with the Hydrographic Office chart No. 2142 of October, 1903. Comparing it with the present maps of the region it will be seen that PEARY's map of November, 1903, as regards the ice-free areas and the edge of the inland ice in North Greenland is in closer agreement with the actual conditions than is the official map of October, 1903.

Hydrographic Office chart No. 2142[1]), which at Mr. HELGESEN's instance in 1915—16 was cancelled and withdrawn, must be supposed to have been constructed after a careful study of the earlier expedition reports and maps, but in many cases it is based on mere suppositions and free-hand drawing. The well-known tendency: to indicate the edge of the inland ice as near the shore as possible when nothing is known about its position, was followed almost everywhere, especially on Washington Land and Nyeboes Land, though it did not agree with GREELY's, LOCKWOOD's, and PEARY's suppositions, and no regard was paid to the picture of the interior of Sherard Osborn Fjord supposed by PEARY and maintained by him up to November, 1903.

PEARY never replied to the attacks made on him on account of the non-existence of the Peary Channel as reported by the three aforementioned Danish expeditions. However, according to verbal information from Mrs. PEARY to me in 1923, the treatment of Chart No. 2142 and of PEARY's results as a whole after the return of the three Danish expeditions embittered the last years of PEARY's life.

[1]) The map was carefully copied and published as part of the Danish official map of Greenland in four sheets (1906). On this map the land north of the Peary Channel—according to verbal information to me by Colonel J. P. KOCH—was named Peary Land, which name had been given by the "Commissionen for Ledelsen af de geologiske og geografiske Undersøgelser i Grønland".

THE SECOND THULE EXPEDITION 1916–1918

Leader: KNUD RASMUSSEN.

Cf. Pls. 5 and 10.

Literature.

1) KOCH, LAUGE: Note to Maps of Melville Bay from Wilcox Point to Cape York and of North Greenland from 81°—83°35′ N., 38°—56° W. Medd. om Grønl. Bd. LXIV, Nr. 2, pp. 77—85. Technical Remarks by P. A. Heiberg-Jürgensen, pp. 85—88. With 2 maps. **1922.**

2) — Contributions to the Glaciology of North Greenland. Medd. om Grønl. Bd. LXV, Nr. 15, pp. 181—464. With 6 pls. and 140 figs. **1928.**

3) — Map of North Greenland (18 sheets). Scale 1 : 300.000. Surveyed by LAUGE KOCH in the years 1917—23. Published by the Geodetic Institute of Denmark. **1932.**

4) RASMUSSEN, KNUD: Den II. Thule-Ekspedition til Nord-Grønland. Geogr. Tidsskr. Bd. 23, Hft. V, pp. 198—200, 1 fig. **1916.**

5) — Den II. Thule-Ekspedition til Grønlands Nordkyst 1916—18. Naturens Verden, Aug. **1918**, Hft. 8, pp. 337—356. With 10 figs.

6) — Grønland langs Polhavet. Pp. 1—596. With several maps and illustrations. København. **1919.**

7) — Greenland by the Polar Sea. Pp. i—xxiii + 1—327. With numerous illustrations in black and white, eight colour plates, and maps. London **1921.**

8) RASMUSSEN, KNUD og LAUGE KOCH: Den II. Thule-Ekspedition til Melville-Bugten og Grønlands Nordkyst 1916—1918. Geogr. Tidsskr. Bd. 24, Hft. VI, pp. 215—232. With 2 maps. **1918.**

9) RASMUSSEN, KNUD: Report of the II. Thule-Expedition for the Exploration of Greenland from Melville Bay to De Long Fjord, 1916—1918. Medd. om Grønl. Bd. LXV, Nr. 14, pp. 1—180. With 1 map and several figs. Copenhagen. **1927.**

The Original Plan of the Expedition.

It was KNUD RASMUSSEN's and PETER FREUCHEN's plan on the First Thule Expedition to make their way from the newly discovered Adam Bierings Land to the region of Nordenskiölds Fjord and Sherard Osborn Fjord but they did not succeed (Medd. om Grønl. Bd. LXV, p. 4). An attempt to solve this task was made by FREUCHEN in 1914 (cf. KNUD RASMUSSEN, Geogr. Tidsskr. 1916, p. 198), but without success. It was not till 1916 that KNUD RASMUSSEN and the present author

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went to Greenland in order to explore the central and northern parts of the Peary Channel (Geogr. Tidsskr. 1916, pp. 198—200).

The main item on the programme of the expedition was as follows (Op. cit., p. 198) (translated from the Danish): "A sledge journey to the land connecting Independence Fjord and Nordenskiöld Inlet across the inland ice and back by the same route", and further, as an alternative programme (p. 199), "A spring and summer expedition for an investigation of Melville Bugt". KNUD RASMUSSEN summarises the plan as follows (pp. 198—199):

"Departure from Copenhagen on April 1st, arrival at Holsteinsborg, southern Greenland, about April 20th. From this place my expedition ship the "Kap York" will take us farther northward if circumstances permit; if not, the sledge journey is to start already here, and by making a rapid journey via the Danish colonies northward to Upernavik, by constantly changing dogs for each day's journey, I hope to arrive at Thule in time to ascend the inland ice on June 1st at the latest. The course is to be laid from Clements Markham Glacier towards Sherard Osborne Fjord, about 600 kilometres across the inland ice, and if it proves possible to descend here, the journey is to be continued from this place to Nordenskiöld Inlet and the land connecting this inlet and Independence Fjord.

"In case we do not succeed in descending into Sherard Osborne Fjord, we shall go direct to Adam Bierings Land and thence an attempt will be made to find the way to the unknown areas to be mapped.

"On August 10th—15th we must be ready for the return journey across the inland ice in order to reach a ship at Thule, whence the return journey is to be made by the "Kap York" at the beginning of September.

"The main object of the expedition will be to explore and map the connecting land between Independence Fjord and Nordenskiöld Inlet, Victoria Inlet and Sherard Osborne Fjord."

The expedition was to be made up of the following members: KNUD RASMUSSEN as leader of the expedition and ethnographer, PETER FREUCHEN as first cartographer, LAUGE KOCH as geologist and second cartographer, and two eskimos. In case the expedition were to encounter difficulties in descending into Sherard Osborne Fjord, which must be anticipated in view of the experiences made by PEARY and ASTRUP, it would be desirable that on reaching Adam Bierings Land the expedition might be divided into two cartographic parties.

Spring set in very early, which caused such great delay during our journey up along the west coast of Greenland that we did not reach Thule till after the middle of June. The journey across the inland ice accordingly had to be given up that year; but nearly the whole of

Melville Bugt was mapped, and various scientific investigations were carried out.

The expedition had to pass the winter in Greenland in order that it might set out across the inland ice next spring. However, in the course of the winter the original plans were entirely changed: the journey was now planned to take place along the north coast of Greenland, the main object being an investigation of the large fjords there. In addition the scientific programme of the expedition was extended, and the number of members was increased from five to seven, namely: KNUD RASMUSSEN, leader and ethnographer, Dr. THORILD WULFF, botanist and biologist, LAUGE KOCH, geologist and cartographer, the West-greenlander HENDRIK OLSEN, and three Polar Eskimos. As was the case on the First Thule Expedition, the expedition was based entirely on Eskimo equipment and travelling methods, that is to say, the expedition was to depend largely on successful hunting[1]). In fact, as early as one month after the start the expedition depended entirely on this factor.

An investigation by dog sledges of the large fjords along the north coast of Greenland is a very difficult undertaking, these fjords being always filled with deep snow in the spring. Moreover, we started out from Thule, about 1000 km from our working field; and men and dogs did not have a rest at Fort Conger, as was the case on PEARY's expeditions as well as on my later expedition around the north of Greenland in 1920—23. We succeeded in covering these c. 1000 km in about one month, but on reaching our working field both men and dogs were overworked, and we had at once to set out to hunt in order to keep our nearly 70 dogs alive.

The Journey.

The expedition started from Thule on April 6th, 1917, and reached Washington Land on April 20th, and Polaris Harbour on May 1st, whence the last extra sledges were sent back. We encountered heavy pack-ice onwards, which exhausted men and dogs, but no obstacles in the form of open water, and as early as May 7th we reached Dragon Pt. at the mouth of Sherard Osborn Fjord; a small depot was established here for our return journey. On May 9th we arrived at Kap May with empty sledges. In the valleys east of this cape we secured some musk-oxen, as predicted by MAC MILLAN.

On May 10th—11th KNUD RASMUSSEN and an Eskimo drove into Victoria Fjord on a short reconnaissance, which seemed to show that

[1]) Cf. KNUD RASMUSSEN, Naturens Verden, 1918.

the inland ice extended far out into the fjord in the shape of a large glacier. In the days May 11th—16th I travelled into the fjord accompanied by an Eskimo in order to map it.

On our return from the excursion the expedition was divided into two parties: a cartographic party consisting of KNUD RASMUSSEN, an Eskimo, and myself, and a biological party consisting of: Dr. WULFF, a Westgreenlander, and two Eskimos.

On May 18th the cartographic party started back towards Dragon Pt. in order to map Sherard Osborn Fjord, which work was done in the days May 20th to 24th. On May 23rd we were stopped in about 81°55′ N. lat. by a distinct ice edge of a floating glacier tongue.

On May 30th we again joined the biological party, which had secured seven musk-oxen on Nares Land.

The month of May had now elapsed. We had stayed for three weeks in our working field, and had mapped Victoria Fjord and Sherard Osborn Fjord. Musk-oxen had been secured on Wulffs Land and Nares Land; however, it had been impossible to obtain the actual rest so much needed by men and dogs after the rapid journey from Thule to Dragon Pt.; on the contrary, the journey had been very exhausting, as we had to travel through deep snow everywhere. Since our arrival at Dragon Pt. the expedition had lost 26 dogs and the remaining dogs were extremely exhausted. Yet we were still optimistic. KNUD RASMUSSEN now decided that the cartographic party should travel through Nordenskiölds Fjord (i.e. part of the supposed Peary Channel) to the head of Independence Fjord and onwards from this point along the south coast of Peary Land around this country as far as Kap Morris Jesup, while the biological party was to travel to the same point along the north coast, hunting musk-oxen along the route.

The day after the two parties had parted, and the cartographic party had penetrated about 20 km into Nordenskiölds Fjord, our further advance was barred by closely packed icebergs, which we took to be floating inland ice. We therefore had to give up all plans of reaching the regions rich in game round the head of Independence Fjord by this route. We now had to try to secure some game on Peary Land as soon as possible, which land with its alpine landscapes was of quite a different character from the ice-covered plateau land through which we had travelled so far. A large, hitherto unknown fjord, J. P. Kochs Fjord, extended in an east-and-west direction, and on June 4th we arrived at the north coast of this fjord. During the following three days we were storm-bound owing to a violent blizzard, which entirely wore out the power of resistance of our dogs. Through a current hole in the ice we secured two seals. We remained at this camp til June 14th, when we proceeded northward towards the north coast of Peary Land.

On June 16th we met the biological party at Kap Neumayer[1]); the party had pushed as far as Low Pt., but since they had experienced many storms, and had secured no game, they were now going southward again. In the course of the five weeks that had elapsed since our arrival at Dragon Pt. the expedition had lost 46 dogs, so that only 24 dogs were left.

Our plans were now changed: the cartographic party was to try and reach De Long Fjord in order to map this fjord, the last of the large unknown fjords along the north coast, while the biological party was to travel towards Wulffs Land.

Next day the cartographic party had successful hunting, and on June 21st we reached Hannes Ø at the mouth of De Long Fjord, and the fjord was mapped by means of a vertical base from the top of the island. On June 28th we were back at Kap Salor, where we joined the biological party, which had had successful seal hunting there.

In May—June it is almost impossible to approach the seals resting on the ice owing to the deep snow. About July 1st the snow has melted, and for some few days it is possible to hunt seals on the ice. However, the surface of the ice is soon converted into a system of pools, which renders it impossible to approach the alert seals.

From June 30th to July 11th we travelled from Kap Salor to Wulffs Land. The day's marches were small owing to slushy snow and water on the ice, but as the weather was fine during this period, the slow progress was of great benefit to the mapping. In the days July 11th —15th we had successful musk-ox hunting on Wulffs Land, and on the 17th arrived at Dragon Pt., where we hunted seal, though without success, till the 20th.

On July 21st the West-Greenlander Hendrik Olsen disappeared on a hunting excursion south of Dragon Pt. The unsuccessful search for him and bad weather caused such great delay that not till August 4th did we reach what we first took to be the edge of the inland ice, with only fourteen emaciated dogs left. In the following days we had to pass a large ice-free ravine and subsequently a broad, flat land area, and not till August 11th did we reach the actual inland ice. During our journey across the inland ice we lived chiefly on dogs, our last dog being devoured on August 24th, the day of our descent from the inland ice on to Inglefield Land. Next day Knud Rasmussen and one of the Eskimos went ahead towards Etah in order to procure help for the remaining members of the expedition. They reached Etah on August 30th and immediately sent out some auxiliary sledges, which joined us on September 4th, too late, however, to save the life of Dr. Wulff,

[1]) Actually Black Cape, cf. footnote p. 129.

who as early as August 29th had succumbed to the hardships of the journey. On September 10th we were back at Etah.

Mapping.

Victoria Fjord was mapped on May 11th—16th. About his reconnaissance trip on May 10th—11th KNUD RASMUSSEN writes as follows (1927, p. 64): "We turned our steps up the hillside at once, and discovered to our surprise, that this fjord, which has hitherto been described as a huge arm of the sea, the inner shores of which lay far out of sight, is in reality hardly more than 80 kilometres deep. The inner part of the fjord terminates in a broad glacier, rising at a gentle slope up to the inland ice itself."

KNUD RASMUSSEN's supposition had, of course, to be closely tested, and it was therefore planned that I should travel into the fjord until I encountered actual glacier ice. From the southernmost point of Stephenson Ø huge pressure ridges extended across the fjord at certain intervals, showing that in the winter, too, the ice is subjected to pressure from the south. We travelled on ice several years thick, and the farther we pushed into the fjord, the older and thicker was the ice. As we approached the cape called Isvolden in about 82°08′ N. lat., the surface of the ice proved to consist not only of the usual small hills with intermediate frozen pools, so characteristic of the surface of the sikussak ice, but in addition we encountered elongated ridges with intervening valleys and large crevasse systems. Towards the flat shore a little north of Isvolden there was a "glacier front" several metres high and with marginal crevasses extending at right angles to the coast. One of these crevasses, which extended far eastwards, near the edge was 5 m broad and 4 m deep (that is to say, it cut down to the frozen surface of the fjord, for in front of the "glacier front" there was sea ice), and on the shore beyond there were huge pressure ridges rising in places to an altitude of 20 m; in many places the ice had pressed gravel and sand up so as to form high moraine-like ridges. All further progress with the sledge was impossible. The huge ridges pressing against the shore, the marginal crevasses, the many crevasse systems farther out, and the broken surface of the ice convinced me that the fjord was filled with floating glacier ice. Great, therefore, was my astonishment when in 1921, on looking across the fjord from the inland ice, I noticed open water in front of the glacier at its head. It proved that the outer part of the fjord was filled with very old sikussak ice, which is pressed with great force, probably by local glaciers from Nares Land, against the shores of Wulffs Land, where the thick sheet of sea ice acts entirely like a glacier front (cf. L. KOCH, 1928, pp. 300—301).

The floating glacier ice in Sherard Osborn Fjord presented quite a different character, since it faces the sea ice with an actual, though low, glacier front, precisely as is the case with Petermanns Gl. (KOCH, 1928, pp. 277—300 and 289—297, with Fig. 38, Front of Petermann Gl., and KNUD RASMUSSEN, 1927, the figure p. 82. "Gradual transition from fjord ice to inland ice, in Sherard Osborne Fjord").

About the discovery of the floating glacier ice in Sherard Osborn Fjord KNUD RASMUSSEN writes (1927, p. 74):

"We had followed the coast on the western side fairly close in to land, and as often as we looked over to the eastward, there was a low, cloud-like fringe frequently covering the lower portion of the coast; with its white colouring, it resembled a narrow bank of mist quivering above the foot of the hills. Only when we had reached right in to the great cape which we were making for all the time did we get up into the bank of mist itself, and discovered that the mysterious feature was fluid inland ice, which extended right down to Cape Gray on Castle Island. This ice, which farther out only rises a few metres above the old *sikûssaq* itself, rises very gradually inward, and is really of the nature of a glacier, increasing in thickness when it passes Cape Buttress on the way in. No fissures could be seen, and this stream of ice, flowing out between two handsome portals of highland, might thus far at least afford a convenient means of ascent to the inland ice itself, if one could only be sure of not meeting with fissures farther on. At any rate, both Peary and Astrup state that they frequently, on the great glacier inside Sherard Osborne Fjord, had to change their course and turn farther in so as to avoid the many broad and deep fissures that barred their way."

About Nordenskiölds Fjord KNUD RASMUSSEN writes as follows (1927, pp. 82—83): "The whole of the country inland is covered with ice, save for a very narrow barren strip along the coast, and the fjord itself, which terminates in broad inland ice, though with nunataks showing here and there, is hardly more than 20 km. deep. Its extent must depend, however, to some degree on where the sea ice proper is considered to end, and the glacier ice to begin. Some 5—6 km. in from our camp a big bank of ice juts out across the channel, barring the passage altogether. As these icebergs, 3—6 m. high, are found in a close mass up towards the main glacier itself, with deep snow in all the crevices, and are evidently moved by it just as with the ice down in Victoria Inlet, we can assert that the fjord proper ends here, for these icebergs themselves render further progress impossible. There is thus no ascent to the inland ice from here, and it is therefore obvious that we must at once give up all idea of getting through to Independence Fjord. We have neither provisions for the road, nor, indeed, a road at all."

In conclusion KNUD RASMUSSEN says about the mapping of Sherard Osborn Fjord, Victoria Fjord, and Nordenskiölds Fjord (p. 83):

"Our geographical discoveries have been extremely interesting, and it will be necessary hence forward to adopt an entirely different system of delimitation between inland ice and coast land up here in those parts of Greenland which we have traversed. We find everything covered with ice to a far greater extent than we had expected, and though it is of course the object of every expedition to bring home as much as possible in the way of news, we could yet find it in our hearts to wish, for our own safety's sake, that we had fewer corrections to make in the beautiful hunting grounds hitherto marked on the American maps."

In my note book the following description of my trip into Nordenskiölds Fjord, dated June 2nd, 1917, is found (translated from the Danish): "After a march of $2^3/_4$ hours I arrived at the iceberg bank. The icebergs are flattopped, 5—7 m high and 50—100 in diameter. At first they were lying somewhat apart, the distance being 20—30 m, but they soon became more densely packed, with high snow-drifts. From the top of one of the highest ice-bergs I sighted the packed bergs for a great distance farther inland, and the glacier as such I dare not say for certain that I saw. The rounding of the land on the east side of the fjord I could not follow with the eyes owing to fog.

"It will be impossible to decide where the closely packed bergs end and the glacier begins. Practically the margin of the icebergs, where no more sea-ice of any importance is found among them, may be regarded as the limit of the glacier. . . ."

In "Greenland by the Polar Sea" KNUD RASMUSSEN says about Nordenskiölds Fjord, July 1st (1921, p. 162):

"The weather was uncommonly beautiful; glorious colours, blue and reddish, rested on Nordenskjöld Fjord's wonderful landscape. For the first time we looked at this fjord approximately from the point from which Peary previously observed it; and we realized why it was that, with this view, he assumed it to be the inlet of an enormous channel stretching right to Independence Fjord. From this point one sees only the coast mountains out by the mouth which forms the entrance to the channel. The end of the fjord is not at all visible, as the inland-ice which finishes the fjord merges entirely into the ocean-ice, which thus seems to stretch infinitely inward. Some backs of Nunatak, which from the fjord itself we discern far in on the inland-ice, appear deceptively from this point to be a continuation of the coast mountains, and it has thus seemed obvious to connect this with the fjord on the east side."

J. P. Kochs Fjord was mapped partly from a mountain station, partly from a station on the sea-ice. I did not succeed in mapping the

inner fjord ramifications, and the cartographic observations from the region round Kap Lars Larsen are somewhat unreliable because the temperature during the observations from Station Syltoppene on June 8th was rising rapidly after the snowstorm of the preceding days, and because the intense evaporation of the newly fallen snow caused difficult atmospheric conditions and mirages. It was our immediate impression that the fjord extended southward south of Kap Lars Larsen, but that it was not particularly broad or extensive.

Under the influence of the impression that the inland ice, in contrast to the earlier views, had a great extension towards and across Peary Land the map accompanying KNUD RASMUSSEN's report of the expedition (Geogr. Tidsskr. 1918) was prepared by me during my stay in West Greenland before the return of the expedition to Denmark. We found that the inland ice covered nearly the whole of Nares Land, further, that Nordenskiölds Fjord was only a short fjord entirely filled with inland ice except for some few nunataks at its sides, that the newly discovered Freuchens Land was almost entirely covered by ice, and that much glaciated plateau land occurred east and southeast of what we took to be the head of J. P. Kochs Fjord. Since moreover we sighted a large plateau covered by an ice-cap at the head of Ad. Jensens Fjord, we assumed that the inland ice extended northward to near the head of De Long Fjord. During the final preparation of the map of the expedition (1922, Pl. II) I was aware of the insufficiency of the observations from the interior of J. P. Kochs Fjord, and I therefore indicated no details east of that fjord, nor did I dare to indicate inland ice there[1]).

De Long Fjord was the farthest point reached by the expedition. The time and provisions left for mapping the fjord were extremely limited, so we decided to ascend a mountain top on one of the islands situated in the middle of the fjord, and to map by means of a vertical base as much as could be seen from this point. The weather was not especially favourable, a cold wind blew, and foehn clouds were approaching from the southwest. Arrived at the mountain top, I sent a brief note to the leader of the expedition; the note is reproduced in his report (1927, pp. 100—101) and runs as follows:

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[1]) On my journey around the north of Greenland in 1921 I observed from the inland ice a depression extending as a continuation of Wandels Dal towards J. P. Kochs Fjord. A restudy of my observation material of 1917 resulted in certain corrections in the map (Atlas, 1932, Pl. 2) i.a. I indicated sea-ice farther southward. On our flight in 1938 it proved that Kap Lars Larsen should be removed about 5 km eastward.

"Thule Hill 21.–6. 1917.

"Ajako and I got up to the top here, which is 780 m. high, in time to take a meridian. De Long Fjord is big, and rich in surprises. Let me commence with Cape Mohn. South of here a fjord in to the W. with sound to the Arctic Ocean and valley across to sound S. of Hanne Island, so that I can see water in front of Cape Ramsay Island. Then fjord in to the S.W. with valley perhaps to Mascart Inlet. Further, fjord towards S. with inland ice in background. Then a wide fjord abt. 30 km in extent towards the S.E., and from here two valleys in towards E., the northern one running very far in. There seems to be a lake here in the direction of Frederik Hyde Fjord. Wild Fjord lies north of here like a panorama. The two big new fjords can be taken with a vertical base. It is very cold and windy which will, I am sorry to say, hinder the work rather. But the air is still very clear in over Peary Land.

(sd.) LAUGE KOCH."

Considering the special character of this fjord, it being a system of narrow fjords and sounds cutting across steep alpine landscapes partially over 1000 m high, mapping from the ground is very difficult. I assumed that the view from the Thule Hill showed the main cartographic features of the fjord; at any rate I could do no more under the existing circumstances. In a few places the eastern side of the fjord was concealed, i.a. by Inges Ø[1]).

Summary and Geographical Results.

Large ice-free areas with occasional local ice-caps had been observed to the west, viz. Nyeboes Land, Warmings Land with Hendriks Ø, and Wulffs Land, whose southern limitation was not known. All these areas were plateau lands, only farthest north did we encounter more sculptured land forms, though here, too, the plateau character was very distinct.

This plateau land continued towards the east, but was here almost entirely covered by ice. This was the case on Nares Land, Freuchens Land, the land southwest of what we took to be the head of J. P. Kochs Fjord, and the land south of the head of Ad. Jensens Fjord in De Long

[1]) After my journey in 1921 I revised my observation material (cf. Atlas, 1932, Pl. 2), however, as regards the east side of O. B. Bøggilds Fjord I could not see that a sound extended from Ad. Jensens Fjord to Th. Thomsens Fjord, nor could I see that this fjord extended much farther southward than assumed by me in 1917. I was much astonished to observe this in 1938, since when making observations from the Thule Hill in 1917 I was extremely careful about the heads of the fjords, repeating the observations several times. Some points still remain uncertain, i.a. a sound may extend from Th. Thomsens Fjord to Mascart Inlet.

Fjord. We were of opinion that these plateau landscapes were covered by the inland ice. In my note book in finishing my description of De Long Fjord I wrote as follows for July 3rd, 1917: "On Peary Land the inland ice extends eastward at least as far as 40° W. long. and 80°50′ N. lat.—that is to say, more than 70 km farther northeastward than originally assumed."

We were debarred by these glaciated plateaus from the rich hunting grounds encountered by the 1st Thule Expedition near the head of Independence Fjord. Nordenskiölds Fjord was impassable owing to a floating glacier. That J. P. Kochs Fjord should trend southward at a right angle, continuing between the glaciated plateaus, did not occur to us. South of De Long Fjord, too, inland-ice-like ice-caps occurred.

North of J. P. Kochs Fjord, on either side of De Long Fjord, and far eastward into Peary Land we observed alpine landscapes with occasional local glaciers. These alpine landscapes seemed to be limited to the north coast of Peary Land and there was a sharp boundary towards the southern plateau landscapes.

The Second Thule Expedition and the Peary Channel.

In "Greenland by the Polar Sea" (1921, p. 154) Knud Rasmussen says:

"After the whole of the big Peary Channel had been reduced to a myth, partly by the first, partly by the second Thule Expedition, there was still the possibility that de Long Fjord — at any rate in contradistinction to the quite small Nordenskjöld Fjord—might penetrate so deeply as to create around its head a stretch of country of the same kind as that which in 1912 I had found by the head of Independence Fjord."

Knud Rasmussen says about De Long Fjord (M. o. G. 1927, p. 101):

"Lockwood, who gave this fjord its name, kept some distance out at sea, where the ice offered better going, and had thus no complete view of De Long Fjord, which appeared to him as a single big fjord cutting in between the heights of Peary Land. Later, Robert Peary came by along almost the same route, and from his observations, which likewise afforded no details as to the fjord system as a whole, the theory arose that De Long Fjord possibly extended so far up through the country as to form a great channel connecting up with the supposed Peary Channel about midway between Nordenskiöld Inlet and Independence Fjord.

"Now that the whole of the great Peary Channel had been proved, by our discoveries on the first, and now on the second Thule Expeditions, to be non-existent, it was still possible that De Long Fjord might—in contrast at least to Nordenskiöld Inlet with its very slight extent—run so far inland that its base could form a tract of land similar to that which I had found in 1912 at the base of Independence Fjord."

After the observations made by the First Thule Expedition near the head of Independence Fjord and those made by the Second Thule Expedition in the northern fjords there seemed to be no possibility of the existence of the Peary Channel, not even the depression was observed.

The Maps of the Second Thule Expedition.[1])

1) Map entitled "Geologisk Kort over Nordvest-Grønland udarbejdet af Lauge Koch". Geogr. Tidsskr., Bd. 24, Hft. VI, p. 225. 1918.

During the winter of 1917—18 KNUD RASMUSSEN and I worked out a report on the expedition, which was handed over to the committee of the expedition on our return to Copenhagen in May, 1918. My geological report was accompanied by a preliminary geological map which had been drawn during my stay in West Greenland and on which the geographical discoveries made by the expedition had been inserted. A few weeks after our return the report accompanied by the map was published in the Danish periodical "Geografisk Tidsskrift".

It is a small-scale map, showing the topographical discoveries made during the journey, i.a. inland ice is indicated on Freuchens Land, and an ice cap on the land east of J. P. Kochs Fjord, which ice cap, in accordance with our observations in De Long Fjord, extends to some distance south of this fjord. No attempt is made to connect the inland ice or this ice cap with the ice cap discovered by the 1st Thule Expedition.

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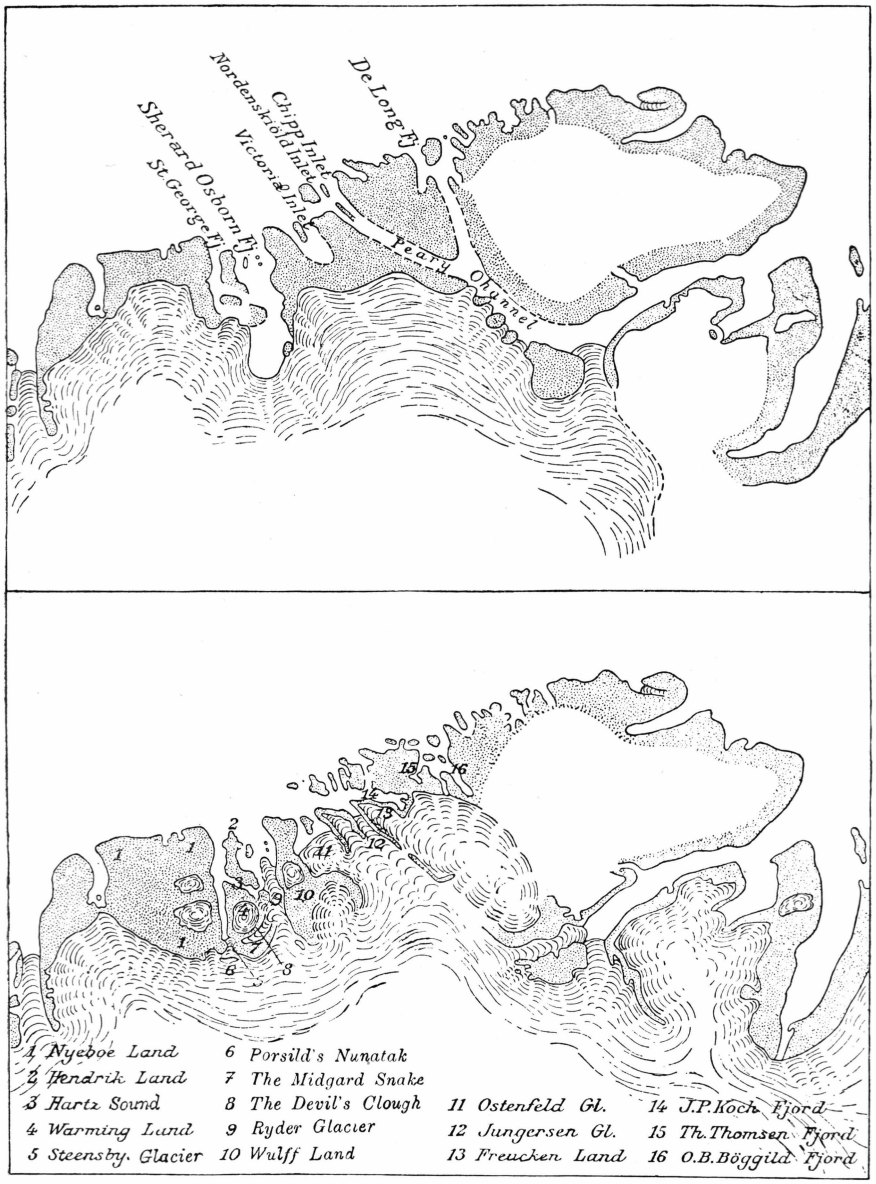
[1]) On the Second Thule Expedition in 1917 I carried with me a sensitive compass which could be fitted on the theodolite. In some places, where the theodolite could remain erected for more than 24 hours, I took bearings to mountain peaks and made compass readings at certain intervals. It turned out that even if the theodolite remained in the place for many hours, the horizontal intensity was so inconsiderable that the compass needle did not move back, but might take up positions varying up to 20°. The compass was therefore not used in the cartographic work on the Second Thule Expedition, and on the Bicentenary Jubilee Expedition I therefore had no compass at all.

Along the north coast of Peary Land basic eruptive dykes occur in several places, and basic dykes further play a great role around the head of Independence Fjord and in the whole of Mylius-Erichsens Land. Such dikes may affect the compass.

Certain obscurities in LOCKWOOD's, PEARY's, and HAGEN's maps are possibly accounted for by the irreliability of the compass in these regions.



THE UPPER MAP SHOWS THE NORTH COAST OF GREENLAND AND THE DISTRICT ROUND INDEPENDENCE FJORD WITH PEARY CHANNEL, AS KNOWN PREVIOUS TO THE FIRST AND SECOND THULE EXPEDITION

THE LOWER MAP SHOWS THE SAME DISTRICT MAPPED BY THE THULE EXPEDITION

Fig. 28. Copy of KNUD RASMUSSEN's Map in "Greenland by the Polar Sea" (1921).

2) Map entitled "Kort over II. Thule Ekspeditions Arbejdsomraade 1916—18 udarbejdet af Lauge Koch". Scale 1 : 2.500.000. Published in: KNUD RASMUSSEN, "Grønland langs Polhavet". København 1919.

In the *de luxe* edition of this book the map appears in colour, the sea being blue, the land areas brown, and the inland ice green; the areas surveyed by the expedition are given in deeper brown and green colours. In agreement with KNUD RASMUSSEN the ice cap on Freuchens Land and the ice cap east of J. P. Kochs Fjord and south of De Long Fjord are connected with the ice cap on Adam Bierings Land, the latter surveyed by the 1st Thule Expedition. These ice caps are indicated as parts of the inland ice, the northeastern limitation of the inland ice thus running from O. B. Bøggilds Fjord southward to Valmuedalen. After our return from the 2nd Thule Expedition both KNUD RASMUSSEN and I held the view that the ice caps were connected with or formed part of the inland ice.

A reduced copy of the map, but uncoloured, is found in the popular Danish edition of the same book and in the English edition entitled "Greenland by the Polar Sea". In the latter book (in the preparations for which I took no part) KNUD RASMUSSEN further publishes a map (facing p. 211) which is reproduced in Fig. 28 of the present paper.

3) Map entitled "Nord-Grønland fra 81° til 83°25′ nordlig Bredde og 38° til 56° vestlig Længde. Opmaalt 1917 paa II. Thule-Ekspedition af Lauge Koch. Maalestok 1:500.000". Medd. om Grønl. Bd. LXIV, Nr. 2, Pl. II. 1922.

On the map the sea and the pack-ice are indicated in blue, land areas in brown, and inland ice and glaciers in green colours. On this map, which is the final map of the expedition, ice caps are indicated on Freuchens Land and south of Ad. Jensens Fjord (a continuation of De Long Fjord), but they are not connected with either the inland ice or the ice cap on Adam Bierings Land (discovered by the 1st Thule Expedition).

4) Map entitled "Kort over II. Thuleekspedition 1916—18 udarbejdet af LAUGE KOCH. Maalestok 1 : 2.500.000". Medd. om Grønl. Bd. LXV, Nr. 1, Pl. I. 1927. Published in: KNUD RASMUSSEN: Report of the II. Thule-Expedition for the Exploration of Greenland from Melville Bay to De Long Fjord, 1916—1918.

The map is an unaltered copy, but without colours, of the map described above under 2).

THE BICENTENARY JUBILEE EXPEDITION AROUND THE NORTH OF GREENLAND 1920–23

Leader: LAUGE KOCH

Cf. Pls. 1, 6, 11.

Literature.

1) HEDIN, SVEN: Doktor Lauge Kochs Kartor. Manuscript kept in the Royal Library of Copenhagen. Dated August 20th, **1924**.

2) KOCH, J. P.: Survey of Northeast Greenland. Medd. om Grønl. Bd. XLVI, Nr. II, pp. 81—468. With 6 pls. and 67 figs. **1916**.

3) KOCH, LAUGE: Plan for Jubilæumsekspeditionen Nord om Grønland. Geogr. Tidsskr. Bd. 25, Hft. VII, pp. 226—228. With 1 map. **1920**.

4) — Article in „Berlingske Tidende". **1922**.

5) — Note to Maps of Melville Bay from Wilcox Point to Cape York and of North Greenland from 81°—83°35′ N., 38°—56° W. Medd. om Grønl. Bd. LXIV, Nr. 2, pp. 77—85. Technical Remarks by P. A. Heiberg-Jürgensen, pp. 85—88. With 2 maps. **1922**.

6) — Resultaterne af Jubilæumsekspeditionen Nord om Grønland i 1921. Naturens Verden, Februar **1923**, pp. 49—74. Botaniske Resultater af J. N. Nygaard, pp. 74—76. With 4 maps in the text.

7) — Preliminary Report on the Results of the Danish Bicentenary Expedition to North Greenland. Geogr. Journ. Vol. LXII, No. 2, August **1923**, pp.103—117. With 2 maps.

8) — De videnskabelige Resultater af Jubilæumsekspeditionen nord om Grønland. Geogr. Tidsskrift, Bd. 27, Hft. VII, **1924**, pp. 208—218. With 5 maps in the text.

9) — North of Greenland. Geogr. Journ. Vol. LXLV, No. 1, July **1924**, pp. 6—17, discussion pp. 17—21. With 1 map and 10 figs.

10) — The Question of Peary Channel. Geogr. Review, Vol. XV, No. 4, October **1925**, pp. 643—649. With 3 figs.

11) — Nord om Grønland. Pp. 1—279. With 120 figs. and 1 map. Copenhagen **1925**.—German edition, "Um Grönlands Norden", **1927**; French edition, "Au Nord du Groenland", pp. i—vii + 1—291. With 2 maps. Paris **1928**.

12) — Report on the Danish Bicentenary Jubilee Expedition North of Greenland 1920—23. Medd. om Grønl. Bd. 70, No. 1, pp. 1—232. With 106 figs. and 13 maps. **1926**.

13) — Contributions to the Glaciology of North Greenland. Medd. om Grønl. Bd. LXV, No. 15, pp. 181—464. With 6 pls. and 140 figs. **1928**.

14) — Map of North Greenland (18 sheets). Scale 1:300.000. Surveyed by LAUGE KOCH in the years 1917—23. Published by the Geodetic Institute of Denmark.**1932**.

15) RIIS-CARSTENSEN, EIGIL: The Godthaab Expedition 1928. Report on the Expedition. Medd. om Grønl. Bd. 78, Nr. 1, pp. 1—105. With 21 figs. and 1 map. **1931**.

Since my stay in West Greenland in 1913 it had been my aim to map North Greenland and to investigate it geologically. As a member of the Second Thule Expedition I had succeeded in mapping Melville Bugt (1916) and the large fjords of the north coast (1917), and many geological problems had been solved, but much geographical and geological work still remained to be done in North Greenland.

During the preparation of my map (survey 1917) my attention was especially attracted by PEARY's and ASTRUP's descriptions of what they had observed from the inland ice in 82° N. lat., 40° W. long., which were not in harmony with the results gained by the First and the Second Thule Expeditions. Very likely, therefore, there must here be some great riddles to solve.

In the summer of 1920 I started out on the so-called Jubilee Expedition[1]) in order to make a cartographic and geological investigation of North Greenland. I went to the Thule District, where I chose the settlement Igdluluorssuit, situated rather far northward, as my headquarters. From this place communication was easy with the various Eskimo settlements southward.

The Original Plan of the Expedition.

(Cf. Medd. om Grønl. Bd. 70, pp. 7—11).

My equipment was to include two tractors, by means of which a depot was to be established in the autumn of 1920 south of St. George Fjord via the inland ice. It was my plan, supported by this depot to travel across the inland ice to Adam Bierings Land and Valmuedalen and onwards to the interior of Peary Land, whence I was to return across the inland ice in the autumn. The journey around the north of Greenland was to take place in 1922.

Should it be impossible to establish a depot south of St. George Fjord in 1920, I was to lay out a depot by means of sledges at Dragon Pt. in the spring of 1921, and in the course of the early summer map the coast from this point southward to my winter quarters, and in addition make geological investigations. In the early autumn a depot was to be established at Kap Heiberg-Jürgensen via the inland ice.

[1]) The expedition was called the Bicentenary Jubilee Expedition, because in 1921 the bicentenary jubilee of the arrival of Hans Egede in Greenland, and accordingly of the Danish colonisation, was celebrated both in Greenland and in Denmark.

In that case the journey to the interior of Peary Land was to take place in 1922 and the journey around the north of Greenland in 1923.

The Journey in 1921.

(Cf. Medd. om Grønl. Bd. 70, pp. 47—147).

The expedition was not destined to develop entirely according to the plan. The upward journey was delayed, and as a consequence my expedition house at Igdluluorssuit was not finished until October 1st, 1920. For the time being I was unable to use my tractors, as my mechanician had had to return home from Upernavik. It was too late in the year to go across the inland ice to St. George Fjord, so I made a journey to Washington Land in October (Medd. om Grønl. Bd. 70, pp. 31—42).

On my arrival at the Thule district the dogs there were in an unusually good condition, and game, too, had been abundant during the last few years, so I determined not to await the arrival of a mechanician, but to make the long sledge journey around the north of Greenland in the spring of 1921. About the New Year I had stayed for some weeks at Upernavik in order to supplement my equipment, but was back at my headquarters on February 15th.

On March 18th I set out from my headquarters, reaching Ft. Conger on Grant Land on April 5th. Here men and dogs had a good rest till April 19th, when we set out across the new ice of Robeson Kanal, which was smooth and free from snow, and after two days reached Kap Brevoort. No open water was encountered at Blackhorn Cliff. Our last three extra sledges returned back from Hand Bay, whence I started on April 23rd accompanied by three Eskimos, three sledges, and 32 dogs. Two days later we passed Kap Bryant, and reached Beaumont Ø on April 29th. Between these two points we had had bad going, but now the going improved, and on May 5th I was able to commence the mapping at De Long Fjord, thus continuing my mapping from 1917.

On May 13th we reached Kap Morris Jesup, the most northerly point of Greenland. For mapping purposes we travelled out on the pack ice to about 53°50′ N. lat. The weather had been fine during the whole journey from Ft. Conger, but now there was a change. However, I was able to continue the mapping as far as Kap Bridgman, where on May 21st, I found J. P. Koch's cairn, erected in 1907.

In view of Peary's and Macmillan's experience we had relied upon successful musk-ox hunting between Kap Morris Jesup and Kap Bridgman, but were disappointed. This in connection with the period of bad weather, which now set in, was a terrible blow to us, as no more food for the dogs was left. However, in spite of the bad weather we continued our journey along the coast. On May 26th we secured 9 musk-

oxen on Herlufsholm Strand, but by that time several of our dogs had already died.

On June 2nd we turned into Independence Fjord. A long period of fine weather now set in, and on June 8th we reached the mouth of Brønlunds Fjord. Even long before, at a great distance out in Independence Fjord, I had noticed that a broad depression, apparently without a head, extended westward from the mouth of Brønlund Fjord. I could not but connect it in my mind with the supposed Peary Channel.

On arrival at Brønlunds Fjord, I sent two Eskimos westward into the fjord in order to reconnoitre, while accompanied by the third Eskimo I continued towards the head of Independence Fjord, and on June 12th found MYLIUS ERICHSEN's cairn near Kap Glacier. After a visit to Astrups Fjord we were back at the camp at the mouth of Brønlunds Fjord on June 15th.

The reconnaissance of the Eskimos showed that Brønlunds Fjord was only short and that it was impossible to reach the inland ice by way of the fjord, since large rivers were breaking up at its head. On June 18th I ascended a mountain west of the head of the fjord and discovered a large valley—Wandels Dal—which extended in continuation of Brønlunds Fjord and was traceable as far as 100 km westward from the mouth of Brønlunds Fjord. In order to reach the inland ice we had to go to the head of Independence Fjord and ascend Academy Gl. We reached the Thule Cairn on Vildt Land on July 3rd and stayed here till July 12th. However, game failed, we secured only one musk-ox. After a short stay on Adam Bierings Land, where we secured one more musk-ox, we started on our return journey across the inland ice on July 18th.

It had been my hope that I could travel on the inland ice to the farthest northern point reached by PEARY in 1892, viz. 82° N. lat. 40° W. long., the point from which he sighted what he took to be the Peary Channel. However, because of our unsuccessful hunting and consequent lack of provisions for our return journey I dared not travel so far, I had to be content with a view from the inland ice of the large lake behind Brønlunds Fjord and, in continuation of the lake, a depression leading towards J. P. Kochs Fjord.

In spite of our lack of provisions the route of our return journey was chosen so as to render it possible to map the edge of the inland ice, and south of both Victoria Fjord and Sherard Osborn Fjord I linked up with my mapping in 1917.

On July 29th we reached Kap Heiberg-Jürgensen, where according to an agreement with the Eskimos a depot should have been established for us; however, this had not been done, so from now on we had to live

entirely on our dogs. On August 4—5th we passed Petermanns Gl. and on August 12th we reached the land at the northern edge of Humboldt Gl., where we found a cairn and some provisions laid out for us. This was fortunate, for by that time only one dog was left. On August 18th relief came from an Eskimo camp which I had erected for the purpose near Kap Webster, and we reached this cape a couple of days afterwards. We had to stay here in southern Washington Land till September 18th, when the ice in front of Humboldt Gl. was practicable, and travelling subsequently along the coast of Inglefield Land and across the inland ice, we reached my headquarters on October 2nd after a journey which had lasted for precisely 200 days.

Nearly all the time the journey had been favoured by fine weather; only one protracted period of storm and snow had been experienced during our stay in eastern Peary Land, and during the whole summer we had hardly been troubled by fog. In Kennedy Kanal and especially in Robeson Kanal the ice conditions had been extraordinarily favourable. The difficulties that arose during the journey were principally due to our unsuccessful hunting which contrary to expectation we experienced near the northernmost point of Greenland and on Vildt Land, and to the absence of the depot at Kap Heiberg-Jürgensen.

On November 12th I left my headquarters and reached Upernavik on New Year's Eve 1921.

The Journeys in 1922.

(Cf. Medd. om Grønl. Bd. 70, pp. 158—210).

My decision to travel around the north of Greenland in 1921 instead of 1922, as originally planned, proved to be a lucky one. For in the course of the summer of 1921 a cutaneous disease had caused the death of several people, and on the whole greatly reduced the hunting possibilities of the Eskimos. Moreover the ship visiting Thule that summer brought with it the "Spanish Flu" (influenza) and many Eskimos died of it in the course of the winter.

In the spring of 1922 the meat stores were therefore small, and the dog teams had been decimated. Moreover the weather was very stormy with heavy snowfalls, and for some time it seemed impossible to push north of the Kap York District. Not till April 27th was I able to start northward from my headquarters accompanied by three Eskimos, with the intention of mapping the coast as far as St. George Fjord.

On May 8th we reached Washington Land, on the 21st Thank God Harbour, and on the 23rd Kap Brevoort. The preceding year I had established a depot at this point intended to suffice for four men and three dog-teams for eight days. However, immediately after our arrival

a snowstorm set in, which continued without interruptions for one week; by that time the depot had been used and we had to return southward in driving snow. Shortly afterwards the storm abated, but it would have been impossible for us to push as far as St. George Fjord.

On June 13th I encountered my mechanician and an Eskimo, who had come to meet me, a little north of Kap Calhoun. Shortly afterwards I sent two Eskimos southwards with their sledges heavily loaded with geological collections to take advantage of the still unbroken ice in front of Humboldt Gl. On June 26th—28th we crossed Kane Basin to Inglefield Land, reaching Etah on July 14th. Thence I travelled across the inland ice and arrived at my headquarters on July 25th. The summer of 1922 was extraordinarily cold, and the precipitation in the spring was unusually heavy. This favoured our late journey across Kane Basin.

In the autumn I made a journey from my headquarters across the inland ice and Inglefield Land to Kap Kent with the object, among other things, of mapping the edge of the inland ice on Inglefield Land. In November I left the northern districts and arrived at Upernavik in January, 1923.

The Journeys in 1923.

(Cf. Medd. om Grønl. Bd. 70, pp. 211—232).

In the spring of 1923 I visited the Kap York district to do cartographical work there. Late in the spring I returned to Upernavik, whence I travelled by ship to Denmark, arriving at Copenhagen in the middle of September.

Mapping on the Jubilee Expedition.

The instructions I received from the Committee of the Expedition defined the main objects of the expedition as follows (Medd. om Grønl. Bd. 70, pp. 10—11):

"1) to procure a topographical map on a scale of 1:500,000 of such large portions of Northern Greenland as will be possible. The ideal will be to get a detailed, uniformly made map of the whole northwestern Greenland from Upernavik to Independence Fjord on a scale of 1:500,000.

"2) to collect such quantities of fossils that will convey a clear impression of the fauna of the sediments in Northern Greenland."

Melville Bugt and the fjords of the north coast had been mapped by me on the Second Thule Expedition in 1916 and 1917 respectively;

this mapping was to be continued and the new maps were to be incorporated with my former mapping. As the journeys had to be made by dog-sledges, the Committee was aware that the mapping had to be confined to 1) the coast line and such areas of the land beyond as were visible from the sea ice, 2) the edge of the inland ice with as many details as could be determined from the observation stations on the inland ice; and 3) exceptionally, mapping along the route, if large land areas were traversed. In other words, the mapping was to be a survey along the routes followed.

The cartographic equipment of the expedition is mentioned in my report (1926, pp. 18—19). I shall here describe the mapping at somewhat greater length.

On a sledge journey the instruments must necessarily be few and primitive. For mapping purposes I carried with me a theodolite (Hildebrandt, kleinstes Reisemodell), which had to be well protected during the journey (cf. 1926, p. 18). Further, three good watches, so-called half-chronometers. I carried them myself in flanel bags next to my body in order that they might as far as possible be constantly kept at the same temperature. However, this was practicable to a certain extent only. During the first part of the long sledge journey, when the temperature often fell to 40° C. or more below zero, we wore skin-clothes, and during this period the watches retained the body temperature. However, when the temperature rose to about 20° C. below zero, we often took off our skin coats when travelling on the pack-ice, and the watches were subjected to great temperature fluctuations which greatly influenced their rate. The same was the case during observations from a mountain top: I was often warm on reaching the top, but during my work was much cooled by the cold winds. Finally, the watches were subjected to temperature fluctuations when in the late summer we suddenly passed from the warm coast land to the cold climate of the inland ice. And last but not least, I was without the aid which may now be obtained through the wireless, probably even on sledge journeys, in controlling the state and rate of the watches, rendering perfectly reliable determinations of longitude possible. In periods when the sun is so high in the sky that the observations for latitude obtained at midnight are reliable, and especially during long periods of fine weather when observations for latitude are taken twice a day, one knows fairly well the state of one's watch. A rough check of the watch may be obtained if immediately after being taken the observation is transformed into a curve, so that it can be ascertained whether or not the sun has culminated. Such a curve will also at once reveal if the mount of the theodolite has caused the sea ice or inland ice to melt beneath it so that it has sunk some way into the ice. In summer it may

at times be difficult to find a place where the theodolite can keep its level even though its legs have been protected against the rays of the sun by means of ice blocks or otherwise.

Travelling in the direction north-and-south, the error of the longitudinal determinations will be eliminated by the latitude and azimuth observations. If, however, the route goes in an east-and-west direction, the unreliability of the longitudinal observations may at times cause great trouble, particularly if the land area surveyed is narrow so that the construction of the terrain will support the astronomical observations to a slight extent only. From the northernmost point of Greenland I went some distance out on to the pack-ice in order to make observations from two stations so as to render the construction of the terrain more reliable and to eliminate the longitudinal errors, if any. In the important area west of the head of Independence Fjord I first laid my route southwestward up the Academy Glacier, then northwestward to Adam Bierings Land. The cartographic stations situated at close intervals and supported by latitude observations and azimuth here gave a similar stability of construction as was obtained along the north coast between Kap Salor and Dragon Pt. in 1917. Such a result is naturally only attainable at the height of summer and when one travels so slowly that it is possible to make observations from many cartographic stations with reliable interbearings. Dr. SVEN HEDIN, who spent several hours in looking through my cartographic material from the Second Thule Expedition and the Jubilee Expedition, makes the following remarks with special reference to the two areas mentioned above (MS. in the Royal Library of Copenhagen) (translated from the Swedish):

"The extraordinarily difficult conditions under which these maps were made, should not be forgotten. On the whole, work in a polar country, on inland ice and sea ice, is an achievement which exites admiration. A circumstance which renders the work extremely difficult is that the compass cannot be employed owing to the proximity of the magnetic pole[1]). The basis on which the maps are built up in the field is therefore principally determinations for latitude and azimuths. Thus the whole work will actually be a triangulation extremely trying to patience. Despite the difficulties there is a surprising accuracy—or merely an error of 300 metres. Thus, for instance, a fjord, extending 100 km inland, may be encumbered with an error amounting at most to 1 km, or 1 % of the length, an accuracy which in maps made on land expeditions in the interior of continents is regarded as very great. In this respect Koch has beaten all records.

"From the 600 to 700 cartographic stations within the area angles have been measured to all peaks within the field of vision, and often

[1]) Cf. footnote p. 240.

the same peak has been measured from four or five different stations, the average of which was taken in order to obtain the height, which in such cases increased in accuracy. From each cartographic station an average of one hundred bearings to different objects in the territory, were taken by means of a theodolite. In this way the accuracy of the observations rose to $^1/_{10}$ minutes, a very unusual accuracy for such observations. All uncertain bearings have been cancelled.

"The abundance of triangulated fixed points thus obtained, lend to the map a solid and immovable skeleton, a stem within which all other details of the terrain crystallise and become firmly fixed. Dr. Koch has brought home nearly twenty times as many such fixed points as any previous expedition, and furthermore his maps are infinitely richer in details.

"As a rule a panorama was drawn from each cartographic station. Thus several panoramas were often drawn in one day from different stations. From the point, which is also the farthest point of Mylius Eriksen, a panorama was drawn which required a stay of six hours in the place! I have seen several of Dr. Koch's panoramas, and I consider them masterly. From my experience of panorama drawing in the Tibet, where on my latest journey I made 552 such drawings, I can say that the accuracy of Koch's altitudinal angles and the abundance of details in the terrain would render it possible to execute a hypsometric map of the north coast of Greenland with equidistance contours inserted in what the Germans call "Gefühlsisohypsen"."

In order to attain as great a reliability as possible a large number of bearings to prominent mountain tops are required, and I therefore took as many bearings as possible, i. a. for geological reasons; thus I made a far greater number of observations to mountain peaks than were made for instance by J. P. Koch on Peary Land in 1907.

It is important that the perspective sketches should be as well executed as possible. Even if one is not, like Sven Hedin, endowed with artistic talents, one may train oneself to make landscape sketches which will give good geographical as well as geological data. Very often the cold will prevent elegant drawing in the landscape sketches, and during spring and autumn drawing may be very painful. However, by long training and especially after one or several winterings in the Arctic and a reduction of one's consumption of fluids, one may be able to draw for a long time at a low temperature, especially when there is no wind. Thus at one of the cartographie stations north of Greenland I could draw for three hours in calm weather at a temperature of 17° C. below zero without my fingers getting numb.

My equipment further included three aneroid barometers, and one boiling point barometer; however, at that time no strong type of the

latter kind of barometers was obtainable, and it was spoiled before it was used. My observations on the altitudinal conditions of the inland ice of North Greenland were based exclusively on the aneroids. It is interesting to note that PEARY records higher altitudes than do the Danish expeditions (First and Second Thule Expeditions, Jubilee Expedition). There is here an element of uncertainty, which may be of some importance cartographically when vertical bases have to be used and especially when a vertical base has to be employed from the inland ice without any knowledge of the state of the barometer (interior of Victoria Fjord).

An odometer may sometimes be useful for cartographic purposes, notably when traversing the smooth ice of narrow fjords, for instance the fjords west of the northernmost point of Greenland. It is essential, however, that the man who breaks trail should walk as straight as possible, that a cairn of snow some 3—4 m high should be built at each observation station, and that an empty pemmican tin, a piece of fur, or the like, is fitted to the top of it so that bearings can be taken to it from one or several of the subsequent stations. A large number of bearings are required from each station, so that a check of the position of the stations is thereby obtained.

It is of special importance to possess the reports of all earlier journeys to the regions visited, or at any rate abstracts of them, and to carry all the existing maps. Every day one's position and the main features of the geography of the country should be inserted on a sketch map. All the time that can be spared during the journey, even part of one's sleeping hours, if necessary, should be used for the construction of maps, thus especially periods of storm and fog must be utilised. It is likewise of value that the maps should be constructed as soon as possible after the journey, while the impressions are still fresh in one's mind.

During the journey I received excellent assistance from my Eskimo companions. As a rule I was accompanied by three Eskimos, so that the party might be divided into two if necessary. I had no sledge myself.

As a rule the order of the day was as follows. One of the Eskimos was called by an alarm-clock half an hour before one of the observation times (i.e. 6, 12, 18, or 24 o'clock); he made coffee and if possible made the theodolite ready for observations. Having taken the observation, I would draw perspective sketches, and when my fingers were numb with cold, we would have our meal. In this way I got warm again and would be able to continue my drawing and angle measurements. Subsequently I would leave the camp, walking on skis or snow-shoes, and when the camp was broken up, the Eskimos would follow in my trail with the sledges; we were then not to meet until the time for the next observation to be taken. Thus when the cartographic work required all

my time and force, I had nothing to do with the camping, the breaking up of the camps, cooking, and dog-feeding.

Whatever amount of energy is expended on making the map as uniform as possible, a number of disappointments will continually be met with. Often the astronomical observations had to be disregarded, either because the theodolite had changed its level during the observation, or because the sun had culminated before the observation began. Sometimes an observation is taken in spite of fog, clouds, or driving snow, and the observation will later prove to be useless; or cold or the low altitude of the sun in the autumn may reduce the reliability of the observations. And finally in utilising the perspective sketches during the construction of the map a large number of bearings have to be disregarded, because it was impossible to obtain countersights from other stations. Series of vertical angles have to be disregarded, because the refraction, which changes so considerably especially during spring and autumn, will cause inaccurate measurements of the mountain altitudes. Bearings taken in the summer across the inland ice or the heated plateau surfaces near its edge will likewise show intricate refraction conditions. Protracted periods of fog, overcast sky, and storm will often prevent the taking of observations, and, in connection with lack of provisions, will compel the traveller either to continue his journey without taking the observations or to await better weather and subsequently to travel all the more rapidly. However good one's equipment, one will sooner or later have to depend on successful hunting and in order to have the dogs well fed will sometimes have to stay for some time in regions rich in game but presenting no possibilities for cartographic work. On the other hand one will often have to travel rapidly through interesting regions because no game is to be found there.

Want of sleep (during the mapping of Melville Bugt in 1916 I had only eighteen hours' sleep in eleven days), overwork accompanied by attacks of fever and the loss of consciousness or an extreme degree of famine will only slightly affect the observation material; for during such states of exhaustion the nervous system is the last to suffer, and I have ascertained but few errors in the observations made during such periods. In most cases they consisted of an error of 10° in the readings, and such errors are easily discovered during the construction of the map.

As a consequence of the conditions under which my mapping of North Greenland was carried out, the cartographical material is naturally heterogeneous.

I received my cartographic training in the winter of 1916 from J. P. Koch, who used the cartographic material of the Danmark Expedition as a basis for his teaching. The method has been described by J. P. Koch (Medd. om Grønl. Vol. 46, 1916).

In the years 1918 and 1919 I constructed, in collaboration with the well-known Iceland-cartographer Captain HEIBERG-JÜRGENSEN, the maps of the Second Thule Expedition on the basis of the observations made on that expedition. This was exceedingly useful to me, since all the weak points of the observations were revealed during the construction, and from this I benefited during the expedition in 1920—23.

After my return from the expedition in 1920—23 Dr. SVEN HEDIN, as stated above (p. 250), was so kind as to look through my cartographic observation material and to estimate its value in a report. As regards the publication of the map—it was meant to be published at the Generalstabens lithografiska Anstalt, Stockholm (leader: A. LAGRELIUS)—Dr. SVEN HEDIN recommended publication in various sheets on different scales according to the value of the observation material.

However, later the publication of the map was entrusted to the Topographic Department of the General Staff, Copenhagen, chief: Colonel JOHANSEN. According to his wish the whole material was published on a scale of 1:300,000 in uniform sheets, for it was his opinion that the value of the cartographic material would appear from the map itself and from the number of observation stations in connection with the expedition report.

As a whole the aims of the Jubilee Expedition 1920—23 were attained. It cannot be denied, however,—and this appears very distinctly from the maps—that in many places the observation material was slight or insufficient or observations were entirely lacking. I shall mention some of the weakest points.

1) In 1921, after a long period of fine weather, a change set in about the middle of May, the weather during the rest of the month being very rough with continuous gales, fog, and snow. Since contrary to expectation we failed to secure any musk-oxen at Kap Morris Jesup and the dogs' food we carried had been calculated to suffice only thus far, we lost about half the number of our dogs on our continued journey southward to Herlufsholms Strand, where at last we had successful hunting. Thus from Kap Bridgman to near Kap København, that is so say practically along the whole stretch of the east coast of Peary Land covered by J. P. KOCH in 1907, I had to refrain from every attempt at mapping.

2) In 1921, during our stay on Vildt Land and Adam Bierings Land in the month of July, we secured only two musk-oxen, which meant that the return journey across the inland ice even from the start was made under the scourge of hunger. Thus it presented too great a risk to map the edge of the inland ice from Kap Gleerup to the northern part of Freuchens Land, as it was situated too far from the

route. I had to be satisfied to ascertain a depression extending from Wandels Dal towards J. P. Kochs Fjord, but the northern and central parts of the supposed Peary Channel were not mapped.

3) In 1922, on May 29th, I reached my aforementioned depot at Kap Brevoort. Some few hours after our arrival a storm broke out, and after being storm-bound for eight days, we had to return southwards again. The depot was intended to serve on a journey as far as Frankfield Fjord, where I had made some observations the previous year, but it had been impossible for me to make a real survey of the north coast of Nyeboes Land.

4) I had no opportunity of surveying the interior of Newman Bugt and the edge of the inland ice round its head and across to Kap Holtedahl.

5) The coast between Kap Brevoort and Kap Calhoun had to be mapped from stations on the sea ice very near the coast. If it had been possible to start at an earlier date in 1922, I might have established some observation stations at greater distances from the coast and thus have obtained a greater reliability of the cartographic material, and I would have been able to map a greater portion of the hinterland.

6) In October, 1920, I made a journey from my headquarters across the inland ice to the Hiawatha Gl., but the sun was then too low in the horizon for observations to be taken. In 1922 I repeated the journey in September; severe cold in connection with the low sun impeded the observations; but it was my only chance of determining the edge of the inland ice along that stretch[1]).

7) In 1922 as well as in 1923 during my mapping of the outer part of the Kap York district[2]) I was much impeded by the lack of a

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[1]) Mr. J. W. WRIGHT (Medd. om Grønl. Bd. 125, Nr. 3, 1939, Map 1) has published a correction to the position of the edge of the inland ice on Inglefield Land between 67° and 71° W. long., since according to his observations it was placed too far northward on my map. According to a letter to me dated November 11th, 1938, Mr. WRIGHT's corrections are based on two latitude determinations, one of which, at any rate, was very rough. As pointed out by me in my report on the expedition in 1921—24 (Medd. om Grønl. Bd. 70, pp. 203—206) my observations in this region were not satisfactory owing to the late season and intense cold. Very likely, therefore, the edge of the inland is situated some distance farther southward than indicated by me; however, I fully agree with Mr. WRIGHT in his statement (Op. cit. p. 8) that "the final decision rests with future surveyors in this region".

[2]) As regards the Kap York district, where in the years 1916, 1917, 1920, 1921, 1922, and 1923 I made many more journeys than are indicated on the maps, some few details have been inserted on the basis of rough observations, sketches, and photographs. As an example I may mention the small bay west of Uvdlisaitúnguaĸ west of the mouth of Granville Bay.

boat. I had to be content with taking observations from stations on land and on the sea ice, which reached only to the outermost capes; even a few stations from boat or ship would have given more reliable bearings to the outermost islands. On the "Godthaab" Expedition in 1928 some observations were at my request taken from the Hakluyt Ø in order to remedy the deficiency of the observations made (cf. Medd. om Grønl. Bd. 78, Nr. 1, pp. 59—60). In addition I had proposed to the "Godthaab" Expedition to make a survey of the Cary Islands. Personally I had been ashore one day in 1916 on one of the islands in company with PETER FREUCHEN, but owing to bad weather I was only able to take some few bearings but no astronomical observations.

On August 15th, 1928, a party of the "Godthaab" Expedition went ashore on "Bjørling's Island, the most easterly and the largest of the Cary Islands" (cf. RIIS-CARSTENSEN, 1931, pp. 61—62). The expedition found PETER FREUCHEN's and my note left there on August 1st, 1916. The party made some measurements by means of a theodolite, and after the return of the expedition I received from the leader of the expedition, Captain E. RIIS-CARSTENSEN, a map on which the Cary Islands were inserted in accordance with these measurements. Since my observations in 1916 were too incomplete to form the basis of any corrections of the map, the Cary Islands were indicated on my "Map of North Greenland" on the basis of the latest edition of the Admiralty map supplemented by the measurements made by the "Godthaab" Expedition. As regards later corrections and mapping of the Cary Islands the reader is referred to a paper by J. M. WORDIE (Geogr. Journ. Vol. XCII, No. 5, 1938, pp. 385—421, Cary Islands, pp. 392—395).

8) Owing to a sudden change of the weather from frost to thaw in 1923 I only managed to map the southern edge of the nunatak system that extends from the head of Wolstenholme Fjord towards the head of Olrik Fjord. The northern part of these nunataks has never been mapped and is not indicated on any map.

Pls. 1—11 will show the mapping work done by earlier expeditions and the mapping carried out by me.

The Jubilee Expedition and the Peary Channel.

After my journey around the north of Greenland in 1920—23 I sent home from Upernavik (February 1922) a report on the journey to the committee of the expedition and to the newspaper "Berlingske Tidende". In the latter report, after describing our ascent of a high mountain from whose peak we had a view across the large lake situated

in the supposed Peary Channel, I wrote as follows (translated from the Danish):

"A Great Moment.—The Riddle of the "Peary Channel" solved.

"One of the great moments of the expedition had come. Only the man who knows it by experience will understand that one willingly suffers great privations and hunger to experience such a moment. The whole western part of Peary Land lay extended like a map below us—to the north jagged glacier-covered alps, whose peaks reared into the clouds, to the south broad valleys abounding in game, and finally, to the west the large lake embedded in a huge ravine bounded by steep mountain walls. Far inland the ravine turned northward and was concealed from our eyes.

"The idea flashed through my mind that this must be the "Peary Channel", that this was the large ravine which PEARY had seen from the inland ice 28 years ago. One month later we were standing on the inland ice almost in the place where PEARY once stood, and here my supposition was confirmed.

"In a couple of places PEARY had been looking across the large frozen lake, and had been able to trace the depression from the Polar Sea across the country southward to Independence Fjord. He was fully justified in assuming that this depression was a channel, and we must admire the correctness with which PEARY has indicated the course of the large depression.

"Accordingly the Peary Channel is a valley from sea to sea with a huge lake, whose surface lies only about two hundred metres above the sea. The valley does not extend between Nordenskiölds Fjord and Independence Fjord, as assumed by PEARY on the basis of the imperfect maps of that time, but between J. P. Kochs Fjord and Brønlunds Fjord, and the latter fjords were not mapped by me till quite recently.

"The earlier Peary Channel, which thus proves to be a large valley, I called Wandels Dal, and the land north of it received the name Erlandsens Land, in memory of two Danish men whose interest in the exploration of Greenland is well-known."

During my return journey from the expedition I stayed in July, 1923, in Godhavn, West Greenland, where I wrote a preliminary report on the results of the expedition, which was sent to the Geographical Society, London, and published in the Geographical Journal August, 1923 (Vol. LXII, No. 2, pp. 103—117). The Peary Channel is referred to as follows (pp. 107—108):

"The "Peary Channel".—In order to finish the survey of Independence Fiord I thought it desirable to climb the highest point here. Burdened with my instruments I set out accompanied by one of the

Eskimo. After a long and exhausting climb we reached the foot of the mountain. Down below us lay the valley dotted with lakes, and with extraordinarily luxuriant vegetation forming verdant oases. As we continued our way up, more and more land became visible. Only the view to the west, where I expected to see the inland ice, was still hidden by the hills. At last we reached the summit and at once exclaimed, "Taserssuak!"—a great lake. All Peary Land was laid bare before us like an enormous map. To the north high torn mountains with numerous glaciers, the highest peaks hidden in clouds; to the south big inviting valleys; and to the west the big lake in an enormous cañon, surrounded by ragged hill-slopes. Far into the country the cañon turned northward and vanished from our sight. Like a flash it struck me: This is the Peary Channel. This must be the great depression seen by Peary from the ice-cap twenty-eight years ago. One month later I stood on the ice-cap myself approximately where Peary had stood, and my supposition proved to be correct. From different locations Peary had been able to see the big frozen lake and to follow the depression in the surface of the land leading from the Polar Sea to the head of Independence Fiord. Peary thus was fully justified in believing that this depression meant a channel, and it is most admirable to see the approximate correctness with which he indicates its course.

"The "Peary Channel" is a big valley from sea to sea, partly filled up by a lake, the surface of which is about 200 metres above sea-level. The valley does not, however, connect Nordenskiöld Fiord with Independence Fiord, as Peary according to the imperfect maps of his time believed, but J. P. Koch Fiord with Jörgen Brönlund Fiord, and these I have only recently mapped myself.

"I gave the valley the name of Rear-Admiral[1]) C. F. Wandel, president of the committee in charge of my expedition, and the land north of it I named Erlandsen Land in honour of the zealous patron of my work, Mr. Erlandsen of Copenhagen."

In a section entitled "History of "Peary Channel"" (pp. 112—116 I gave an account of the history of the Peary Channel, concluding as follows (pp. 114—115):

"As so often before in the history of geographical discovery, an idea, a supposition, has caused a number of expeditions having the same aim but yielding very different results. Peary and Astrup detected the big depression separating the ice-free Peary Land from the ice-bound Greenland proper. Mylius Erichsen and Hagen stated the non-existence of a channel from the head of Independence Fiord, and their discovery was brought to light by Mikkelsen. Knud Rasmussen and Freuchen mapped Valmuedalen, but did not find the big depression of

[1]) Vice-Admiral.

Peary; and Knud Rasmussen and Lauge Koch surveyed Nordenskiöld Fiord and found it filled by an enormous glacier. Each time people said: "The Peary Channel does not exist"; even the great depression they could not find again. Nevertheless Peary's statement was largely correct; the great depression connecting the fiords of the north coast with Independence Fiord does exist. Only it does not connect Nordenskiöld Fiord with the extreme head of Independence Fiord, but rather J. P. Koch Fiord—not known at all to Peary—with Brönlund Fiord, of which he had seen the outlet only from a great distance. Between these fiords a big and broad valley—Wandel Valley—extends with a long and narrow lake in its central parts."

In February, 1923, I published in "Naturens Verden" (pp. 49—76) an article, in which the section dealing with the history of the Peary Channel is essentially the same as that quoted above from the Geographical Journal.

In 1924 I published two almost identical articles, viz. in Geografisk Tidsskrift (Bd. 27, Hft. VII, pp. 207—218), in which the work of all earlier cartographers in North Greenland, notably that of PEARY, is discussed; as to the Peary Channel, reference is made to my aforementioned article in "Naturens Verden". The other article was published in The Geographical Journal (Vol. LXIV, No. 1, July 1924, pp. 6—17). As regards the Peary Channel I say as follows (p. 13): ". . . but when penetrating into the fjord," (viz. Brønlund Fjord) "we soon discovered that the way to the inland ice was barred by vast hitherto unknown districts, and here we happened to make one of the greatest discoveries during the expedition, as we succeeded in re-discovering Peary Channel. About this discovery I have already told you in an article in the *Journal* of this society (62, 103, Aug. 1923)."

In the winter of 1924—25 I visited America, and naturally could not fail to notice that my view of PEARY's mapping of North Greenland had aroused a great interest. At the request of the American Geographical Society, after my return from America I wrote an article entitled "The Question of Peary Channel" (Geogr. Review, Vol. XV, No. 4, October 1925, pp. 643—649). The article ends as follows (p. 649):

"When now, on the basis of my map, we recapitulate the history of Peary Channel we see that the sketch Peary brought home was substantially correct with regard to almost all points in the environs of Navy Cliff, PEARY's only real cartographical station during his journey; and further we see that Peary marked the drainage area as a channel. On my map we find Peary's four glaciers. Two of these descend into very low-lying lakes, the third is drained northward through Brønlund Fjord like the two first mentioned, and the fourth, first discovered by

Mylius Erichsen and by him called Marie Sophie Glacier, debouches into the head of Independence Fjord. Light on the way in which Peary's mistakes arose is gained by noting that he drew the coast east of Cape Glacier in a southeastward direction. From Navy Cliff he saw what he called Academy Land. On his map we find the two small local ice caps that exist here; but, as Peary stood only at a height of 890 meters, and the mountains surrounding Cape Glacier were at least 100 meters higher, and the top of the northern ice cap another 100 meters higher, he naturally got the impression that the coast turned southeastward behind the northern ice cap, where a great valley extends in that direction. This idea was confirmed when from Navy Cliff he looked southeastward across a plateau with local ice caps and in several places far away saw land, probably situated behind Hagen's Fjord and around the head of Independence Fjord.

"In conclusion I would emphasize the high quality of Peary's sketch map, and the justification for his assumption of the insularity of the land he discovered—land which now properly bears his name. Morphologically it may be regarded as an island, though it is not separated from Greenland by a channel but by a broad low depression that perhaps once after the glacial period, when the land was less high, was actually submerged."

Maps of the Bicentenary Jubilee Expedition.

1) Map accompanying LAUGE KOCH: Resultaterne af Jubilæumsekspeditionen Nord om Grønland i 1921. Naturens Verden, Copenhagen, February, 1923, pp. 49—76.

Small-scale map, uncoloured, showing the travelling route of LAUGE KOCH of 1921 and of the cartographic discoveries made during the journey in the area round Wandels Dal. This valley is bounded on the south by the inland ice, to the north by a local ice cap extending from some distance east of J. P. Kochs Fjord to some distance south of De Long Fjord and to a little north of the large lake in Wandels Dal.

2) Map entitled "Lauge Koch's routes in Northern Greenland, 1921", accompanying "Preliminary Report on the Results of the Danish Bicentenary Expedition to North Greenland". Geogr. Journ. Vol. LXII, No. 2, August 1923, pp. 103—117, map p. 105.

A small-scale map, uncoloured, showing travelling route and areas surveyed in 1921. Wandels Dal is shown to extend from J. P. Kochs Fjord to the lake west of Brønlunds Fjord, and the boundary of the inland ice is indicated as far as Wandels Dal. An ice cap is indicated east of J. P. Kochs Fjord connected with an ice-cap south of De Long

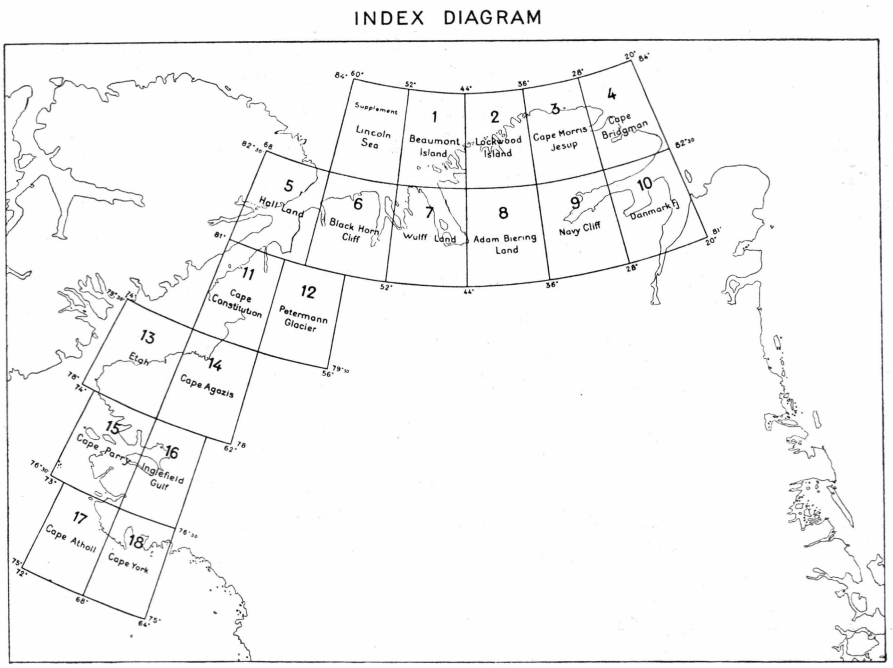

Fig. 29. Index diagram showing the area comprised by "Map of North Greenland" (1932).

Fjord, the latter extending to some distance north of the lake in Wandels Dal.

3) Map entitled "Sketch map to illustrate Dr. Lauge Koch's journeys in North Greenland", accompanying an article entitled "North of Greenland" by Lauge Koch, Geogr. Journal, Vol. LXIV, No. 1, July 1924, pp. 6—17, map p. 8.

Uncoloured small-scale map, travelling routes not indicated. Only the regions round Wandels Dal are in accordance with the map of 1923 (Geogr. Journ.), other areas surveyed by the expedition, e. g. Washington Land, Victoria Fjord, etc., not yet corrected.

4) Map entitled "Kort over de i Teksten omtalte Lokaliteter med Jubilæumsekspeditionens Rute 1921", accompanying report entitled "De videnskabelige Resultater af Jubilæumsekspeditionen nord om Grønland", Geogr. Tidsskr. Bd. 27, Hft. VII, 1924, fig. 1.

Inland ice and land areas are indicated, the latter shaded. The corrections in the available maps resulting from the expedition are inserted; thus the inland ice extends to some distance southwest of Wandels Dal, while north of Wandels Dal no ice caps but only land is indicated.

5) Map accompanying Lauge Koch's popular report on the expedition, "Nord om Grønland", published 1925.

A small-scale map, uncoloured, showing inland ice and land areas (shaded), the travelling route of 1921, and all the corrections of the available maps made by the expedition. The edge of the inland ice is indicated from the head of J. P. Kochs Fjord southwards to Wandels Dal. The mountain Nordkronen is marked on Peary Land, but no ice caps are shown.

Two small inset maps showing inland ice and land areas in black representing North Greenland before and after LAUGE KOCH's mapping and Denmark on the same scale.

The same map, with the same inset maps, but on a reduced scale is found in a German edition of the book, published 1927.

The map is likewise found in the French edition published 1928. An inset map shows the whole route of the expedition from Copenhagen to and including the north coast of Greenland. The French edition of the book further contains a map of the whole of Greenland on which the geographical results of the Expedition are indicated, in all essentials correctly; it should be noted, however, that the two lastnamed maps were published without my knowledge and without having been shown to me beforehand.

6) Map accompanying "Report on the Danish Bicentenary Jubilee Expedition North of Greenland 1920—23". Medd. om Grønl. Bd. LXX, Pl. 6, 1926[1]).

Map of northern Greenland, scale 1:2,000,000, showing the travelling route of 1921, inland ice, and land areas. The inland ice is shown to extend to, and to be connected with, the ice cap on Freuchens Land, but the boundary between the inland ice and the ice-free Peary Land is not indicated.

7) The final maps of the expedition, incorporated with the results of the 2nd Thule Expedition, were published in 1932 entitled "Map of North Greenland, Scale 1:300,000, surveyed by Lauge Koch in the years 1917—23. Published by the Geodetic Institute of Denmark".

The atlas consists of 18 sheets, printed in 10 colours, showing travelling routes in red. On sheet No. 8, Adam Bierings Land, the boundary between the inland ice and the ice-free Peary Land it not indicated. Various revisions of the cartographic material of the 2nd Thule Expedition are incorporated in the maps (cf. above).

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[1]) A good synopsis of the mapping of Northeast Greenland is given by Commander F. H. TRAP, R. N. (Greenland, vol. I, pp. 174—179, Copenhagen and London 1928).

IV.

DANISH EXPEDITIONS TO EAST AND NORTH GREENLAND (NORTH OF 79° N. LAT.) SECOND PERIOD 1933–38

RECENT MAPPING OF EAST GREENLAND BETWEEN 68° AND 83° N. LAT.

After 1923 there was a pause in the mapping of North Greenland north of 79° N. lat. However, from 1926 a lively activity set in from various quarters in the central part of East Greenland, and in 1933 this activity was extended to the regions north of 79° N. lat. also. As these investigations north of 79° N. lat. formed part of the East Greenland investigations, I shall here briefly summarise the exploration activity in East Greenland.

A comprehensive account of the mapping of East Greenland from early times to and including the Danmark Expedition has been given by AMDRUP (M. o. G. Bd. 41, 1913, pp. 11—35). As a continuation of the Danmark Expedition there followed EJNAR MIKKELSEN's expedition 1909—12 (cf. p. 190) and J. P. KOCH and WEGENER's crossing of the inland ice to the west coast in 1912—13 (cf. M. o. G. Bd. 75). During the last-named expedition various mapping work was executed around the interior of Dove Bugt and on Dronning Louises Land.

Professor J. B. CHARCOT, who had visited Scoresby Sund in 1925, during the succeeding years, until his tragic death near Iceland in the autumn of 1936, led French ship expeditions to East Greenland, mostly Scoresby Sund, almost every summer, chiefly with hydrographic and geological objects, and a scientific station under his leadership was established in Scoresby Sund in 1932—33. British expeditions under J. M. WORDIE were at work in the northern part of the area, and under H. G. WATKINS, M. LINDSAY, and L. R. WAGER in the southern area. Norwegian expeditions under the leadership of A. HOEL and K. ORVIN did various scientific work chiefly in the area between Franz Joseph Fjord and Sabine Ø. American expeditions under the leadership of Miss LOUISE A. BOYD had mostly hydrographic objects, but also did some topographical detail mapping of certain areas. Mention should finally be made of the flight made by the German Commander W. VON GRONAU from the east coast of Greenland across the inland ice to the

west coast, and the flight made by the American Colonel C. LINDBERGH from the west coast to the east coast of Greenland and his subsequent flights along the east coast.

Of Danish expeditions EJNAR MIKKELSEN's (1932) and KNUD RASMUSSEN's summer expeditions to the area south of Scoresby Sound (1933) and ALWIN PEDERSEN's (1927—28) and E. KNUTH's (1938—39) wintering expeditions should be mentioned. In the years 1926—38 Danish expeditions to East Greenland were made every year except in 1928 and 1935 under the leadership of the present author. A geologist with one assistant spent the winter of 1938—39 in East Greenland to continue our work up there, but from the autumn of 1939 nearly all expedition activity stopped owing to the impending war.

The period 1926—39 may naturally be divided into two sections, viz. the period 1926—32, characterised by a number of expeditions which mostly did exploration and mapping work within restricted areas. The period closed with the beginning of the Danish Three-Year Expedition in 1931, when a systematic cartographical survey of the whole area between 72° and 76° N. lat. was initiated. The work was carried out by the personnel of the Geodetic Institute of Copenhagen.

The period 1932—38 was characterised by a lively systematic activity from the air, during which mapping of large areas was completed by means of aerial photography.

In the subjoined list of American, British, Danish, German, and Norwegian expeditions to East Greenland only such will be mentioned as did survey work.

1926.

A **British** summer expedition under J. M. WORDIE did survey work in the area between Sabine Ø and Traill Ø.

J. M. WORDIE: The Cambridge Expedition to East Greenland in 1926. Geogr. Journ. Vol. LXX, 1927, pp. 225—265. Detail map of Sabine Island and Little Pendulum Island (p. 228). The Coast Region of East Greenland between Davy Sound and Little Pendulum Island. Scale 1:1,000,000 (facing p. 320).

1926—27.

A **Danish** expedition, under the present author, wintered in Scoresby Sund. In the autumn of 1926 a sledge journey was made from Scoresby Sund to Myggbukta near Hold-with-Hope and back, and next spring another sledge journey from Scoresby Sund to Danmarks Havn and back. Though the object of the journeys was geological investigation, various minor corrections in the map were made, and the two geologists which were at work on Jameson Land and Milne Land likewise inserted various details in the maps.

Lauge Koch: Geology of East Greenland, M. o. Gr. Bd. LXXIII[II], pp. 1—204, including: Alfred Rosenkrantz: Preliminary Account of the Geology of the Scoresby Sound Distict (pp. 135—154). With four geological maps of East Greenland.

Alfred Rosenkrantz: The Lower Jurassic Rocks of East Greenland. Part I. Map: Pl. 1, Map of Jameson Land and Liverpool Land, based on J. P. Koch's map of 1902 (Medd. om Grønl. Bd. XXVII) and the map of East Greenland published in 1932 by the Geodetic Institute, Copenhagen. M. o. G. Bd. 110, Nr. 1. 1934.

1928.

The **Danish** zoologist Alwin Pedersen made a sledge journey to Nordvestfjord in the interior of Scoresby Sund and indicated certain corrections to be made in the map of that part of the fjord.

Alwin Pedersen: Der Scoresbysund. Berlin 1930, pp. 1—155. Mit 56 Abbildungen und einer Karte.

1929.

A **British** ship expedition under the leadership of J. M. Wordie did survey work chiefly near the head of Franz Joseph Fjord, and an ascent was made of Petermanns Bjærg.

J. M. Wordie: Cambridge East Greenland Expedition, 1929. Ascent of Petermann Peak. Geogr. Journ. Vol. LXXV, No. 6, June 1930, pp. 491—504. Map: Nordenskiöld Glacier and Petermann Peak, from a Survey by R. C. Wakefield & A. Courtauld (opposite p. 568). Scale 1:250,000.

A **Danish** summer expedition to East Greenland led by the present author. Mapping work was done by Backlund, Seidenfaden, and Koch. Mapping of Ymer Ø and of Dusén Fjord.

Lauge Koch: Notes on the Map of Dusén Fjord. Map p. 387, Dusén Fjord, Surveyed by Lauge Koch 1929. M. o. G.r Bd. LXXIV, pp. 383—394. 1930.

A **Norwegian** summer expedition under the leadership of K. Orvin. Made preparations for a survey of the coast-line from Sabine Ø to Geographical Society Ø and the greater part of Hudson Land. (Cf. Norges Svalb. Ish. Skr. Nr. 73, pp. 14—17, 71—72, and 109).

1930.

In the summer of 1930 a large **English** expedition under the leadership of H. G. Watkins set out for Angmagssalik on board the steamer "Quest". In the late summer Kangerdlugssuak Fjord was explored and mapped, and air-photographs were taken of the region north of the

fjord. The actual working-field of the expedition was situated farther southward. The expedition remained in East Greenland during the winter.

H. G. WATKINS: The British Arctic air-route Expedition. Geogr. Journ. Vol. LXXIX No. 5, May 1932, pp. 353—367, and No. 6, June 1932, pp. 466—496, discussion pp. 497—501. Map: Kangerdlugssuak. From a survey by the British Arctic Air Route Expedition August 1930. Scale 1:400,000. Opposite p. 544. And: East Coast of Greenland, from Ikersuak to Umivik Bay, Surveyed during the Seventh Journey of the British Arctic Air Route Expedition 1931. Scale 1:500,000. Opp. p. 544.

A. STEPHENSON: Kangerdlugssuaq and Mount Forel: Two Journeys on the British Arctic Air Route Expedition. Geogr. Journ. Vol. LXXX No. 1, July 1932, pp. 1—30. Map opposite p. 96, East Coast of Greenland from Latitude 66° N. to 68° N. Scale 1:750,000.

A **Danish** summer expedition, leader LAUGE KOCH, in the s. s. *Godthaab*. The objects of the expedition were principally geologic-topographical. Survey work was done by several members of the expedition.

LAUGE KOCH: Carboniferous and Triassic Stratigraphy of East Greenland. M. o. Gr. Bd. 83, Nr. 2. 1931. Maps: Pl. I. Cape Stosch and Vicinity. Topographically and geologically mapped by Lauge Koch, assisted by A. Noe-Nygaard and R. Bøgvad, 1930. Scale 1:100,000.—Pl. III. Map of the 501 m Plateau South of C. Stosch, showing the fossil localities and the conglomeratic beds. Surveyed by Lauge Koch 1930.—Pl. IV. Sketch-map of Mt. Brinkley and Surroundings. Topographically and geologically mapped in 1930 by L. Koch assisted by G. Seidenfaden and A. Noe-Nygaard. Corrected in 1931 by G. Säve-Söderbergh and D. Malmqvist.—Pl. VI. Sketch-Map of Margrethe Valley and Vicinity. Topographically and geologically mapped 1930 by Lauge Koch, assisted by A. Noe-Nygaard and R. Bøgvad.

GUNNAR SEIDENFADEN: Notes on a Map of East Greenland from 73°00′ to 74°50′ N. lat. Map of East-Greenland 73°00′—74°50′ N. lat. Based upon the previous maps and the surveys of the Danish expeditions 1926—30 by Helge Backlund, Lauge Koch and Gunnar Seidenfaden. Scale 1:500,000. M. o. Gr. Bd. 87, Nr. 3. 1931.

HELGE G. BACKLUND: Das Alter des "Metamorphen Komplexes" von Franz Josef Fjord in Ost-Grönland. Wordie Gletscher und Umgebungen. Topographische Unterlage laut Triangulationen und Messungen von H. G. Backlund, G. Seidenfaden u. M. Grotewahl 1930; Geologie und Oberflächenbeschaffenheit laut Begehungen von H. G. Backlund 1929 und 1930; zusammengestellt von H. G. Backlund 1931. Scale 1:150,000.—Innere Teile des Moschusochs-Fjords. Topographische Unterlage laut Triangulationen und Messungen von H. Backlund, G. Seidenfaden und A. Noe-Nygaard 1929 und 1930; Geologie und Oberflächenbeschaffenheit laut Begehungen von H. Backlund und A. Noe-Nygaard 1929 und 1930; tektonische Leitlinien nach Beobachtungen von H. Backlund; zusammengestellt von H. G. Backlund 1931. Scale 1:150,000. M. o. Gr. Bd. 87, Nr. 4. 1932.

HELGE G. BACKLUND und D. MALMQVIST: Zur Geologie und Petrographie der nordostgrönländischen Basaltformation. Teil I. Die Basische Reihe. Map: Östlicher Teil der Clavering Insel. Scale 1:100,000. Topographische Unterlage laut Triangulationen und Messungen von H. Backlund, Lauge Koch, G. Seidenfaden und A. Noe-Nygaard 1929 und 1930, und Seidenfaden 1931. Geologie und Oberflächenbeschaffen-

heit laut Begehungen von H. Backlund und A. Noe-Nygaard 1929 und 1930 samt Noe-Nygaard und Söderbergh 1931. Zusammengestellt von H. G. Backlund 1932. Tektonische Leitlinien zusammengestellt von H. G. Backlund 1932. M. o. Gr. Bd. 87, Nr. 5. 1932.

A **Norwegian** summer expedition, Leader A. HOEL. The survey work commenced in 1929 was continued. (Cf. Skr. Svalb. Ish. Nr. 73, p. 20).

1931.

Miss LOUISE A. BOYD led an **American** summer expedition to East Greenland, which did survey work in the interior of Franz Joseph Fjord. (For the results, see below (1933)).

The **British** Arctic Air-Route Expedition under WATKINS (cf. above) continued its work during the summer of 1931.

The **Danish** Three-Year Expedition to East Greenland 1931—34 under the leadership of the present author started in the summer of 1931 in the two steamers *Gustav Holm* and *Godthaab*. Two wintering stations, Eskimonæs and Ella Ø, and the two smaller stations Nordfjord and Kap Brown were established. Triangulation was commenced between 72° and 76° N. lat. The expedition numbered 65 men. The geologic-topographical work commenced in 1926, 1929, and 1930, was continued.

Maps: Østgrønland mellem 70° og 77° n. Br. Efter de nyeste Kilder, deri indbefattet Opmaalinger udført af Lauge Kochs sidste Ekspeditioner. Scale 1:1,000,000. Issued by the Geodetic Institute of Copenhagen, 1931.

Côte orientale du Groenland. Partie comprise entre 70° et 77° de latitude. D'après les sources les récentes, y compris les levés des dernières expéditions de Lauge Koch. Echelle 1:1,000,000.—Planches annexées au mémoire du gouvernement danois présenté à la cour permanente de justice internationale le 31 octobre 1931.

HANS FREBOLD: Grundzüge der tektonischen Entwickelung Ostgrönlands in postdevonischer Zeit. Map: Geologische Karte der Nordostküste des Young Inlet von HANS FREBOLD. Topographisch aufgenommen von GUNNAR SEIDENFADEN 1931. Scale 1:30,000.—M. o. Gr. Bd. 94, Nr. 2. 1932.

A. NOE-NYGAARD und G. SÄVE-SÖDERBERGH: Zur Stratigraphie der Nordostecke der Claveringinsel (Ostgrönland). Map: Geologische Karte der Nordostecke der Claveringinsel von A. Noe-Nygaard und G. Säve-Söderbergh. Topographische Unterlage von G. Seidenfaden. Scale 1:50,000. M. o. Gr. Bd. 94, Nr. 3. 1932.

HANS FREBOLD: Zur Kenntnis der oberkarbonischen Sedimente der westlichen Clavering Insel, Ostgrönland. Map: Geologische Kartenskizze des östlichen Teils des oberkarbonischen Sedimentgebietes W. Clavering Insel. Scale 1:100,000. M. o. Gr. Bd. 94, Nr. 6. 1932.

On August 15th, 1931, the **German** Commander W. VON GRONAU, after flying from Germany via the Faroes and Iceland to Scoresby Sund,

started on a flight across the inland ice to Sukkertoppen on the west coast. From Kap Hope near Scoresby Sund he took the route across Jameson Land to the interior of Gaasefjord before crossing the ice-cap. A number of hitherto unknown nunataks south and west of Scoresby Sund were discovered.

A **Norwegian** expedition under the leadership of A. HOEL. Various surveys were made between Foster Bugt and Kap Herschel and northward to Home Forland. (Cf. Skr. Svalb. Ish. Nr. 73, pp. 28—30.)

Maps: Austgrønland. East Greenland. Eirik Raudes Land frå Sofiasund til Youngsund. Målestokk 1:200,000. Mælingar av Norges Svalbard- og Ishavs-Undersøkelser 1929, 1931. Oslo 1932.

Norges Svalbard- og Ishavs-Undersøkelser (1932). Eirik-Raudes-Land. Carte dressée par Norges Svalbard- og Ishavs-Undersøkelser. Echelle de 1:1,000,000.

The two **Norwegians**, A. HØYGAARD and M. MEHREN, made a crossing by dog-sledge of the inland ice from Kamarujuk Gl. in West Greenland to the east coast, where they descended from the inland ice by way of Waltershausen Gl. and Adolf Hoel Gl. to Nordfjord.

ARNE HØYGAARD og MARTIN MEHREN. "Ajungilak" eller Grønland på Tvers. Pp. i—xv + 1—151. Ill. Oslo 1931.—Kartskisse over Landet nordvest for Frans Josefs Fjord, optat av Mehren og Høygaards Grønlandsekspedisjon Sommeren 1931. 1:1,000,000.

ARNE HØYGAARD og MARTIN MEHREN: Tvers over Grønlands innlandsis. Map: Kortskisse over Landet nordvest for Frans Josefs Fjord optatt av Mehren og Høygaards Grönlandsekspedisjon Sommeren 1931. Scale: 1:1,000,000.—Norsk Geogr. Tidsskr. Bd. IV, Hft. 1—3, pp. 1—14. 1932.

1932.

A **Danish** summer expedition, under the leadership of EJNAR MIKKELSEN, did survey work and trigonometric measurements along the stretch from Kap Dalton to Kangerdlugssuak.

EJNAR MIKKELSEN: Report on the Expedition. Map: Kort over Østgrønlands Kystlinie mellem 68°00′ n. Br. og 69°30′ n. Br. Opmaalt under Ejnar Mikkelsens Ekspedition 1932 af Geodætisk Institut. M. o. Gr. Bd. 104, Nr. 1. 1933.

MICHAEL SPENDER: Map-Making during the Expedition. Maps: Pl. 1, Map of the coast of East Greenland between 68°00′ N. and 69°30′ N., showing districts surveyed by The Scoresby Sound Committee's 2nd East Greenland Expedition 1932 led by Captain Ejnar Mikkelsen. Pl. 2, Kangerdlugssuak. From a terrestrial photogrammetric survey made by the Expedition under Captain Ejnar Mikkelsen's leadership (Spender and Larsson) and plotted at the Geodetic Institute. Scale: 1:200,000. —M. o. Gr. Bd. 104, Nr. 2. 1933.

In the summer of 1932 the **Danish** Three-Year Expedition continued its work, with the two ships s. s. *Gustav Holm* and s. s. *Godthaab*, each

equipped with a seaplane. During the winter 16 persons had stayed in East Greenland, four of whom were cartographers. The summer staff included 95 members, of whom 8 were cartographers, 14 air-plane personnel, including air photographers. A new station, Kulhuse, on Hochstetter Forland was erected.

HANS FREBOLD: Geologie der Jurakohlen des nördlichen Ostgrönland. Map: Geologische Kartenskizze des südlichen Teils von Hochstetter Vorland. Kartengrundlage von Gunnar Seidenfaden. M. o. Gr. Bd. 84, Nr. 5. 1932.

A. NOE-NYGAARD: Stratigraphical outlines of the area round Fleming Inlet (East Greenland). Map of Wegener Peninsula and surrounding regions, "Geologically mapped by A. Noe-Nygaard 1931—32. Topographical substratum partly after J. P. KOCH, with corrections by A. Noe-Nygaard." Scale 1:200,000.—M. o. Gr. Bd. 103, Nr. 1. 1934.

R. SPÄRCK: Contributions to the Animal Ecology of the Franz Joseph Fjord, and Adjacent East Greenland Waters. I—II. Chart showing the bathymetrical survey in East Greenland during the summer of 1932, conducted by Dr. R. SPÄRCK. Chart showing temperature conditions at the bottom of Franz Joseph Fjord and the biological-hydrographical stations of the Danish survey in East Greenland 1932 conducted by Dr. R. SPÄRCK. M. o. Gr. Bd. 100, Nr. 1. 1933.

A **Norwegian** summer expedition led by K. ORVIN. Two airplanes. Air-survey of the area from Traill Ø and Suess Land in the southwest to Sabine Ø and Kuhn Ø in the northeast. (Cf. Skr. Svalb. Ish. Nr. 73, pp. 37—43.)

OTTO LACMANN: Karte von Nordostgrönland, Blatt Claveringöya, Jordan Hill und Geographical Society-Öya. Mit einem Geleitwort von Prof. Dr. Ing. Otto Lacmann. Norges Svalb. Ish. Undersökelser 1937. Scale 1:100,000.

1933.

An **American** summer expedition under the leadership of Miss LOUISE A. BOYD continued the survey work commenced on the expedition in 1931.

The Fiord Region of East Greenland. By Louise A. Boyd with contributions by J. Harlen Bertz, O. M. Müller, Walter A. Wood, William B. Drew, Charles B. Hitchcock, and John K. Wright. New York 1935.—American Geogr. Society. Special Publications No. 118. (Several maps).

The **Danish** Seventh Thule Expedition, leader KNUD RASMUSSEN, extended its working field to the area north of Kangerdlugssuaq (cf. C. C. A. GABEL- JØRGENSEN, Report on the Expedition. M. o. G. Bd. 106, Nr. 1, 1940, pp. 133—263). The ship of the expedition stayed in Mikis Fjord, a little north of Kangerdlugssuaq, from August 19th to September 7th; the leader of the expedition made a motorboat journey to Scoresby Sund and back to Mikis Fjord. Fig. 30 is a copy of Fig. 61 of the paper just cited showing the air-photo routes carried out in 1933. As a result of the

mapping work done by the expedition north of Kangerdlugssuaq the map-sheets 68, [1], [2], [3], (cf. Geogr. Tidsskr. Bd. 42, Pl. 4) published by the Geodetic Institute of Copenhagen, are available.

The **Danish** Three-Year Expedition. 19 persons, six of whom were cartographers, had continued the work during the winter of 1932—33.

In the summer of 1933 the vessels *Gustav Holm* and *Godthaab*, each equipped with a sea-plane, arrived to East Greenland. The expedition numbered 109 men, of whom 21 were cartographers and air-personnel, including air photographers.

HELGE G. BACKLUND und D. MALMÜVIST: Zur Geologie und Petrographie der Nordostgrönländischen Basaltformation II. Die sauren Ergussgesteine von Kap Franklin. Map: Geologische Skizze von Kap Franklin. Topographie nach JOHANSEN und DEVANTIER. Höhenschichtlinien je 100 m. Scale 1:100,000. M. o. Gr. Bd. 95, Nr. 3. 1935.

E. H. KRANCK: On the Crystalline Complex of Liverpool Land. Geological Map of the southern part of Liverpool Land. Cartographical corrections by H. G. BACKLUND. M. o. Gr. Bd. 95, Nr. 7. 1935.

G. SÄVE-SÖDERBERGH: Further Contributions to the Devonian Stratigraphy of East Greenland. II. Investigations on Gauss Peninsula during the summer of 1933. With an appendix: Notes on the Geology of the Passage Hills (East Greenland). Maps: Geological map of the Central Parts of Gauss Peninsula.Scale 1:100,000. "Geological map of the central parts of Gauss Peninsula. Geological features mostly after own direct field-observations; but in Mt. Ramsay and surroundings mainly after BACKLUND (1932); and in certain parts to the N. and S. of Mt. Harder after photographs taken from aeroplane by the mappers of the Danish East Greenland Expedition."

Geological map of the Passage Hills. Scale 1:100,000. "Triangulation, topography, and geology by the writer, except in the inner parts of the valley between Mt. Nordhoek and Plant Hill. Since a very accurate map of the whole working-area of the Expedition is to be published later by the Geodetic Institute, Copenhagen, I have thought it more appropriate not to give any preliminary determinations of the exact altitudes of the points used, which have thus only been numbered for the purpose of identification in the description and in the other plates (pls. 7, 8)."— M. o. Gr. Bd. 96, Nr. 2. 1934.

EIGIL NIELSEN: The Permian and Eotriassic Vertebrate-bearing Beds at Godthaab Gulf (East Greenland). Map: Geological Sketch Map of the Coast East of C. Stosch, East-Greenland. Topography based on the measurements of KOCH 1930 and NIELSEN 1932—33. Compiled by SEIDENFADEN 1934. Geological mapping by NIELSEN 1932—33. Scale c. 1:25,000. M. o. Gr. Bd. 98, Nr. 1. 1935.

HERMANN ALDINGER: Geologische Beobachtungen im oberen Jura des Scoresbysundes (Ostgrönland). Maps: Geologische Karte der Umgebung der Astartekløft in Jamesonland, Ostgrönland. Scale 1: 40,000. Southern part of Jameson Land, Scoresbysund. Worked out by G. SÄVE-SÖDERBERGH and GUNNAR SEIDENFADEN: Geological observations by G. SÄVE-SÖDERBERGH and H. ALDINGER. Scale 1:100,000. M. o. Gr. Bd. 99, Nr. 1. 1935.

G. THORSON: Contributions to the Animal Ecology of the Scoresby Sound Fjord Complex (East Greenland). Hydrography by H. USSING. Chart showing the Bathymetrical Conditions in the Scoresby Sound Fjord Complex (East Greenland).

Based upon the soundings taken from S/S "Godthaab" during the Danish expedition to East Greenland in the summer of 1933. Conducted by G. THORSON. Further the soundings from the Ryder and the Amdrup expeditions have been used (here marked with a circle). The different bathymetrical zones indicated in colour are based exclusively on the soundings given in the map. Storfjord after a sketch by H. BACKLUND. Soundings in metres. Scale 1:550,000. M. o. Gr. Bd. 100, Nr. 3. 1934.

GUNNAR SEIDENFADEN and THORV. SØRENSEN: The Vascular Plants of North-east Greenland from 74°30′ to 79°00′ N. lat. Map of Skærfjord, showing the situation

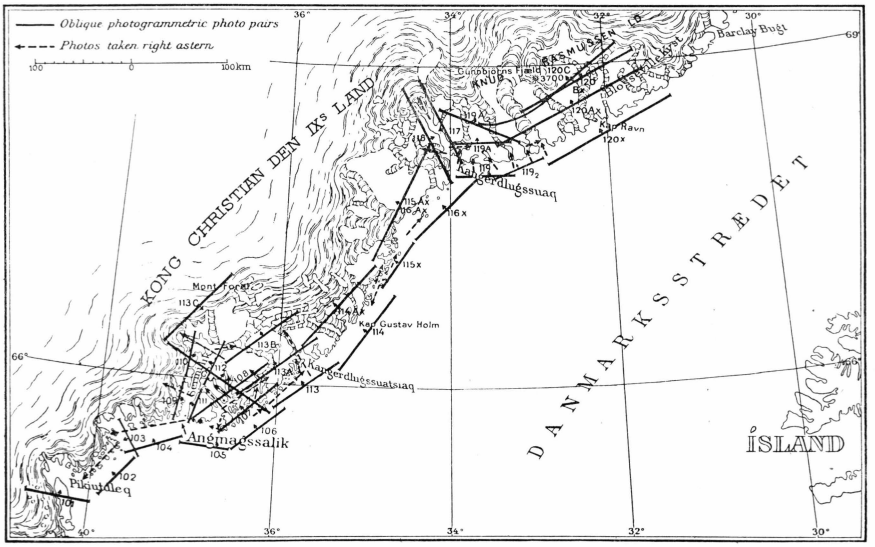


Fig. 30. Air-photo routes of the Seventh Thule Expedition 1933 (cf. the text).

of the localities. This map was constructed by MALMQVIST during his stay in the region in August, 1933, and contains a number of significant geographical corrections. We are very grateful to Dr. MALMQVIST for his kind permission to publish the map here for the first time. M. o. Gr. Bd. 101, Nr. 4. 1937, fig. 3, p. 20.

A **Norwegian** summer expedition, under the leadership of A. HOEL, continued the survey work done on the earlier Norwegian expeditions. (Cf. Skr. Svalb. Ish. Nr. 73, pp. 46—48). A summary of the topographic work done in the years 1929—33 is found in Skr. Svalb. Ish. Nr. 73, pp. 71—73. Cf. further pp. 109—111.

1934.

In the summer of 1934 the **British** Trans-Greenland Expedition, led by Lieutenant M. LINDSAY, made a crossing of the Greenland inland ice from a place near Jakobshavn on the west coast to the moun-

tains southwest of Scoresby Sund, and from here, having a view of the innermost nunataks, they continued their journey to a place near Mt. Forel and onwards to Angmagssalik. From the inland ice bearings were taken i. a. to the highest peak of Watkins Fjælde.

MARTIN LINDSAY: The British Trans-Greenland Expedition 1934.—Geogr. Journal, vol. LXXXV No. 5, May 1935, pp. 393—411. Ill. and vol. LXXXVI No. 3, Sept. 1935, pp. 235—252. Ill.—On pp. 236—37 the height of the highest peak of Watkins Fjælde is discussed; the height is stated to be: from Station 5. 13183 feet; from Station 7: 13032 feet; mean height: 13100 feet.

In the winter of 1933—34 13 persons, of whom 2 were cartographers, had been at work at the **Danish** stations in East Greenland. The summer expedition 1934, on board s. s. *Gustav Holm* (with one seaplane), was joined by 65 members, of whom 2 were cartographers, 3 airplane personnel. As the air-photography had been completed the preceding summer, no air-photographing and cartographic work from the air was done. Altogether the maps of the Geodetic Institute were now so far advanced that no topographic survey was made by the geologists this summer.

In 1934 the main objects of the seaplane were ice reconnaissance and geological reconnaissance. Fairly long flights for geological purposes were made by the geologists H. BACKLUND, H. BÜTLER, G. SÄVE-SÖDERBERGH, and E. WEGMANN. As the working field of the expedition did not extend beyond the stretch from Scoresby Sund to Danmarks Havn, no mapping was done that summer. Altogether about 8000 km were covered by the seaplane.

The summer expedition 1934 terminated the Danish Three-Year Expedition 1931—34. Its main cartographic object was a mapping of the area between 72° and 76° N. lat., executed by the personnel of the Danish Geodetic Institute, on a scale of 1:250,000, and a map on the same scale of the outer part of Scoresby Sund. In addition extensive areas were photographed from the air, thus the northern part of Jameson Land and the regions between Bessels Fjord and Danmarks Havn and portions of Dronning Louises Land (cf. N. E. NÖRLUND: Kortlægningen af Grønland og Island. With 5 figs. and 10 pls. Geogr. Tidsskr. Bd. 42, Juni 1939; and N. E. NØRLUND: The Survey Work of the Danish Geodetic Institute in Greenland and Iceland.—The Polar Record, No. 17, pp. 38—45. 1939).

1935.

No cartographical activity in East Greenland. A **Danish** expedition on board s. s. *Godthaab* with one seaplane, was equipped by the Geodetic Institute of Copenhagen for the purpose of mapping the interior of Scoresby Sund and photographing it from the air. However, owing to

very unfavourable ice conditions that summer the ship failed to penetrate the pack-ice belt.

The **Anglo-Danish** expedition to East Greenland 1935—36, under the leadership of L. R. WAGER, had geological and other scientific objects. The winter was spent near Kangerdlugssuak. In the summer

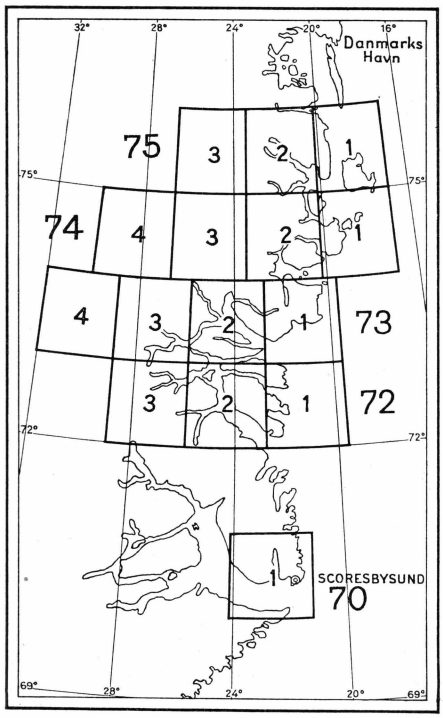


Fig. 31. Diagram showing the areas mapped by the Geodetic Institute of Copenhagen on the Danish Three-Year Expedition 1931—34.

of 1935 a party under A. COURTAULD made an ascent of the highest peak of Watkins Fjælde.

AUGUSTINE COURTAULD: A Journey in Rasmussen Land. With a map and illustrations. Geogr.-Journ., vol. 1 XXXVIII No. 3, Sept. 1936. — The map is based upon the air-survey of the Geoditic Institute of Copenhagen in 1933.

1936—38.

On the basis of the topographical maps surveyed on the Danish Three-Year Expedition 1931—34 by the staff of the Geodetic Institute of Copenhagen, which maps were now worked up but not yet published, a geological mapping was made of the outer part of the east coast of Greenland between 71° and 75° N. lat. under the leadership of the present author. Several geologist parties were at work from the **Danish**

stations Eskimonæs and Ella Ø during the three summers and in the winters of 1936—37 and 1937—38, the last-named year, in addition, from the stations Gurreholm and Scoresby Sund. Expedition ships: 1936 and 1937, s. s. *Gustav Holm*, 1938 s. s. *Godthaab*, with one seaplane. In the summer of 1938 all the leading geologists utilised the seaplane for a revision of their geological maps.

1938.

Miss LOUISE A. BOYD led an **American** summer expedition to East Greenland, chiefly with hydrographical objects, but some survey work was done in Dove Bugt.

A **Danish** expedition, "Dansk Nordøstgrønlands Ekspedition 1938—39 udsendt af Alf Trolle, Ebbe Munck og Eigil Knuth til Minde om Danmark Ekspeditionen" set out for Northeast Greenland to make geological, botanical, and archæological investigations of Kronprins Christians Land and Peary Land. Some cartographic corrections were made, i. a. of Ingolfs Fjord, which proved to extend some distance farther inland than previously assumed (cf. address to the kgl. Dansk Geografisk Selskab, Copenhagen, November 7th, 1939). The results of the expedition not yet published.

Danish air-expedition to Peary Land in April-May, led by the present author. Start by hydroplane from Copenhagen to Spitsbergen, whence two flights were made to the east coast of Greenland, the latter including a flight across Peary Land and Nordostrundingen (cf. below).

RECONNAISANCE MAPPING FROM THE AIR EXECUTED ON THE DANISH THREE-YEAR EXPEDITION TO EAST GREENLAND 1931–34

Introduction.

In 1932 the two seaplanes flew 156 hours 10 minutes; with an average rate of about 170 km an hour this amounts to somewhat more than 25,000 km. The total of flying hours in 1933 was 216 hours 50 minutes, corresponding to a distance of about 36,000 km. Thus altogether about 60,000 km were covered by seaplane during the two summers.

In the summers of 1932 and 1933 a number of flights were made, the principal object of which was to procure a provisional map of the east coast between 68° (Kangerdlugssuak) and 82° N. lat. (Peary Land) on the basis of the earlier maps. Nearly all these flights were made by Victor Petersen, air pilot, V. Kramme, radio operator, and myself as cartographer. In 1932 these flights extended over 51.5 hours, corresponding to a distance covered of about 8700 km, and in 1933 about 52.5 hours, corresponding to about 8800 km.

The routes of the flights are shown on Pls. 19 and 20 and are mentioned below.

A number of observations were made during the flights. Ice reconnaissance was often of great importance. Likewise a general view was obtained of various geological conditions, which observations were immediately placed at the disposal of the geologists. Finally, a number of police inspection tasks, relief of motorboats, transport of persons, etc., were carried out. By means of the aircraft the expedition attained an effectivity which would have been impossible without them.

The aircraft used for the flights was a three-seated seaplane of the Heinkel-type, built in Denmark and furnished with an English 460 HP Jaguar motor. We carried fuel for six hours, and generally flew at a speed of 170 km an hour. A strong wireless communicated with the ship during

the flights, and for use in case of a forced landing we further carried a short-wave transmitter, winter clothes, skis, provisions for three weeks, and a rifle. As a rule we flew at a height of 3000—4000 m, as registered by the four altimeters fitted in the plane. The greatest height attained was 4600 m. The cartographic work was done as follows. The route to be followed was marked on an aluminium plate on which all former discoveries had been inserted. The distance to be covered was indicated by a dot for every five minutes in calm weather, with deviations in case of windy weather. In addition to an instrument-board showing altitude, hour, compass direction, etc., instruments for taking bearings were placed on either side of my seat. Naturally, however, a great part of the mapping done on such a flight must be free-hand drawing, so the map cannot be published on too large a scale.

Originally the mapping work was planned in order to procure a uniform provisional map on a scale of 1:1,000,000 of the stretch between Scoresby Sund and Danmarks Havn to be used in the Hague arbitration case between Denmark and Norway about East Greenland, it being considered of very great importance that a general view of the hitherto unknown land areas and nunataks nearest the inland ice should be obtained even in 1932. Shortly after the return of the expedition a map was therefore published by the Geodetic Institute of Copenhagen, entitled "Østgrønland mellem 70° og 77° n. Br. Efter de nyeste Kilder, deri indbefattet Opmaalinger og Rekognosceringer udført af Lauge Koch i 1932. Maalestok 1:1,000,000." In 1933 this map was improved in several details, and the mapping was extended northward to Peary Land and southward to Kangerdlugssuaq.

A mapping of this nature, which, as far as is known to me, has not been done by anyone else, cannot, of course, claim to be very detailed. The map will naturally be especially good if the flight is made between two points already known and the weather is absolutely clear and calm. Before the start the wind in the higher atmospheric layers is as a rule an unknown factor and may of course cause some uncertainty. But as a rule the summer climate in Greenland is very clear, so that low clouds and fog will rarely cause any trouble. As the Geodetic Institute has now published its maps of considerable areas charted by me by the methods described above, the readers interested in the matter may make comparisons of the two maps.

In the autumn of 1933 Pls. 19 and 20 were drawn, it being the intention to publish them in colours. For various reasons this was not done, but on the East Greenland expeditions these maps had their great importance for the planning of the journeys and flights, and they likewise formed the basis of ice maps, and geological, botanical, and hydrographical working maps.



Fig. 32. The Danish station of Eskimonæs, base for the scientific work of the Danish expeditions 1931—34 and 1936—39. Similar stations: Scoresby Sund 1926—27 and 1937—38, Gurreholm 1937—38, Ella Ø 1931—34 and 1936—38, and Kulhuse 1932—33.

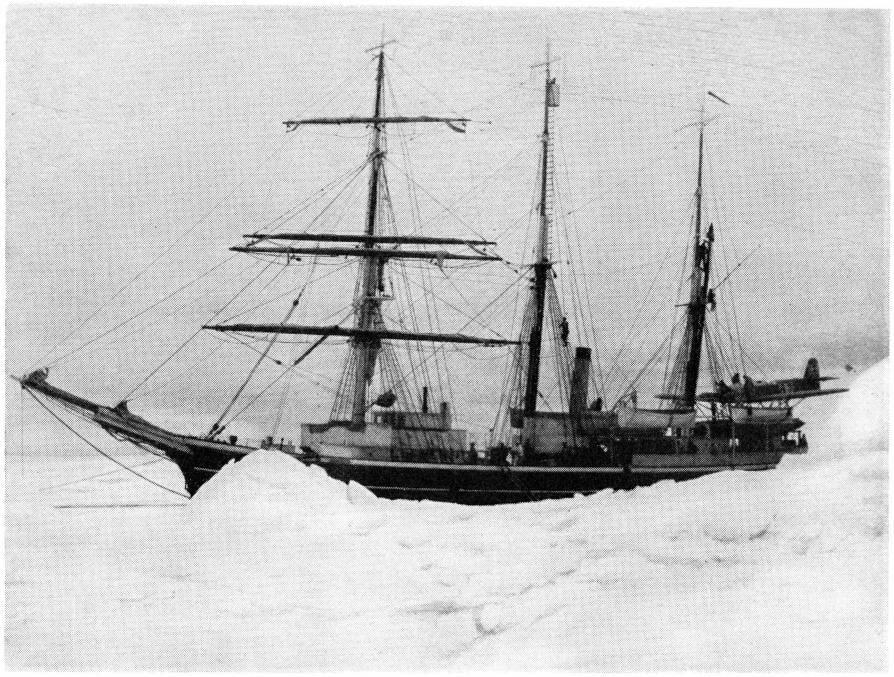


Fig. 33. S.S. *Gustav Holm*, my expedition ship in the years 1931, 1932, 1933, 1934, 1936 and 1937 (to East Greenland) and 1938 (to Spitsbergen).

Synopsis of the Flights in 1932 and 1933.

1932.

1) July 15th. O hours 55 min. Weather calm, cloudy. Start from open water near Bontekoe Ø, whence the course was laid to the coast of Myggbukta and onwards along the coast of Hold-with-Hope to Eskimonæs. Ice observations were sent by wireless to the ship during the flight.

2) July 17th. 4 hours 15 min. Clear weather, southeasterly wind force 2. Route of flight: Eskimonæs, Dronning Louises Land, Wordie Gl. and back to Eskimonæs. First long inland ice flight.

In the spring of 1932 Captain T. JOHANSEN, accompanied by a party of three, made a sledge journey from Eskimonæs, up Wordie Gl., across the inland ice to Bessels Fjord. When the expedition arrived at Eskimonæs in the summer of 1932, the cartographic results of this journey had not yet been computed, but a sketch map showing the route of the party was available (see Fig. 34). Furthermore JOHANSEN had inserted a couple of mountain peaks, which later proved to be situated in the southern part of Carlsbergfondets Land, whose southern limitation was unknown at that time.

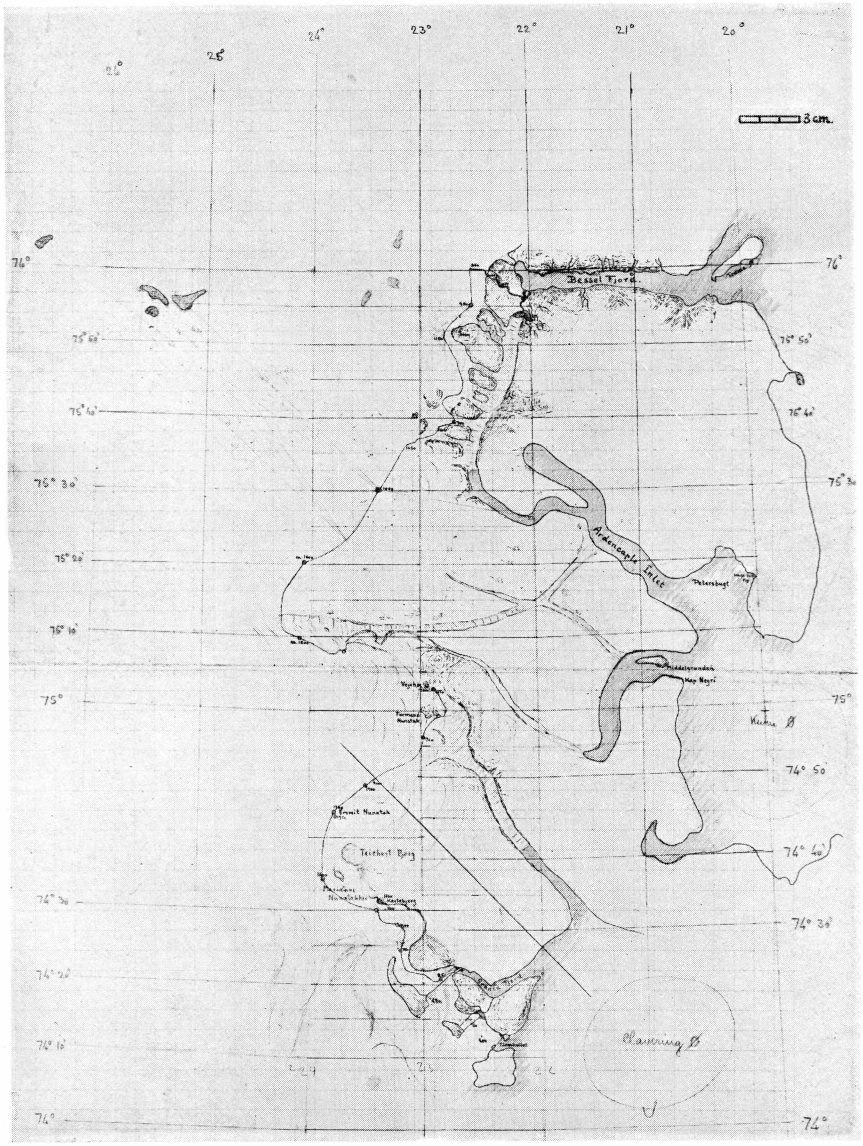


Fig. 34. Copy of the original map resulting from JOHANSEN's inland ice journey, handed over to me on July 15th, 1932.

3) July 21st. 3 hours 35 min. Clear weather, northwesterly wind force 4. Second large inland ice flight. Route of flight: from Eskimonæs westward to Hobbs Land, along the innermost nunataks to some distance south of Goudenoughs Land, thence to Kempes Fjord and onwards to Ella Ø. On this flight a general view was gained of the large nunatak systems which were partially seen and sketched by WORDIE in 1929 and by MEHREN and HØYGAARD in 1931. The flight was somewhat troubled

by rather heavy winds, but our position was determined by taking bearings to Petermanns Bjærg, which was distinctly visible during the whole flight, and to other known mountain peaks.

4) July 22nd. 1 hour 30 min. Light changing winds. Route of flight: from Ella Ø, through Sofia Sund, across Myggbukta and Loch Fyne to Eskimonæs.

5) July 28th. 4 hours 50 min. Almost calm, slightly overcast. From Eskimonæs across Wollaston Forland, along the outer coast of Store Koldewey to Danmarks Havn, where a short stay was made; onwards to Hvalrosodden, whence a direct course was laid to Kap Daly in Ardencaple Fjord, thence via Kap Giesecke in Tyroler Fjord and back to Eskimonæs.

The purpose of the first half of the flight was police inspection and ice observation. On the second half of the flight, in connection with flight No. 2, the interior of Kong Wilhelms Land was mapped.

6) July 30th. 2 hours 55 min. Slightly overcast, northwesterly wind force 2. From Eskimonæs almost directly towards Petermanns Bjærg, around this peak to Ella Ø. Across Hudson Land the flight was somewhat troubled by clouds, subsequently it was clear weather. Portions of Andrées Land, Louise A. Boyds Land, Frænkels Land, and Suess Land were mapped, supported by the observations made on Flight No. 3.

7) July 30th. 2 hours 15 min. Slightly overcast, northwest wind force 2. From Ella Ø to the head of Alp Fjord, along the west side of Staunings Alper to Nordvest Fjord, onwards to the mouth of Schuchert Elv, along the south coast of Jameson Land to the settlement of Scoresby Sund.

It was discovered that Alp Fjord continued for a considerable distance farther inland than previously assumed. Staunings Alper and parts of Nathorst Land were discovered and partially mapped.

8) August 4th. 1 hour 15 min. Slightly overcast, westerly wind force 3. Trial flight after motor-trouble. From the settlement of Scoresby Sund across the fjord to near Danmarks Ø.

9) August 5th. 4 hours 40 min. Somewhat cloudy, northwesterly wind force 1. From Scoresby Sund through Ø Fjord to Røde Punkt, short landing there. Thence around the west coast of Renland to Nordvest Fjord, onwards to c. 30° W. long., along the innermost nunataks to Sorte Hest and onwards to Ella Ø. Third large inland ice flight.

It was found that Renland was not bounded on the northwest by a fjord, as supposed by RYDER's Expedition 1891—92. Flyverfjord was discovered, Nordvest Fjord proved to extend farther inland than hitherto assumed, and the two large glaciers, Daugaard-Jensens Gl. and F. Graaes Gl., descended into the fjord on either side of Charcot Land. South of



Fig. 35. S.S. *Godthaab*, my expedition ship in East Greenland in 1929, 1930, 1931, 1932, 1933, and 1938.

Daugaard-Jensens Gl. the nunataks extended far into the inland ice. Nathorst Land was partially covered with ice.

10) August 5th. 1 hour 55 min. Somewhat cloudy, northeasterly wind force 2. From Ella Ø via Sofia Sund and Myggbukta to Eskimonæs.

11) August 8th. 1 hour 45 min. Haze, southeasterly wind force 4. From Eskimonæs across K. Borlase Warren to Bass Rock, around Lille Pendulum Ø and back to Eskimonæs. Ice observations.

12) August 11th. 1 hour 05 min. Cloudy, northeasterly wind force 2. From Eskimonæs, across K. Borlase Warren, around Sabine Ø to investigate the possibility of navigation through Clavering Strædet, to Hochstetter Forland.

13) August 11th. 1 hour 10 min. Clear weather, southeasterly wind force 2. From Hochstetter Forland along the coast to some distance north of Haystack, return flight along the Barth Bjærge. Ice reconnaisance and mapping.

14) August 17th. 1 hour 50 min. Clear weather, foehn winds, gusty. From Hochstetter Forland through Grandjeans Fjord to Lindemanns Bugt and back to Hochstetter Forland.

15) August 20th. 1 hour 45 min. Easterly wind force 4, rapidly increasing haze, owing to which the planned flight to Ole Rømers Land and Wilkins Nunatakker had to be given up. From Eskimonæs to the

head of Tyroler Fjord and Pasterze Gl., around Payer Land and across Wordie Gl. back to Eskimonæs.

16) August 22nd. 5 hours 30 min. Some clouds, northerly wind force 3. From Eskimonæs across Wollaston Forland along the outer coast via Danmarks Havn to Hvalrosodden, where a short landing was made. Onwards to Storstrømmen Gl., along the northern point of Rechnitzers Land to a point in the southern Dove Bugt, where a short landing was made at the Danish ship "Gefion", about which news had been wanting for some time. Return flight along the outer coast to Eskimonæs.

17) August 24th. 4 hours 15 min. Cloudy, W. 3. From Eskimonæs to Ella Ø, where short landing, onwards through Kong Oskars Fjord to Kap Biot, through Fleming Inlet, across Jameson Land and Hurry Inlet to the settlement of Scoresby Sund.

18) August 26th. 5 hours 55 min. Changing winds. From Scoresby Sund along the outer coast southwards to Kap Barclay and across Danmarksstrædet to Iceland, along its west coast to Akranes. A heavy fall of the barometer was reported from Julianehaab, Angmagssalik, and Iceland in the morning. When we started, the fog was low in Scoresby Sund, but southward from Kap Brewster it was clear though with increasing haze and a slight northerly wind. Near Kap Barclay the coast was still visible. During the flight across the sea to Iceland the sky grew more overcast, the light north wind was turning to the east, but the visibility was fairly good almost as far as Iceland. On approaching the coast there came strong gusts of wind and the visibility decreased noticeably. On flying towards Reykjavik the wind was right ahead, force 7, at times 9. The lighthouse on Snefjældsnæs was sighted. A little south of this point we lost the tug-aerial owing to the severe gale, which in connection with the bad weather made navigation very difficult. As, moreover, we were running short for fuel, we decided to land at Akranes.

19) August 27th. 0 hour 15 min. Rain, W. 4. From Akranæs to Reykjavik.

1933.

20) June 26th. 2 hours 45 min. Clear and calm. From Kap Hope, along the coast of Liverpool Land and onwards to Antarctic Havn, over land to Nordostbugten and along the south coast of Jameson Land to Kap Hope.

Ice observations and, over land, mapping.

The two steamers of the expedition had been so fortunate as to get through the ice so as to arrive at Scoresby Sund as early as the night after Midsummer Day. The flight was planned as an ice reconnaissance trip northward along the coast of Liverpool Land to examine whether it would be possible for the vessels to go northward along this coast.



Fig. 36. One of the Heinkel-planes among the mountains of East Greenland, seen from the other plane.

The return flight was made across Scoresby Land to the mouth of Schuchert Elv, i. a. to investigate the geology along this stretch. The results of the flight are published in a map (cf. L. Koch, Geologie von Grönland, 1935, p. 75). These areas were later mapped geologically by H. Stauber (cf. Hans Stauber: Stratigraphisch-geologische Untersuchungen in der ostgrönländischen Senkungszone des nördlichen Jamesonlandes. Geological Map, Taf. 1.—M. o. Gr. Bd. 114, Nr. 7. 1940).

21) June 28th. 2 hours. Cloudy, westerly wind force 2. From Kap Hope, across Kap Brewster, round the Dunholmene for ice reconnaissance. Short landing near a swimming bear.

22) July 7th. 0 hour 55 min. Clear, almost calm. Flight across Rosenvinge Bugt and Hurry Inlet in order to take messages to the geologists.

23) July 8th. 2 hours 10 min. W. 4. From Hurry Inlet, across Jameson Land, along Schuchert Elv to Archer Øer and onwards to Ella Ø. Chief purpose: mapping of Schuchert Elv and the glaciers on Scoresby Land. Schuchert Elv was followed to its source, since there was great doubt as to the position of the latter. During flight No. 20 I discovered that the inner part of Schuchert Elv did not turn towards the west, as previously assumed, and this error was now corrected.

24) July 9th. 2 hours 05 min. Cloudy, calm. From Ella Ø, across

Traill Ø, south of Vega Sund, along the outer coast to Storfjord on Liverpool Kyst, thence over land to Hurry Inlet. Ice reconnaissance and mapping of Storfjord.

The purpose of the flight was ice reconnaissance along the outer coast. Various geological observations were made in the interior of Traill Ø, and during the flight across Liverpool Land Storfjord was provisionally mapped. Shortly afterwards this map was used for planning a more detailed mapping from motorboat under the leadership of Professor H. BACKLUND.

25) July 10th. 0 hour 25 min. Cloudy, wind from the north, force 2. Flight across Hurry Inlet.

26) July 14th. 1 hour 45 min. Cloudy, calm. Flight from the sea off Vega Sund to LOUISE A. BOYD's ship *Vesle Kari* off Myggbukta, visit on board, back to *Gustav Holm* off Vega Sund. Ice observations were made during the flight.

27) July 23rd. 2 hours 35 min. Somewhat cloudy, easterly wind force 4. From Eskimonæs, along the coast to Kap Borlase Warren, ice reconnaissance around Bontekoe Ø, back to Eskimonæs.

28) July 26th. 1 hour 30 min. Cloudy, wind force 2. From Eskimonæs around Clavering Ø to Eskimonæs. Landings at a couple of geologist camps.

29) July 27th. 4 hours 10 min. Haze, south-easterly wind force 3. From Ella Ø to the head of Alp Fjord, landing by a stranded Norwegian vessel. Onwards through Kong Oskar Fjord, across Carlsberg Fjord and Hurry Inlet to Scoresby Sund.

30) July 29th. 2 hours 35 min. Some clouds, wind from the north-west, force 2. From Scoresby Sund along the coast of Jameson Land to Nordvest Fjord, thence across Staunings Alper to Alp Fjord and Ella Ø.

The route lay from Sydkap across the highest peaks of Staunings Alper, the purpose being chiefly to revise the results of flights Nos. 2, 20, and 23. Owing to the considerable height at which we flew and the severe cold in the upper layers of the atmosphere mapping was very difficult.

31) August 4th. 1 hour 10 min. Slightly cloudy, wind from the east, force 4. From Eskimonæs to Ella Ø via Kap Franklin.

32) August 5th. 1 hour 20 min. Slightly cloudy, easterly wind, force 4. From Ella Ø across Kap Franklin to Eskimonæs in company with Colonel C. LINDBERGH.

33) August 8th. 0 hour 25 min. Slightly cloudy, wind from the west force 2. From Hochstetter Forland, around Peters Bugt and back to Hochstetter Forland.

34) August 11th. 2 hours 40 min. Slightly cloudy, low fog. Start from the ship near Lille Koldewey Ø, across Ile de France to the Pariser



Fig. 37. One of the Heinkel-planes.

Øer near the southernmost point of Norske Øer. Return flight across the interior of Skærfjord to the ship. Ice observations along the coast and a revision of the map of Skærfjord were made.

The aim of the flight was ice reconnaissance. It turned out that there was open water northward along the coast at any rate as far as Norske Øer. The visibility was somewhat impeded by low fog over the sea. During the return flight across Skærfjord a provisional map of this fjord was made, which was subsequently handed over to D. Malmqvist, who shortly after visited the fjord by motorboat and prepared a more detailed map (cf. M. o. G. Bd. 101, Nr. 4, p. 20).

35) August 16th. 4 hours 30 min. Slightly cloudy, foehn winds. Start from a point near the northernmost point of Norske Øer, around the north of Lamberts Land to the regions south and west of Danmarks Fjord, thence to the interior of Ingolfs Fjord, across Lynn Ø, the western part of Hovgaards Ø, and back to the ship. The latter half of the flight troubled by clouds. The flight across the southern part of Kronprins Christians Land and the southern part of Danmarks Fjord will be described in more detail on p. 290 et seq.

36) August 16th. 5 hours 00 min. Increasing clouds and wind from the north force 2. From the ship near Norske Øer, along the outer coast to Antarctics Bugt, thence to Kap København on Peary Land, and back across Romers Sø to Ingolfs Fjord and across the outer coast back to the ship.

The results of the flight will be dealt with in more detail on pp. 290—299.

37) August 21st. 3 hours 35 min. Cloudy, westerly wind force 2. From Eskimonæs across Myggbukta, along the outer coast to Scoresby Sund and onwards to Danmarks Ø.

38) August 22nd. 4 hours 30 min. Clear and calm. Start from Røde Ø southwards along Von Gronaus Nunatakker to a point near the head of Kangerdlugssuaq, thence to a point northeast of Mikis Fjord, onwards to Geikies Plateau and back to Røde Ø.

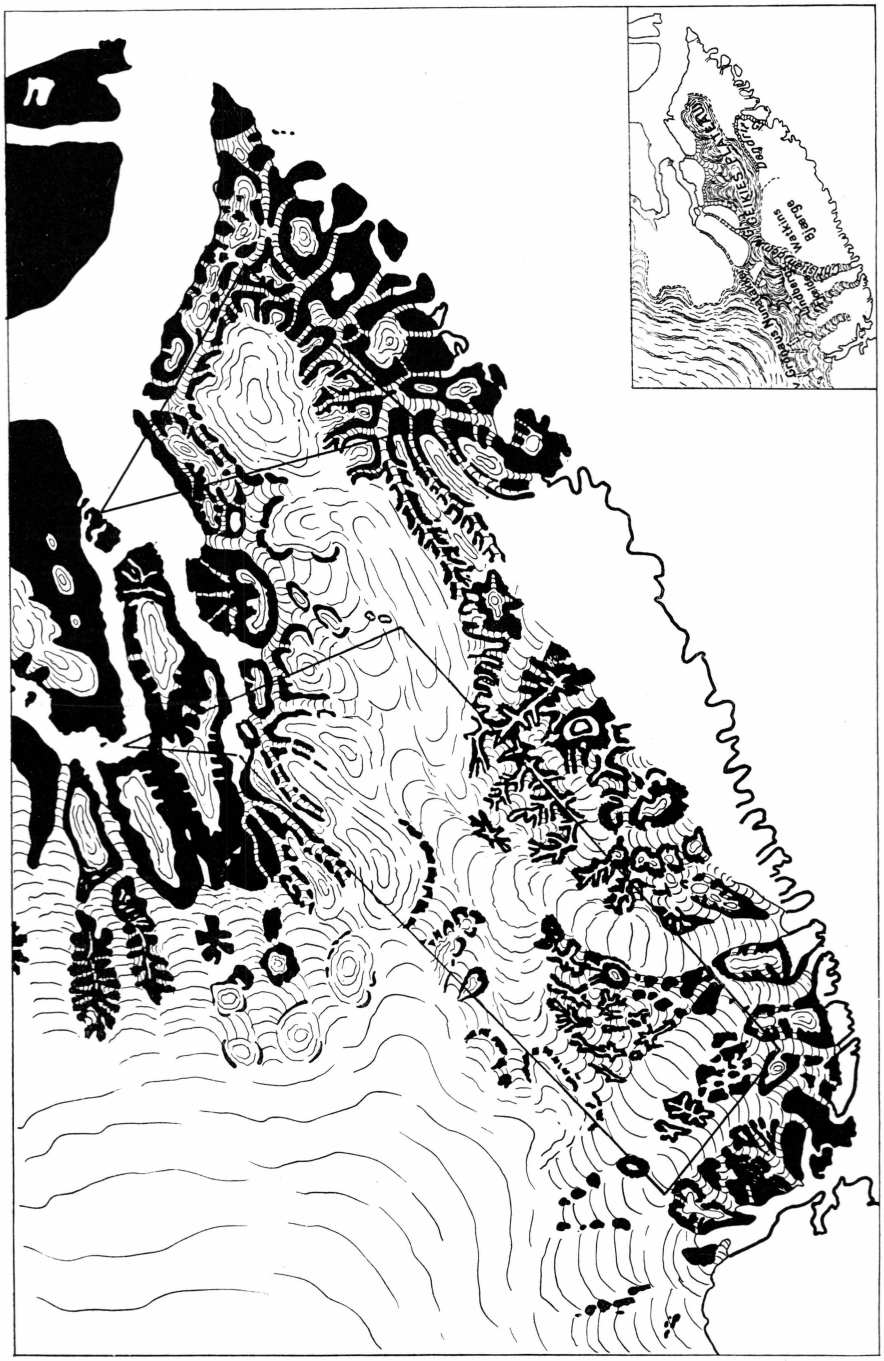
The flight was favoured by fine weather. The time calculated for the planned route agreed entirely with the plan, which shows that at an altitude of about 4000 m it must have been quite calm. The inner nunataks and the highest peak of Greenland, later called Gunnbjørn Fjæld, were discovered and inserted on the map. Its height, which I took to be a little over 4000 m (a view likewise held by M. LINDSAY, who had taken bearings to it from the inland ice) was later, on the basis of more accurate measurements and observations made during COURTAULD'S ascent, determined to be 3700 m.

I had been looking forward to this flight, which I had hoped to make even in 1932, since, as stated above, before setting out in 1932 I had discussed with both WATKINS and von GRONAU the nunataks they had seen during their flights, started from Kangerdlugssuaq and Scoresby Sund respectively, and had studied their photographic material with them.

39) August 23rd. 2 hours 10 min. Clear and calm. From Danmarks Ø to a point inside Kap Barclay, parallel with the coast to a point on Geikies Plateau and back to Danmarks Ø.

During this flight, too, the weather was excellent. On the two last-named flights the interior of the peninsula between Scoresby Sund and Kangerdlugssuaq with the exception of the coast-land east of Watkins Land was provisionally mapped.

40) August 23rd. 4 hours 00 min. Northerly winds force 2—4, fog along the outer coast. From Danmarks Ø to near the mouth of Hurry Inlet, where a short landing was made alongside KNUD RASMUSSEN'S motorboat *Kiwioq*; thence along the outer coast to Myggbukta and via Loch Fyne to Eskimonæs.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Gjertrud Bugt

THE FLIGHTS ACROSS KRONPRINS CHRISTIANS LAND IN THE SUMMER OF 1933

Cf. Pls. 16 and 20.

Literature.

KOCH, LAUGE: A Day in North Greenland. Geografiska Annaler (Sven Hedin) 1935, pp. 609—620. With 4 figs. Stockholm **1935**.

Before the departure of the expedition in 1932 three long inland ice flights for the discovery and mapping of the innermost nunataks between Dronning Louises Land and Scoresby Sund were planned (cf. p. 280). These flights were made in 1932, and I further hoped that it would be be possible to map the area between Scoresby Sund and Kangerdlugssuaq, since from my conversations with WATKINS and VON GRONAU I knew that considerable geographical problems in these regions still remained unsolved. The last-mentioned flights, however, were not made till 1933.

No flights north of Danmarks Havn had been planned, but after our first landing there in 1932 and subsequently in the course of the summer VICTOR PETERSEN and myself repeatedly discussed the objects of a flight between Danmarks Havn and Peary Land.

Before the departure of the expedition in 1933 the discussions and calculations were continued, and preparations were made for a flight across Kronprins Christians Land, as the radius of action of the plane did not allow a flight as far as Wandels Dal and J. P. Kochs Fjord. We took it for granted that the ship would be unable to push north of Danmarks Havn, and as the distance from Danmarks Havn to Peary Land and back was 1400 km, it was planned that a depot should be carried by aircraft as far northward as possible from Danmarks Havn, the radius of operation of the aircraft being 950 km. This depot was planned to include 400 l petrol, 20 kg lubricating oil, three pair of skis, a sledge, kamiks, underwear, and stockings, a tent, a rifle and 100 cartridges, three pair of boots, provisions for a month, and a petrol primus stove. In case of a forced landing, and provided all of us were uninjured, such a depot would enable us to sustain life until the ice became strong enough to support us so that we might walk south to Danmarks Havn. The depot was to be established on Lamberts Land or on Norske Øer, and it was expected that two flights would be required to take the depot from the ship to the place decided upon.

In order to facilitate the transport of fuel, this was filled into some flat vessels of such a shape and size that they could be easily stowed in the back of the seaplane; each contained about 16 l.

We were fully aware of the difficulties attending the establishing of the depot and the subsequent start from the place; for very likely the drift ice and fog might prevent access to it or at any rate present great obstacles.

It was hoped that the ice conditions would allow us to reach Danmarks Havn by ship and start the flight from this place at the beginning of August when the weather is generally most favourable for flights in these regions. Owing to the unexpected visit by Colonel LINDBERGH by airplane on August 4th the journey was somewhat postponed, and s. s. *Gustav Holm* did not leave Eskimonæs till the morning of August 7th.

The ship first called at the station Kulhuse on Hochstetter Forland, whence an air reconnaissance was made, which showed that the sound between Shannon Ø and Hochstetter Forland was impassable and the greater part of Dove Bugt, too, was covered with winter ice. The course had therefore to be laid south and east of Shannon Ø. Another ice-reconnaissance from the air reported much open water east of Koldewey Ø, while north and east of Shannon Ø as far as the south point of Koldewey Ø the ice was rather densely packed.

During the voyage towards Koldewey Ø ice conditions seemed rather hopeless, but at last we reached the open water east of the island, and on August 10th approached Danmarks Havn. An attempt was made to call at the hunting station Hvalrosodden, but the ship was stopped by the ice at Stormkap. On August 11th we arrived at Danmarks Havn. Owing to the drift of the ice the ship was forced to go to Lille Koldewey Ø later in the day, and an air reconnaissance northward was made. To our surprise the waterway off Ile de France and the islands as far as Norske Øer seemed to provide an easy passage, and although a low fog lay over the sea, which forced the plane to return from Franske Øer, there seemed to be a possibility that the ship might push rather far northward.

This changed our plans, for if the ship was able to reach Norske Øer, the establishment of the planned depot would not be needed, and the flight would, of course, be more easy to carry out.

In the afternoon the ship therefore headed northward. The fog continued, but apart from occasional small ice-floes the ice presented no obstacles until August 12th, when we met a large ice-sheet in about 79°03′ N. lat., at which we moored for the night. Our position was about 20 km east of Norske Øer. The temperature of the sea water was here 4° C. above zero.

The fog continued during the next days. Every night rime and icicles formed in the rigging, and during the day the icicles fell down and caused various damage to the seaplane, so that repairs had constantly to be made. Owing to the advanced season the prospects for the flight

were not good; and moreover the ship could not remain very many days here, as the large personnel of the expedition at work farther south required its presence there. Ever since our departure from Danmarks Havn there had been a slight wind from the east, and as long as the wind blew from the ice-free waters to the east, there was no prospect that the fog would lift. However, in the afternoon of August 15th the wind shifted to the west, and before evening the fog had disappeared. So we sailed towards Norske Øer and anchored there for the night. Here the temperature of the water was $^1/_2$—1° C. below zero. This explains the constant fog during easterly winds.

In the morning of August 16th we started on the flight to Danmarks Fjord (see Pl. 20). The route went from the north side of Norske Øer, north of Lamberts Land and south of Danmarks Fjord to about 30° W. long., whence we turned towards the north and subsequently to the east across Danmarks Fjord to the head of Ingolfs Fjord and back to Norske Øer. The weather was not entirely favourable. We had no means by which to measure the force of the wind in the upper layers of the atmosphere, but we supposed that there was a strong westerly wind. It was therefore difficult to determine our position, all the more so since the flight presented great geographical surprises. During our return flight from Danmarks Fjord to the outer coast we encountered several scattered clouds, which in places greatly impeded the mapping.

On our return to the ship everything was made ready for another flight across the northern part of Kronprins Christians Land. In the afternoon we set out, flying along the outer coast to Antarctics Bugt and thence over the ice cap of Nordostrundingen, heading directly towards Kap København on Peary Land. The course was then laid to Prins Frederiks Øer and onwards over land to Ingolfs Fjord, whence we flew along the coast back to the ship. When we started on the latter flight the weather was better than in the forenoon, but gradually a rather heavy north wind came up, and north and east of Peary Land a storm was approaching. The ice-floe at which we had moored on August 12th had a size of several kilometres, but it was now drifting southwards, and there was open water as far as Nordostrundingen and some distance farther northward and eastward. The outer part of the triangular ice-tongue off Nioghalvfjerdsfjorden no doubt consisted of sea-ice, but it was difficult to decide where the Nioghalvfjerds Gl. ceased and the sea ice began owing to the very gradual transition between them. On Pl. 16 the boundary of the glacier ice is indicated. A short distance off Norske Øer a lead extended northward through the sea ice, and I should suppose that a few days after our departure from Norske Øer the outer triangular part of the ice tongue has become detached and drifted southward; for a storm broke out immediately after we had left. With the exception of a small area west of Lynn Ø, where the ice had melted, the winter

ice was unbroken in Dijmphna Sund, and it can hardly be supposed to have broken up later in 1933. Ingolfs Fjord to and including the small skerries off Amdrups Land were covered with winter ice, which did not, probably, break up either; but in the interior of Ingolfs Fjord the ice had melted. In all other places the open water extended right in to the coast. The interior of Danmarks Fjord as far as 81°30′ was entirely free from ice, while the ice was unbroken in the outer part of the fjord as well as in Hagens Fjord and Independence Fjord, where on August 16th the surface of the ice was very dry, that is to say, there were only very few thaw-water pools on it, so that as early as the middle of August the ice must have been excellent for sledging. Near Brønlunds Fjord and along the south coast of Peary Land on either side of Kap København the ice had melted along the coast. An area of open water, though with many ice-floes, was further found east of Prinsesse Margrethes Ø (cf. Pl. 16).

During our return flight from Ingolfs Fjord the north wind increased in force, and we practically ran a race with the fog, which was now driven southward along the coast; however, we won the race, we landed near the ship and had the seaplane taken on board before the fog reached Norske Øer. Immediately afterwards the ship weighed anchor and sailed southward, arriving at Danmarks Havn next morning.

The weather had not been ideal, but yet it had been so clear that the two planned flights had been carried out. It had been very fortunate for us that the ship could push so far northward as Norske Øer.

As regards the geographical results of the flight the reader is referred to my article "A Day in North Greenland", to my letter of June 16th, 1938, to the KNUTH-MUNCK Expedition (cf. below), and to my remarks on the map Pl. 16 (cf. p. 354).

When the KNUTH-MUNCK expedition started in 1938, whose working field was planned to be Kronprins Christians Land and Peary Land, I furnished the expedition with all available map material from my flight across Kronprins Christians Land and the just completed flight across Peary Land, and the expedition likewise received all the photographs taken during the last-named flight. In addition I summarised my knowledge of these regions in a letter. As it may perhaps be useful to future expeditions also, I shall quote it in extenso here (translated from the Danish):

Copenhagen, June 16th, 1938.

To

Eigil Knuth's, Ebbe Munck's, and Alf Trolle's Expedition to Northeast Greenland in memory of the Danmark Ekspedition.

In connection with the proposed stay of the Expedition in Northeast Greenland, I will here make some remarks which may perhaps be of use to the members of the Expedition.

Universitetets geografiske Laboratorium

I must, however, at once strongly emphasise that my observations south of Peary Land, as is well known, were taken from the air and are therefore of quite a different character from the observations I can give from the coasts of Peary Land. You must take into account that, even if a fjord seems to you to be either shorter or longer than indicated by me on the map, one makes no great mistake from an airplane, and fatigue, deep snow, gales, and other things may give one the impression that the distances are quite different from those shown on the map. On the whole, therefore, you must take it for granted that the maps of Northeast Greenland are correct in their main features. But you must also be prepared that the maps may show valleys which are apparently deep and easily passable; and yet there may be something, for instance a slope of some 100 m which has not been observed from the airplane and which may present great obstacles or entirely stop the advance of the sledge. Or, on the other hand, you may find that a valley which looks even and easily passable from the air, is covered with large stones and impracticable, while perhaps a plateau nearby presents a much better travelling route.

On making now some remarks relating purely to the travelling-technique, I ask you to bear in mind that observations made from the air, according to the above, may be deficient in several respects..

Let us commence with Lamberts Land. Should you happen to come to Lamberts Land from the inland ice, i. e. from the west, at a time when you are able to see at any rate part of the day and night (i. e. not in the dark time), I advise you to descend through one of the river beds. Immediately north of Lamberts Land the glaciers are highly crevassed and not easily practicable. At any rate it is not difficult to descend from the inland ice to Lamberts Land proper.

As stated above, the glacier in Nioghalvfjerdsfjorden is much crevassed in its narrow parts. I should think—though I cannot say so definitely—that it is most easily passable on the north side. The outer portion between Lamberts Land and Hovgaards Ø is relatively flat. If you pass that part, there may be some possibility of your finding Mylius-Erichsen's camp on one of the small flat nunataks.

The land called Skallingen by me is flat, but I should take it to be rather difficult to ascend from Hekla Fjord, since the two small fjords end in steep valleys. From the large lake, Blaasø, as far as Kap Cohn at any rate, the edge of the inland ice is even and, as far as I could make out, free from crevasses. In some places it may form steep cliffs towards the land, but it is at any rate fairly easy to ascend the inland ice, and it is not difficult either to find a place where it is possible to get down on to the land. In the immediate neighbourhood of the land there are deep thaw-water cracks in the late summer, so you will have to travel some distance inland.

The interior of Danmarks Fjord is low-lying, very clayey and sandy, and consists of a system of lakes or low basins; it is therefore difficult to make out from the air where the fjord stops and the lake begins. As for the rest you must expect that the fjords will be frozen all the year round and passable, though with difficulty, all the summer. Yet, about the middle of August, 1933, I observed open water in the interior of Hekla Fjord and likewise in front of the large river at the head of Ingolfs Fjord. You must further count upon that in a normal summer the whole inner half of Danmarks Fjord will be free of ice, at any rate in August. There should be a good travelling route from the head of Ingolfs Fjord across the drainage system to the inland ice and thence over low-lying land to the head of Danmarks Fjord; I point out, however, that my map of this drainage system, especially of the land areas north of it, Sjællands Fjælde, etc., is primitive, because it was difficult to determine our position i. a. because of clouds. Whether or not you will be able to travel from the narrow lake—whose shape and size I dare not entirely guarantee—up through

the flat firn areas, the Sjællands Fjælde, the Alexandrine Fjelde, etc., to Danmarks Fjord, I cannot say. If you have to go, there is a route, but I cannot guarantee that it is a good one.

A low-lying, fairly narrow valley probably leads northward from Ingolfs Fjord to Romers Sø, which cannot be situated at any great altitude. I am unable to say anything as to whether this valley is stony; may be it is difficult to pass, but it may just as well be easily practicable. I expect that you will encounter deep snow on Romers Sø except in the early autumn. It may present surprises. For, as will be known, its whole northern portion is bounded by ice. A glacier comes from the east and possibly extends right across the fjord. If the glacier is productive, crevasses may occur in the ice of the lake. Possibly Romers Sø may be a good travelling route. If the ascent from its northern end to the inland ice is fairly easy, I do not think that crevasse systems of any importance will be met with on the way to the fjord ice north of it.

On descending to the fjord ice here, you will come to extremely flat land. As I flew directly over it about the middle of August, I take it for granted that my map is correct here, but several of the islands are so low that when the area is covered with snow. it is difficult to decide where the land begins and the sea-ice stops. The same applies to the Prinsesse islands. The members of the Danmark Expedition no doubt travelled across Prinsesse Margrethes Ø without discovering that they were no longer on the sea-ice. Unlike the other islands the greater part of this island is covered by a quite low firn, which, when snow-covered, is practically on a level with the sea-ice. I indicated Prinsesse Margrethes Ø relatively to Prinsesse Thyras Ø, whose size was given by the Danmark Expedition. On my flight in the Perssuak, when the whole area was covered with snow, I found that these two islands were too large on the map; but in August, 1933, when they were entirely free of snow, they showed a fairly considerable size.

As regards Flade Isblink, it forms a glacier front with icebergs towards Antarctics Bugt, and behind, that is to say, north of Antarctics Bugt crevasse systems occur. Large and dangerous crevasse systems are likewise found some distance inland in the northwestern part of Flade Isblink. I should think that if necessary one might travel directly northward from Grenen and descend a little west of Nakkehoved without coming across any crevasses; but if not necessary, you should not make the experiment. It will be better to follow the coast. On reaching the peculiar mountain formation extending some way into the inland ice between Antarctics Bugt and Nordostrundingen, one may then sledge right up to Nakkehoved and behind Nakkehoved, for it is doubtless possible to travel on the flat firn if only one does not travel at too great an altitude.

The mountain formation between Antarctics Bugt and Nordostrundingen consists of flattopped mountains. From Perssuak it looked as if the lower portion merely consisted of some moraines possibly resting on ice. I am not certain whether this land extends right out to the shore, or whether the outer portion is only a moraine resting on ice. Nakkehoved itself lies like an island covered with a flat firn, and no doubt it is possible to travel across the firn south of the cape. I should like to point out here that the situation of Nakkehoved was not in agreement with our observations made from Perssuak. Possibly Nakkehoved is situated some distance farther northward. This was claimed most emphatically by Mayr and Overbye. We discussed whether the Danmark Expedition, on its outward journey, might be supposed to have passed south around Nakkehoved across the flat firn, and whether J. P. Koch stood on the firn, which rises slowly towards Nakkehoved, and only on its north side presents ice-free mountains. Possibly on account of mirages he saw these mountains, but placed them in the horizon precisely be-

cause the flat firn owing to mirages made an estimate of the distance very difficult. When J. P. KOCH then saw the whole of it from the north, it seemed to him more natural that Nakkehoved lay in its proper place. It is peculiar to notice that on his return journey from Prinsesse Dagmars Halvø J. P. KOCH laid his course in a northeasterly direction, subsequently turning suddenly towards the shore. These theories are perhaps improbable. I mention them here, as it may be supposed that if you travel south of Nakkehoved on a day in spring, you may experience an optical delusion which may perhaps explain the Fata Morgana Øer of J. P. KOCH. I can hardly believe that Nakkehoved should be moved on the map, for on May 1st J. P. KOCH had a cartographic station on Nakkehoved. On the other hand the map contains some details which would not fit in with our observations during our flight in the Perssuak. It is quite possible that more land is found along the coast from Prinsesse Dagmars Halvø, which is probably the island observed by me between the two Prinsesse islands, so that Flade Isblink does not here extend right out to the water. I suppose this to be the case, but as long as the snow remains on the ground, one should be cautious in making corrections in the map here, for from a sledge it is almost impossible to determine precisely one's position in this area, where the land is almost at sea-level, and where the tide water cracks owing to the inconsiderable ebb and flow are so inconspicuous that the coast lines are very little marked.

As regards the hunting possibilities, experience from North Greenland shows that animal life (hares and musk-oxen) is especially abundant near the edge of the inland ice. I should think, therefore, that near Blaasø and at the head of Danmarks Fjord the chances of successful hunting will be greatest. As is well known, MYLIUS-ERICHSEN met with bad luck on the lowland near the mouth of Hagens Fjord. But musk-oxen may, of course, be met with everywhere on either side of Danmarks Fjord.

As is well known, the members of the Danmark Expedition fell sick from eating musk-ox meat. Personally I was taken ill, too, after eating musk-ox meat on the north coast of Greenland both in 1917 and in 1921. The symptoms of the illness are especially indigestion, obstinate constipation, severe headache, dizziness. I never noticed similar symptoms farther southward in East Greenland. Possibly it is because the animals are very lean up here. At any rate attention should be given to this fact.

To the whole stretch from Mallemukfjældet to north of Nordostrundingen in its widest sense it applies that one should be careful not to travel too far seawards, especially in autumn and winter; for northwesterly gales are frequent here, and you must always be prepared for the ice breaking up, sometimes almost quite close to the shore, even in the winter.

As regards details west of Danmarks Fjord the map is very rough. However, the edge of the inland ice is probably fairly correctly placed. The two Eskimos of the 1st Thule Expedition told me that in their opinion the Zig-Zag Dalen does not exist, insisting that they travelled in the same direction all the time. In this region FREUCHEN suffered very much from snowblindness. I dare not decide the question. In these regions the river-beds cut rather deep down. The peninsula with Slutstenen and Himmelbjærget is flat and desolate, and MYLIUS-ERICHSEN had rather unsuccessful hunting here. From Perssuak I was unable to detect Slutstenen, but on my sledge journey along the south coast of Peary Land I believed I could see it as a kind of natural cairn like the top of Steinmannspitze on Clavering Ø. If you happen to come to the neighbourhood, there is most likely a possibility of finding a report here, perhaps a sketch-map from HAGEN.

Let me mention in this connection a circumstance, which to me remains a complete mystery, viz. Danmarks Fjord, whose inner part, as shown by the Danmark Expedition, has an east-west direction, and EJNAR MIKKELSEN'S correct correction of it. So far I have believed that HAGEN (it appears from his map that he has been at the very head of the fjord) turned the fjord from a south-north to an east-west direction in order to save paper. But in the letter to TROLLE which MYLIUS-ERICHSEN sent home with J. P. KOCH from Kap Rigsdagen he states expressly the longitude and latitude of the head of the fjord. It is hard to believe that this sledge party travelled in the direction north-south and believed that they were travelling east-west. Perhaps you will find a report which solves this riddle. At any rate we must take it for granted that later in the summer the party realised that the fjord extended in a north-south direction and that this was one great reason why they chose to travel the fairly short distance from the head of the fjord down to Lamberts Land.

All the large fjords, Danmarks Fjord, Hagens Fjord, Independence Fjord, were no doubt free of ice in the favourable ice-year 1936; this could be seen from the fresh icebergs lying everywhere in the fjords. This has probably resulted in a considerable retreat of the glacier fronts in Hagens Fjord and at the head of Independence Fjord. For in years in which the ice remains in the fjords, the bergs cannot drift away and accordingly remain as a floating portion of the glacier. In the spring of 1938 the small nunatak indicated by HAGEN in Hagens Fjord lay as an island which the ice reached. It is not situated in the middle of the fjord, as indicated by HAGEN, but near the south coast, and it is smaller than shown by HAGEN. If you happen to come to the heads of these fjords, it will possibly be difficult for you, who have no opportunity of cartographic measurement, to mark the position of the glacier front. But as regards Independence Fjord it will probably be possible for you to approximately indicate the glacier front, which would be very interesting.

Peary Land.

MYLIUS-ERICHSEN says in one of his cairn reports that he has found both animal and plant fossils, but fails to state what they are and where they were found.

It will not be worth while to look for fossils in the red sandstone with basalt in Danmarks Fjord, Hagens Fjord, and the interior of Independence Fjord.

Cambrian strata, no doubt fossiliferous, may perhaps be found in Hagens Fjord south of Kap Bernhard, at any rate south of Brønlunds Fjord, Midsommer Sø and onwards to the head of J. P. Kochs Fjord, but it is very difficult to find fossils in these beds.

On the south coast of Peary Land I collected fossils between c. 22° and 24° W. long., grey shales with graptolites; on Kap Caroline Marie: corals, brachiopods, and others, and between c. 27° and 30° W. long. corals and other fossils. The graptolites are Gotlandian, the other fossils Ordovician. None of them have been brought home, as I had to leave them on the inland ice near Kap Heiberg-Jürgensen.— Further, on Herlufsholm Strand, where many Permian fossils are found, brachiopods and probably also Carboniferous plants. About this latter question I have written in detail to Mr. EIGIL NIELSEN.

Hunting Conditions.

On the whole game is very sparse on Peary Land.

The bear is rare. PEARY killed a bear at the extreme northern point of Greenland. On Herlufsholm Strand we observed a track leading inland; the bear must have been dying from hunger. Further, we came across the track of a young bear in the interior of Independence Fjord.

The musk-ox was found to be fairly common on Herlufsholm Strand both by J. P. KOCH and myself. We also killed some few musk-oxen south of Brønlunds Fjord and saw a couple north of the fjord. There may be a possibility of musk-ox hunting south of Midsommer Sø, but on the whole it must be characterised as a stroke of good fortune if a traveller should come across musk-oxen on Peary Land.

About June 1st seals are abundant on the ice near a crack across the mouth of Brønlunds Fjord. A fairly great number are likewise found near a crack at the mouth of Astrups Bugt. Otherwise seals are sparse, and when lying on the ice they can only be killed in the short period when the snow is almost melted. As soon as water begins to form on the ice, the seal can hear the hunters coming and will disappear. On the whole game is shy in these regions, which may be due to the wolf. In 1921 the wolf was exceedingly common in the southern part of Peary Land and was seen daily. As a rule the wolf does not attack, especially not if it has an opportunity of hunting seal. Still one must be cautious. HENDRIK OLSEN's death was no doubt due to wolves. The wolf is eatable and tastes fine.

Arctic hares are generally rather common near the edge of the inland ice. Other game (ptarmigans, geese, etc.) should not be counted upon.

Travelling conditions.

No rules can be given for the amount of snow in the month of May, as it varies very much from year to year. At the beginning of June, when it is possible to travel by night, good travelling conditions may be found near the shore from Hagens Fjord towards the interior of Independence Fjord, because the coast is mostly steep here and protects the snow against the midnight sun. Along southern Peary Land, where the snow is exposed to the rays of the sun both night and day, the going will soon be bad. In 1921 travelling conditions were fairly good on the sea ice till the end of June. Before the melting of the snow good travelling conditions may be found through Midsommer Sø, where either quite smooth ice or very little snow is found, because the strong westerly gales blow out through this valley.

As regards the pass to J. P. Kochs Fjord, it is difficult to give any advice. Two routes may be tried: a northwestward route along the river at the head of the lake, and on reaching a certain height you may descend towards J. P. Kochs Fjord. You may also ascend through the innermost large branch valley to the south and go across the land to the fjord. On the basis of observations from the air I cannot indicate any place as the most suitable for this passage over land. Very possibly you will at first come across a bad passage, and subsequently will find the right way here. If there are not too many stones, I am inclined to think that the passage will be fairly easy. When you reach J. P. Kochs Fjord, you will probably meet very much loose snow in the fjord itself—this applies to all the fjords of the north coast. I point out expressly here that a low spit of land may span the interior of J. P. Kochs Fjord at the place where the coast is shown by a broken line; over a small stretch it was impossible for me to trace the sea-ice here. Thus there is a possibility, though slight, that the head of the fjord is situated a little farther westward than indicated by me, and that the glacier at its head descends into a lake. If this is the case, the lake is almost on a level with the sea.

If the expedition should travel through Fr. E. Hyde Fjord, there will probably be chances for good going in the innermost part of the fjord, as it seems to be very windy here. The Danmark Expedition encountered musk-oxen on the south coast of the fjord quite near the mouth. A large valley debouches in the small fjord which extends northward up through Roosevelt Fjælde. Whether there are musk-oxen here, I do not know, but a great deal of flat country is found here. Otherwise there are

no great chances of successful hunting in Fr. E. Hyde Fjord, the coasts being steep and rather inaccessible almost everywhere.

If circumstances should bring about that you come to De Long Fjord, you will no doubt find abundant and deep snow in this fjord, and the chances for successful hunting are here extremely small.

There will be no opportunity of making large alterations in the map of Peary Land. Of course passages between the fjords and the altitudes of the lakes above sea-level will be of the greatest interest. In my opinion the Eskimo migration has taken place by way of J. P. Kochs Fjord, Midsommer Sø, and Brønlunds Fjord, at the mouth of which a couple of tent-rings are found (discovered by KNUD RASMUSSEN), and at its head we found remnants of an Eskimo bow in 1921. As a whole J. P. Kochs Fjord is steep and inaccessible on both sides, and it is only on reaching its outer part at the entrance to the sound that cuts inland from the north, that a current hole will be found, where we came across entirely open water on June 1st. Here KNUD RASMUSSEN himself killed a seal, but looked in vain for Eskimo remains; to him, who claimed that the Eskimos had not migrated around the north of Greenland, it was of decisive importance that no Eskimo remains were found around this current hole. I point out, however, that we experienced a snowstorm here, and if you should be more fortunate than we, there may possibly be chances of finding Eskimo remains here.

I point out that the maps I am supplying you with are mostly manuscript maps. As regards Peary Land alterations may take place during the final working up of the material, which alterations, however, will probably be of no importance to you. I expressly point out that we must of course reserve to ourselves all copyrights of both maps and pictures; I ask you to regard the material you will receive from me as confidential, and I therefore ask you not to show it to the members of other expeditions, as the material must be regarded as a still unfinished manuscript.

In the above I have attempted to the best of my ability to give some remarks that may be helpful, but in conclusion I wish to emphasize once more 1) that large parts of these regions are only known to me from the air, which involves the advantage that the main features are correct, but the details may present quite a different appearance, so that much of the advice given here must be accepted with reservation. Furthermore I take the opportunity to emphasise 2) that travelling conditions and chances for game may vary so considerably from year to year in these regions that possibly—I may say I hope so—your experience will be better in places as to which I have perhaps been somewhat pessimistic. And with these words I wish you a successful journey and many new and interesting results in these regions.

Sincerely yours,

LAUGE KOCH.

P. S. Will you please let DRASTRUP read this letter if he is to start for Peary Land, otherwise it is confidential.

THE SEAPLANE EXPEDITION TO PEARY LAND 1938

Cf. Pls. 12. 13 and 21.

Literature.

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KOCH, LAUGE: A Day in North Greenland. Geografiska Annaler 1935 (Sven Hedin). Pp. 609—620, with 4 figs. Stockholm **1935**.

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THOSTRUP, C. B.: Flyveekspeditionen 1938 til Peary Land via Spitsbergen. Pp. 001—010 + 314—315. Særtryk af Tidsskrift for Søvæsen **1938**. København.

Introduction.

As stated above, the Danmark Expedition 1907 mapped the coast of Northeast Greenland from Kap Bismarck to Navy Cliff and to Kap Clarence Wyckoff respectively, the last unknown stretch of the Greenland coast. To the great surprise of the expedition the coast extended eastward as far as about 12° W. long. Near this place the leader of the 2nd cartographic party of the expedition, J. P. KOCH, made an observation which was later to become of great importance. On May 2nd, 1907, the party, which consisted of J. P. KOCH, AAGE BERTELSEN, and the Greenlander TOBIAS, were in about 81°48′ N. lat., 15°52′ W. long., that is to say, on the sea-ice a little north of Nakkehoved, and from this place they believed they saw land in the direction of Spitsbergen. As to this observation AMDRUP (1913, p. 124) says: "May 2nd. On making an observation at 5 a. m. KOCH saw land to the north by east and took a bearing of it. At the same time he saw the vapour of open water almost in the same direction. It was resolved to try and advance in the direction of the land and the open water, where they might expect to find game.

„Departure at 3 p. m. The screw-ice soon proved to be so difficult, that KOCH on the advice of TOBIAS gave up further advance in the direction north by east. The sledges could not stand the blows and thumps in the quite fresh and sharp screw-ice, and the land had disappeared; it was not seen at all beyond that once and has probably been "cape-fly-away", (in the observation journal is added: "wind — 0; refraction anomalies — 2; horizon — in all directions"). The course was then set along the border of the screw-ice in the direction west by north."

During our flight on August 16th, 1933, both my two companions, VICTOR PETERSEN and V. KRAMME, and myself believed that we saw land in the same direction. About this discovery I wrote under the heading "The possible existence of a land between Greenland and Spitsbergen" (1935, p. 613):

"On our flight across Flade Isblink slightly west of Nordostrundingen, the pilot, the radio operator, and myself discerned some mountain tops east of Nordostrundingen, in the direction of Spitsbergen. After landing the first remark of my two companions was: "Did you see the new land in the direction of Spitsbergen?" Independently of each other all of us thought we had seen land with alpine peaks and glacier-filled valleys. However, the atmospheric conditions during the flight were unfavourable, a storm was coming on over the northern part of Peary Land, and another was approaching from Spitsbergen, though in that direction it was clear over a rather large distance. Personally I believe that a land occurs here about 150 km from Nordostrundingen, but recollecting my experiences from earlier journeys, I have become sceptical as to the existence of land seen from a great distance, so I wish to point out that considering the unfavourable atmospheric conditions during our flight there is a possibility that what we saw was only formations of clouds."

In the same paper I further discussed the possibility of the existence of this land, saying (p. 619): "Considering now the geological conditions of North and Northeast Greenland, we shall see that the two geosynclines meet at an acute angle in the sea east of Nordostrundingen, almost in the place where the hypothetical land should be situated." Cf. also Fig. 4 of the same paper, "Geological map of North Greenland". In the chapter entitled "Ice Conditions" (p. 616), after mentioning that the presence of a special glacier type, of the bird-cliff on Mallemukfjældet, and of the Eskimo settlements found by the Danmark Expedition between 80° and 81° N. lat. suggests that large areas of open water are often found along the coast of Nordostrundingen, I goes on to say: "If the land presumed by us to lie about 150 km east of Nordostrundingen really exists, it would seem that in years when the Polar ice is chiefly pressed towards Siberia and Alaska, very little ice will drift southward

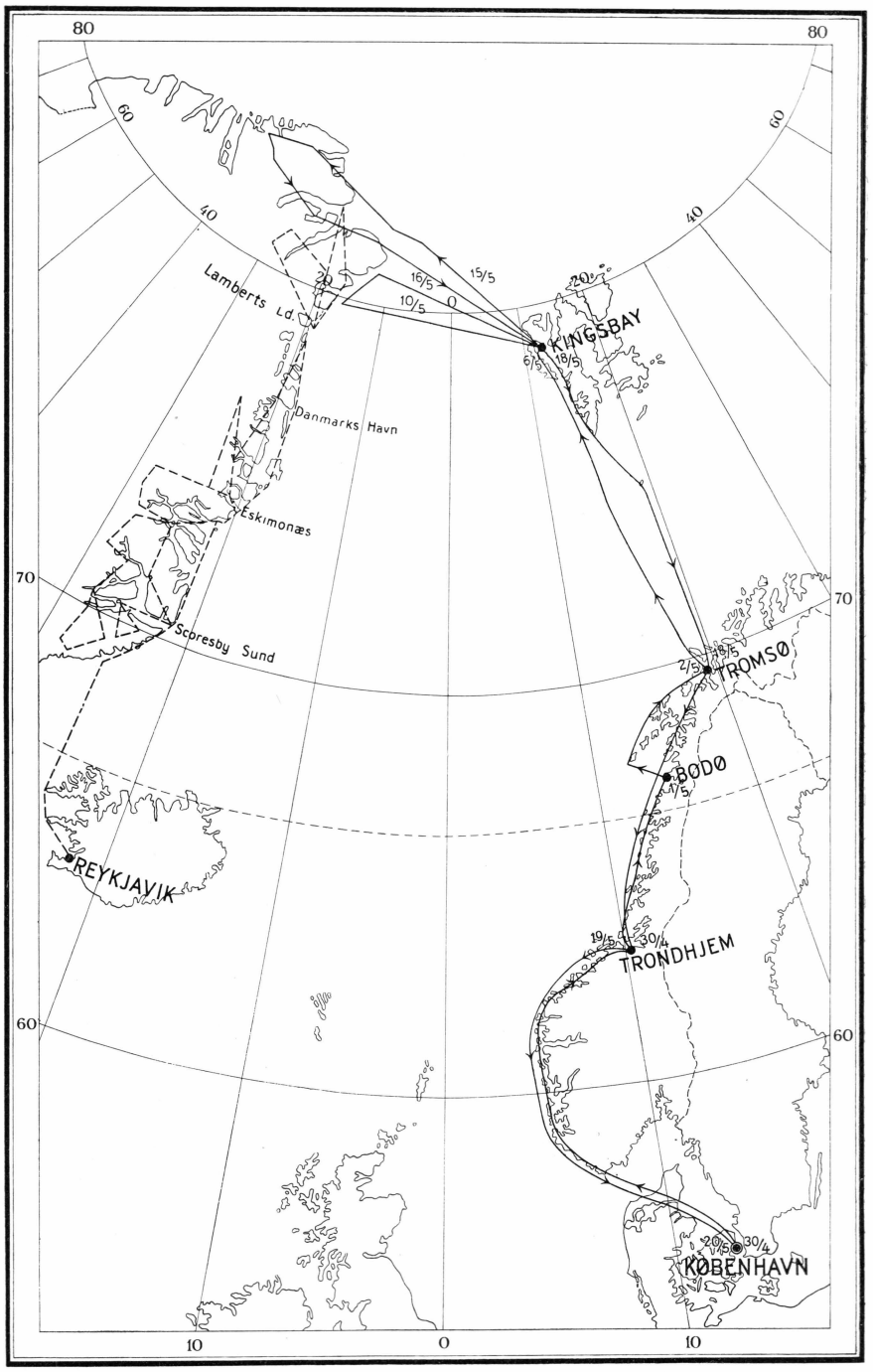

Fig. 39. Map showing route of air expedition in 1938 from Copenhagen to Peary Land and back. Areas of East Greenland mapped from the air in 1932 and 1933 outlined.

between this land and Nordostrundingen, and even in years when large quantities of ice are produced along this stretch, the ice will not be pressed against the coast till south of Ile de France. In fact, the East Greenland ice seems to originate from two areas, consisting partly of ice that has moved from the regions round the North Pole (the North Polar ice) southwards between Greenland and the hypothetical land, partly of ice coming from the waters round Siberia (the Siberian ice) and passing north around Spitsbergen to East Greenland. The Siberian ice does not probably reach the coast of East Greenland until about 77° N. lat., which is one of the reasons why there is often open water between 77° and 82° N. lat." Cf. Fig. 3, p. 615 of the same paper, "Main routes of ice-drift along North and East Greenland".

In 1935 PETER FREUCHEN says (p. 205): "I let my gaze wander out across the ice-jammed sea. The atmosphere was exceptionally clear. Far out to the northeast where the maps say there is nothing but open water, I believed, and I still do believe, that I saw mountains and the outlines of land. It may have been "water sky" — the steam rising from an open stretch of water. This phenomenon has deceived far more learned men. Remember that Robert Peary thought he saw "Crocker Land" from Grant's Land at the northern tip of Ellesmere Island. I am still not convinced, however, that I did not see land from Cape Rigsdagen, and that section of the sea has been insufficiently explored to prove me wrong."

It should be noted that Kap Rigsdagen is situated about 50 km southwest of J. P. KOCH's sledge route from Nakkehoved to Peary Land and accordingly at a much greater distance from the supposed land.

In 1934 and 1937 Captain ALF TROLLE, the former Second-in-Command of the Danmark Expedition, had plans of expeditions, partly by ship partly by airplane, in quest of the supposed land, but for various reasons these plans were not carried out (cf. C. B. THOSTRUP 1938, p. 007).

At the end of December 1937, the newspapers reported that the Russian expedition consisting of PAPANIN, leader, KRENKEL, radio operator, FEODOROV, astronomer, and SHIRSHOV, hydrographer, had sent home a wireless message that they had seen land from the ice-floe on which they drifted from the North Pole towards Nordostrundingen and onwards along the east coast of Greenland. At that time the floe was near Nordostrundingen and accordingly near the place whence the Danish expeditions had reported the discovery of land. The observation of the Russians was made under a waning moon, and as it was in the middle of the dark time, the ice-floe could not be very far from the supposed land. It may be asked, with what degree of certainty can land be observed during the dark time and especially under a waning

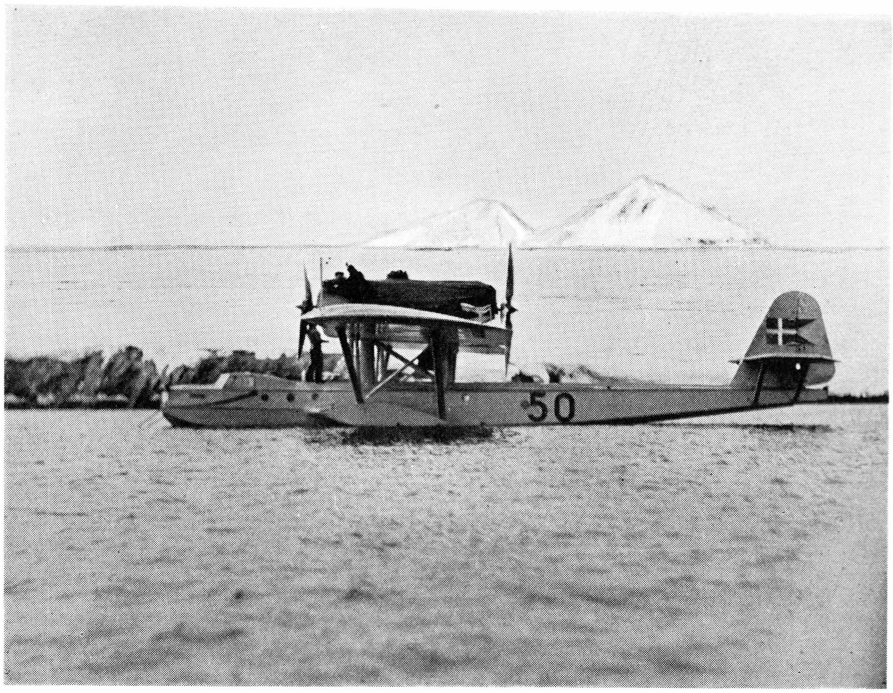

Fig. 40. "Perssuak" in Kings Bay.

moon, and whether there is not a great possibility of confusion with icebergs or high pressure ridges. During my many sledge-journeys across Melville Bugt my experience was that in the dark time land is very easily distinguished from icebergs and pressure ridges even at a great distance. I therefore attached great importance to the reported message of the Russians, and immediately made up my mind to prepare for an expedition to investigate whether unknown land existed between Greenland and Spitsbergen.

There could hardly be any great land masses, for the northern and eastern extension was limited by WILKINS's and NOBILE's air-routes of 1928 and to the east further by WILKINS's route in the submarine *Nautilus* in 1929.

Preparations and Start.

The plans for an expedition to investigate whether or not there existed any land between Greenland and Spitsbergen caused some stir and were kindly received in Denmark. If such a land actually existed, it would be of great importance for future air communication in the Arctic, and since, according to the few and vague observations, it must be assumed to be situated nearer to Greenland than to Spitsbergen, it was natural for Denmark to take up the task.



Fig. 41. The former coal-mine Ny Aalesund at Kings Bay.

However, this was too slight a basis on which to start an expedition, but old plans for an investigation of the interior of Peary Land turned up again and the expedition thus acquired two objects, 1) an investigation as to whether any land existed between Greenland and Spitsbergen, and 2) an air survey of the interior of Peary Land, more especially of the depression seen by me in 1921 extending towards J. P. Kochs Fjord in continuation of Wandels Dal.

The Administration of Greenland placed my former expedition ship s. s. *Gustav Holm* at my disposal, under the command of Captain H. Rosfeldt, and the Danish Navy supplied a 1-motor Heinkel hydroplane, pilot Lieutenant Sundby, who had previously been flying in Greenland, and a 10-tons Dornier-Wal flying boat, previously used on the German air route to South America.

The plan was briefly as follows: s. s. *Gustav Holm* with the seaplane on board was to go to Kings Bay, Spitsbergen, to serve as station and base ship for the Dornier-Wal hydroplane, which received the name *Perssuak*. The latter was to fly from Copenhagen to Spitsbergen, whence it was to start out to investigate the waterway between Greenland and Spitsbergen and the interior of Peary Land.

s. s. *Gustav Holm* left Copenhagen for Spitsbergen on April 13th. A great number of its officers and crew had previously taken part in several East Greenland expeditions under my leadership. On board the ship there was further some personnel from the Danish Navy and my earlier chief of equipment G. Seidenfaden, who was in constant communication with the Greenland Administration during the expedition, and who was to organise a rescue expedition in case the *Perssuak* should not return from one of its flights. s. s. *Gustav Holm* had



Fig. 42. The *Perssuak* takes in fuel at Kings Bay.

been furnished with various new wireless instruments, and two wireless operators were on board. Further the ship carried a float to serve in case repairs should have to be done to the large hydroplane and during its taking in of fuel, further, fuel for the *Perssuak*, a spare motor, and various spare parts for the plane.

The Dornier-Wal hydroplane to be used on the long flights was built in 1934. Its data were as follows: width 27.2 m, length 18.2 m, maximum height 5.8 m, total weight 9.5 tons, total pay load 3.2 tons, two motors 660 HP, B.M.W., supply of petrol 2.45 tons, march speed 180 km/h, maximum rate 220 km/h, radius of action c. 2500 km, crew 4—5 men, wireless equipment: long-wave and short-wave stations, an automatic electrically-driven air-photo apparatus (Eagle camera). This camera was fitted to the hydroplane with a view to the supposed land. If the land existed, it would be situated at such a short distance from Spitsbergen that a complete mapping of it from the air would be possible by means of this apparatus. However, the operation of the camera would require an extra man, and for this reason as also on account of its great weight it could not be employed on the long flight to Peary Land.

As the flights would probably have to be made in intense cold, the hydroplane was especially fitted out with a view to this possibility,

i. a. electric switch buttons were fitted in many places for the electrically heated suits. A small petrol motor, which in case of motor stops might supply the necessary electricity to the wireless, was likewise present. Unfortunately this type of plane could not ascend higher than 3000 m; our maximum height during the flights was 2400 m. The plane was orange-coloured on its upper side, experience having shown that in case of a forced landing this colour will be visible for the greatest distance in the Polar countries.

The piloting of the hydroplane, F.M.I.50 *Perssuak*, was entrusted to Lieutenant E. Overbye, the youngest of the pilots who joined my East Greenland expedition in 1932. Further he had acted as a pilot in East Greenland in 1933 and 1934 also, and finally, on an expedition in 1935 he had made a number of excellent flights. No pilot knew East Greenland from the air better than he.

The other pilot, R. Mayr, was lent to the expedition by Deutsche Lufthansa. He had participated in a number of pioneer flights, i. a. across the North Atlantic to New York, and on the South Atlantic route he was one of the veterans, having made 36 flights out and back across the Atlantic, several of them in the *Perssuak*.

The radio mechanician Preuschoff, likewise of the Deutsche Lufthansa, had crossed the Atlantic several times and had an intimate knowledge of the radio equipment of the plane.

Equipment.

As the planned flight across Peary Land and back to Spitsbergen was very nearly the maximum distance which the hydroplane was able to cover, the weight of the equipment must not exceed 250 kg. As a rule we wore thick underwear and overalls of woollen stuff, which was usually sufficient in the closed plane, so that we need not use the electrically heated suits. Owing to the great weight of skin clothes, and since a forced landing in North Greenland, should it happen, would take place about the middle of May at the earliest, we did not carry skin clothes.

The equipment included a so-called Nansen-sledge, which could be fastened to the outer side of the plane and could likewise be transported by the Heinkel plane, and a small "Pulk" (i. e. a Lappish sledge). Two tents, ice-axes, and military spades; in 1925 Amundsen was badly in want of the latter, in particular when he had to make a starting ground for his plane on an ice-floe. Each man was equipped with a pair of skis including ski-sticks, boots, and socks; further a sleeping bag and an eiderdown waistcoat. Finally the equipment included a primus stove of aluminium for petrol and kitchen utensils, a telescope rifle and 100 cartridges, sewing materials, and medicine.

The sleeping bags and the tents were packed into the Pulk, and the provisions were distributed into four rucksacks, one for each man, so that in addition to the skis there were only five pieces of luggage, namely the Pulk and the rucksacks. Our provisions had been prepared according to the advice of the Danish Physiological Laboratory, Chief: Professor FRIDERICIA. Each rucksack contained sufficient provisions for one man for one month even if he worked hard. If we were to remain in camp awaiting a rescue, the provisions would suffice for two months. The daily provisions for each man were as follows:

60 g	oatmeal
100 -	coarse crisp bread
50 -	dried figs
50 -	dried apricots
50 -	sugar
100 -	chocolate
50 -	dried milk
300 -	pemmican
60 -	butter.

All the provisions were packed in watertight aluminium boxes.

The Journey to Spitsbergen.

s. s. *Gustav Holm* arrived at Kings Bay in the evening of April 29th. In the morning of April 30th the *Perssuak* started from Copenhagen, heading towards Cape Lindesnæs, and from this point we proceeded along the coast of Norway to Trondhejm, where we arrived after a flight of 7 hours 20 min.

The weather was not particularly good when we started next morning, and on reaching the Lofoten it was impossible for us to pass either east or west of the islands owing to clouds and rain, and having covered only 550 km. we were forced to land at Bodø after a flight of 3 hours 45 min.

Next afternoon the weather improved. We laid our course west of the Lofoten, and as we passed Andø the weather was clear. We landed at Tromsø on May 2nd after a flight of 2 hours 30 min.

The meteorological office of Tromsø informed us that the weather forecasts for the succeeding days were unfavourable, and we therefore had to remain here for three days. Not till May 6th did the weather clear so much that we found it advisable to start. After a flight of 6 hours 25 min. and having covered 1150 km, we landed in Kings Bay alongside the *Gustav Holm.*

Captain ROSFELDT had chosen the anchorage of the ship in the immediate vicinity of the deserted mining town Ny Aalesund, now only inhabited by two Norwegian hunters.

On our arrival we learned that Kings Bay was practically free of ice, and on reconnaissance flights Lieutenant SUNDBY had determined the position of the edge of the pack-ice to the north and west of Spitsbergen. It seemed to be an exceptionally favourable ice-year, for the position of the ice edge on May 1st corresponded to that normally found in August.

Kings Bay and its nearest surroundings have played an important part in the history of Polar flights. Thus it was from a place a little north of Kings Bay that ANDRÉE started on his unsuccessful North Pole flight in a balloon in 1897. On May 21st, 1925, AMUNDSEN, ELLSWORTH, and RIISER-LARSEN started in two Dornier-Wal planes on their flight towards the North Pole. At that time Kings Bay was covered with ice. In 1926 AMUNDSEN again visited Kings Bay, this time with the navigable airship *Norge*, built in Italy; on May 11th he started with ELLSWORTH and NOBILE on board the airship to Alaska. A couple of days before BYRD had set out from Kings Bay towards the North Pole. Two years later General NOBILE returned to Kings Bay in a large new airship, and on May 15th he started on the first long flight towards the islands north of Siberia and back to Kings Bay. On May 23rd he set out for the North Pole, but on the return flight the airship was wrecked. Finally, in May, 1928, WILKINS landed near Kings Bay after his famous flight from Alaska across the Polar basin.

During our stay in Kings Bay the weather was generally fine in the interior of the fjord. West of Spitsbergen the wind, though usually light, was blowing almost constantly from the north. Far out to the west we discerned a bank of fog, whose presence seemed to be associated with the edge af the pack-ice.

The hydroplane was now overhauled and made ready for the first flight towards Greenland. It was to be made with as little fuel as possible, having almost the character of a reconnaissance during which we were to make observations of the position of the ice-edge, the weather conditions, and the height of the fog over the ice. Furthermore the compasses were to be tested, the magnetic variation in these latitudes being very considerable and increasing towards Greenland, and at the same time the horizontal intensity is rather slight. We did not, therefore, know to what extent we could rely on our compasses. Last but not least there was a possibility that during this reconnaissance trip we might discover the supposed new land, and if it was possible for us to land near it, it would be good if the hydroplane were not to heavy.

The fog-bank which on our arrival at Spitsbergen on May 6th was very high, gradually decreased, and on May 8th we decided to make an attempt to approach Greenland. After about an hour's flight we reached the fog-bank. It soon proved that it was too high for us to fly above it, and we therefore flew right into it, hoping that it would soon decrease. It was not long, however, before ice began to form on the plane in such great quantities that further advance was inadvisable, and we had to return to Kings Bay.

The First Flight to Greenland.

On May 10th the weather was fine, clear and calm in the fjord, and to the west also weather conditions seemed to improve. The fog-bank was lower and seemed to decrease hour by hour. We decided to make an attempt to reach Greenland.

We started at nine in the morning, and after a flight of 35 minutes, having covered a little over 100 km, we encountered the first patches of mist, but no compact wall of fog as on our previous attempt. The mist-patches lay at a height of 600—700 m, and all the way we were able to see the surface of the sea through them. The wind blew from the north, but it was not so strong as the other day.

After a little more than an hour's flight we discerned the edge of the pack-ice below us. It was satisfying to know that even at a distance of 200 km from Spitsbergen it would be possible to land in open water, and that in case of an accident the ship might reach us here.

We proceeded on our flight towards the east coast of Greenland. After about 15 minutes (c. 45 km) the waves of the Arctic Ocean had no more influence on the ice-floes, the swell did not reach the large ice-sheets over which we flew. The mist was low and thin, and the size of the ice-floes could be distinctly seen through it. Stretches with open water up to a kilometer long were occasionally seen; in several of them it might be possible to land.

The farther we proceeded westward, the thinner grew the haze; at last it disappeared entirely and we flew in bright sunshine across the uniform ice fields.

At eleven o'clock, after two hours' flight, we passed some zones in which the ice-floes looked as if they were ground to pieces. We were almost south of the place where the Fata Morgana Islands were supposed to be situated. I took these alterations in the ice as a sign of their existence.

We again flew over large unbroken ice-fields and now the vague outlines of the mountains of Greenland appeared to the west. Soon we were able to determine our position; we had come a little farther south than planned, and we therefore followed a somewhat more northerly

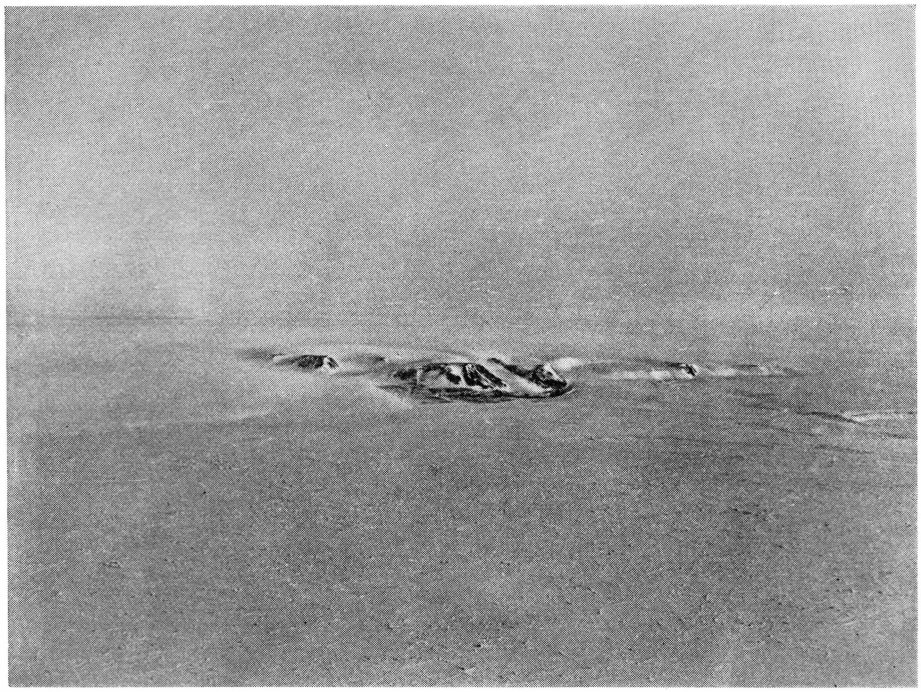

Fig. 43. Eastern part of Nakkehoved, seen from the northeast.

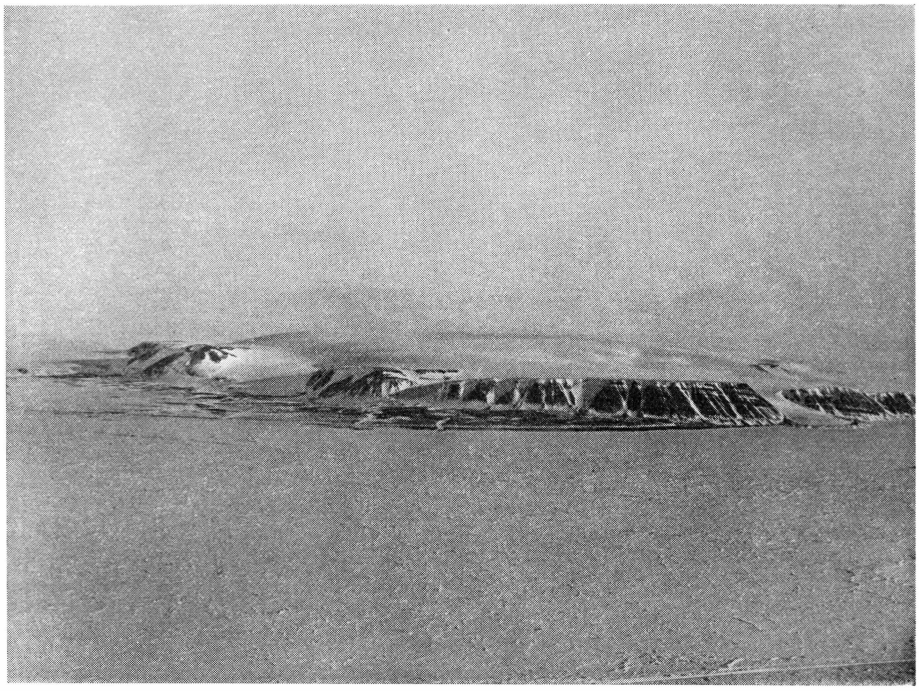

Fig. 44. Western part of Nakkehoved.



Fig. 45. The head of G. B. Schley Fjord.

course. Now the ice-dome of Nordostrundingen emerged in the north, and some distance ahead we sighted a nunatak which was mapped by the Danmark Expedition in 1907, and which I recognised from my flight in 1933 to these regions.

At 11.41 a. m., after a flight of 2 hours 41 min., we reached the coast and now flew southward along it. The weather was very clear, which enabled us to recognise every detail marked on the map. Near the shore the ice had changed its character, large openings with open water occurred and it was evident that the ice had been subjected to violent pressures and frequent gales from the northwest which had broken it up. But the land was still covered with snow everywhere.

These conditions must be due to the storms which blow around the north of Greenland during the winter, continuing southward along the east coast, where again and again they break up the sea-ice and force it far seawards; for immense pressure ridges alternated with areas covered by quite thin ice and in many places open water was observed to near the coast.

Off Mallemukfjældet there was much open water—an observation made by previous expeditions also. I had a consultation with the two pilots. The weather was ideal, we had fuel enough—should we go north again to make another attempt to solve the riddle about the

supposed land? However, we found it more advisable to return to Spitsbergen and make ready for the planned flight to and across Peary Land; if on that flight we followed a more northerly course, we should be able to decide whether or not the islands existed. A short distance north of Mallemukfjældet we therefore turned and headed towards Kings Bay. As on our outward flight, the mist was low and thin and as a rule the ice-floes were distinctly visible through it. Near the ice-edge the weather was clear.

This flight was rich in experience. The wireless had acted excellently, and the same applied to the homing device. The compasses had taken us a little farther south than planned, but had otherwise acted to our satisfaction. Furthermore we had made various observations of the sea-ice. From an altitude of 1000 m the ice-fields looked as if they were quite even, but on closer inspection we perceived that their surface was covered by a network of old pressure ridges. But in several places right in to the Greenland shore there had been areas with open water large enough for landing and starting the hydroplane. However, if we were forced to land in such a place owing to a motorstop, so that we could not start again, the chance of rescuing us, even by means of a seaplane, would be diminutive, owing to the mist, which apparently, though low and thin, lingered almost constantly over the ice.

On our return to Kings Bay it proved that one of the large glaciers had calved and the sea around the ship was filled with ice blocks, which would render it impossible to start the hydroplane. We landed some distance out in the fjord at 3.25 p. m., having covered 1240 km in 6 hours 25 min. It was rather difficult to keep the hydroplane free of the ice blocks, which were carried out by the wind, and it took a long time to tug the plane through the ice-filled water to a safe place near the ship. Under these circumstances our planned start for Peary Land had to be given up for the time being.

Next day the fog-bank to the west was again very high, and neither this day nor the succeeding days was there any possibility of starting. In Kings Bay, too, the weather was unsettled, with frequent snow-squalls, and the fog-bank out at sea showed that a northerly gale was blowing west of Spitsbergen.

During these days, however, we made the hydroplane ready for the start for the Peary Land flight. Everything that we could do without was removed from the hydroplane in order to reduce its weight as much as possible, even the Eagle Camera was removed. It was filled up with 3950 litres of petrol, which with a personnel of four and the equipment was regarded as the absolute maximum weight.

The Second Flight to Greenland.

During the last few days of bad weather I had been afraid that no opportunity would come for starting on the Peary Land flight before the unsettled period, which always occurs in North Greenland when the temperature approaches zero, should set in, and I regretted that on May 10th we had not been equipped for the long flight.

In the morning of May 15th it snowed in Kings Bay, but in the course of the day the weather cleared, and the fog-bank to the west grew lower. In the interior of Kings Bay it was quite calm and consequently it was impossible to start with the heavily loaded hydroplane. But in the evening there came the first gusts of wind, and after an hour the wind had increased so much in force that we decided to start.

After a long and difficult start the hydroplane took the air without any mishap, though it had never before started so heavily loaded. We took a more northerly course than on our former flight. The weather was clear and calm over Spitsbergen, we distinctly sighted Amsterdam Ø and Danske Ø.

The fog-bank lay at an altitude of about 600 m, but we flew easily across it. Near the ice-edge the fog was low and transparent, and as we flew across the first ice-floes, it had entirely vanished.

We passed the ice-edge about 100 km farther northward than the other day, but it presented almost the same appearance: a belt, some 20—30 km broad, of densely packed small ice-floes, succeeded by large ice-sheets interrupted by stretches with open water. The mist over the ice lay at an altitude of about 50—100 m above sea-level, as a rule it was rather dense, but the ice was visible through it. Above the mist the air was extraordinarily clear, so that even an hour before we reached Greenland the coast mountains became visible. As on the previous flight the misty veil did not extend right in to the shore, but stopped some 30 to 40 km from it, a phenomenon well-known to me from my sledge journeys in North Greenland: the fog hangs above the pack-ice, but in calm weather it never reaches the coast except during periods of thaw.

Suddenly land was sighted south of our course. We changed our course to approach it. It proved to be a low plateau covered by glacier ice, which in most places descended into the sea. Was it the unknown land? The very flat glacier-ice, only occasionally broken by isolated steep cliffs, might in case of mirages have confused observers standing some way inland, and have rendered it difficult to estimate the distance. However, the more we approached the land, the more convinced was I that it was Nordostrundingen, or more precisely Nakkehoved; for it

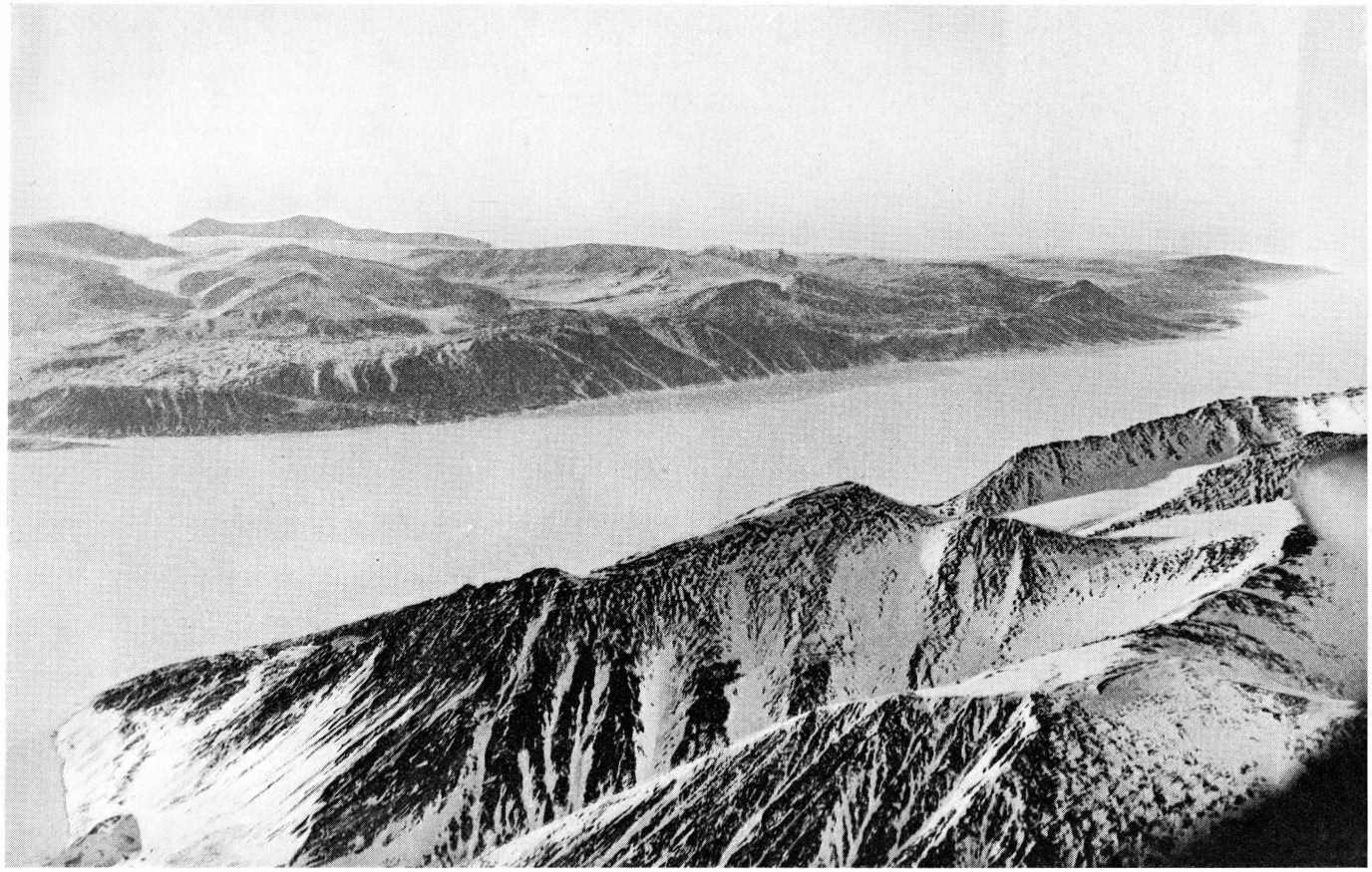

Fig. 46. The mouth of Fr. E. Hyde Fjord, seen from the southwest.

might be expected that we had deflected somewhat southward from our course as on our previous flight.

As soon as we were certain that it was Nordostrundingen, we headed northward again, looking anxiously out to the northeast for the supposed land. A low foggy haze about 50 m high lay over the ice but no land rose above it. The air was clear and calm, as it is only met with in the Polar countries. From an altitude of 1200 m we looked for miles around in all directions. We had now crossed the unknown area within which the new land was supposed to be situated, without discovering the slightest trace of it. Every possibility of the existence of the Fata Morgana Islands thus had to be rejected.

It has been claimed that perhaps some small and low skerries are to be found. Quite right, if the skerries are small and lower than 50 m, they may exist. But if they are merely of a fairly large extent, there would have been a hole in the fog, which would form like a ring around them. Moreover the land which earlier expeditions believed they had seen was a high alpine land, and such a land does not, at any rate, exist, and the possibility of the existence of some low skerries is almost nil. Possibly, however, the repeated observations of the so-called Fata Morgana Islands may be due to mirages about the place where the sea-current coming from the North Pole meets with that coming from the Siberian waters. At is has now turned out that the Fata Morgana Islands do not exist, the zones of much crushed and packed ice-floes observed by me from aircraft on May 10th may therefore be taken to represent a boundary zone between the ice-streams coming from the north and east respectively, the meeting of which may very well be supposed to give rise to mirages.

North of Nordostrundingen the landfast ice extended about 25 km out from the coast, and along its edge there was a belt with open water. It was evident that the wind was blowing from the south down at the surface of the sea, but at an altitude of 1200 m there was apparently no wind.

Our observation of Nordostrundingen was now further confirmed, for shortly after the mouth of Danmarks Fjord appeared. To the north we sighted Peary Land, and we headed directly for the mountains behind Herlufsholms Strand.

Peary Land.

As we approached Peary Land the mountains grew higher and higher, and more and more details were discerned, several of which I recognised from my journey in 1921, when I travelled by sledge around the whole coast of Peary Land accompanied by three Eskimos.

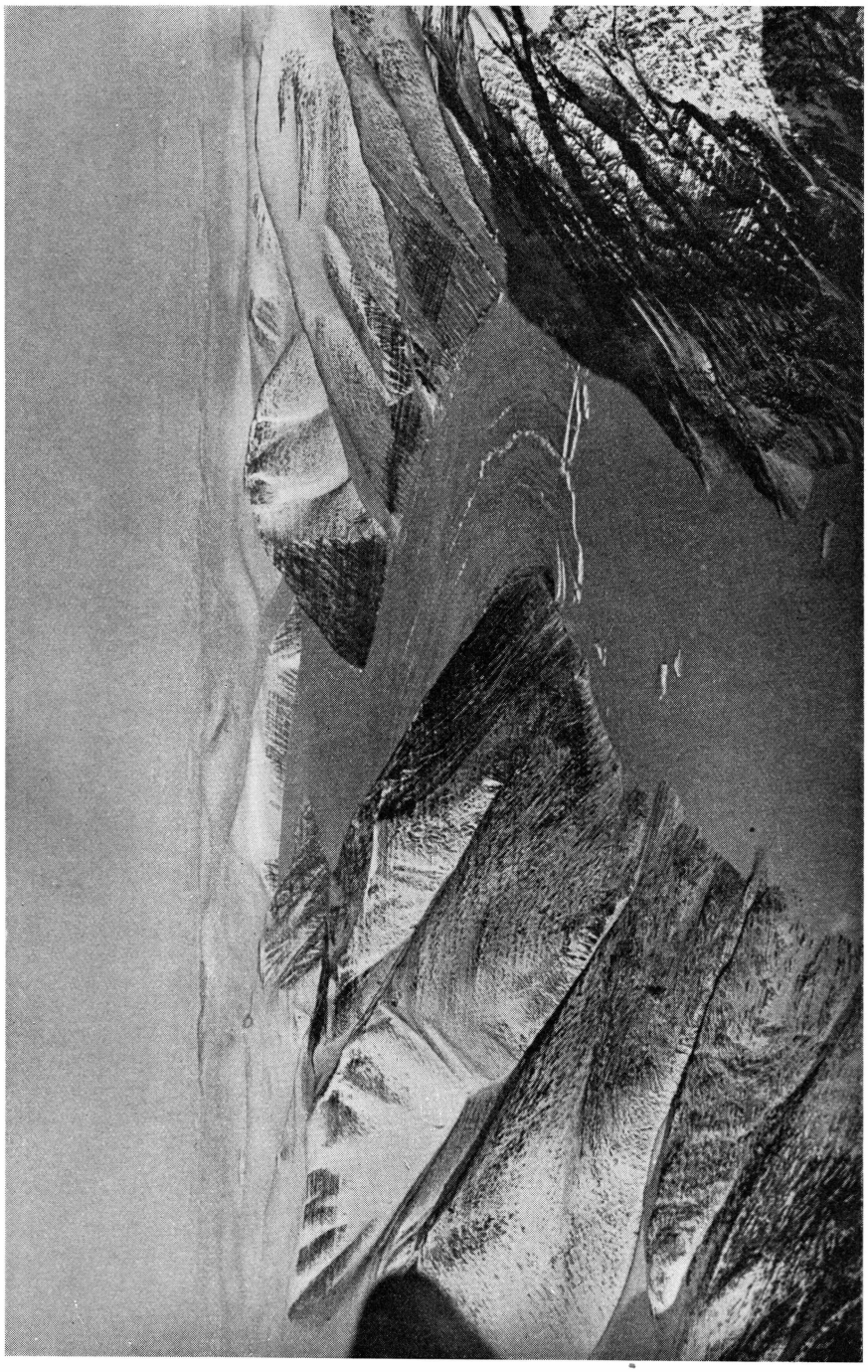

Fig. 47. Head of Frejas Fjord with Balders Gl.

I called to mind the earlier expeditions which had tried to solve the riddles of this remote and forbidding land—what physical force it had required! Naturally I especially remembered my own two summers in Peary Land.

I had visited Peary Land twice before, in 1917 on the Second Thule Expedition and in 1921 on the Jubilee Expedition. How often did we, during both these summers, look into a fjord without being able to see its head! How often did we make a laborious ascent of a mountain peak in the hope of gaining a wide view inland; but on reaching the top we found our view barred by even higher mountains!

Quite independently of pack-ice, deep snow, mountain peaks and ravines, and with all our strength intact we were now to sail across the white spot, the largest blank still found on the map of Greenland, to fill it out.

The weather was fine, the sun was high in the sky to the north, it was a splendid night.

We made everything ready for the work. MAYR took the wheel for the following three hours. Personally I arranged map sketches and drawing utensils in the pilot cabin. OVERBYE arranged the camera and made the film-packets ready for use. Only the radio operator continued unaffected his work, sending and receiving wireless messages; and once every hour he went upstairs to inspect the motors. The idea that there might be some risks attending the flight, never occurred to any of us. Nor did time permit any indulgence in reveries about the grandeur and beauty of the landscapes below us; our attention was directed towards the geographical discoveries that were going to be revealed to us.

At 11.20 p. m. we passed the coast-line. When travelling by sledge in the springtime it is almost impossible to determine the accurate position of the coast-line; for the land is very flat, there is hardly any tide, so land and sea ice pass evenly into each other. From the aircraft, however, the coast-line was distinctly visible.

On my journey in 1921 I had encountered musk-oxen here. All of us knew it, and we all anxiously scanned the plains below, but no musk-oxen were seen, nor did we discover any living being on Peary Land during the whole flight.

I now began my mapping work, measuring and sketching rivers and valleys which on earlier expeditions I had failed to trace to their full extent, but which now lay extended before my eye.

It was not long before the first of the great geographical riddles was to be solved: G. B. Schley Fjord, whose mouth was well-known, but whose inner courses were entirely unknown, emerged ahead. It was not as large as I had expected, only about 35 km in length. But on the other

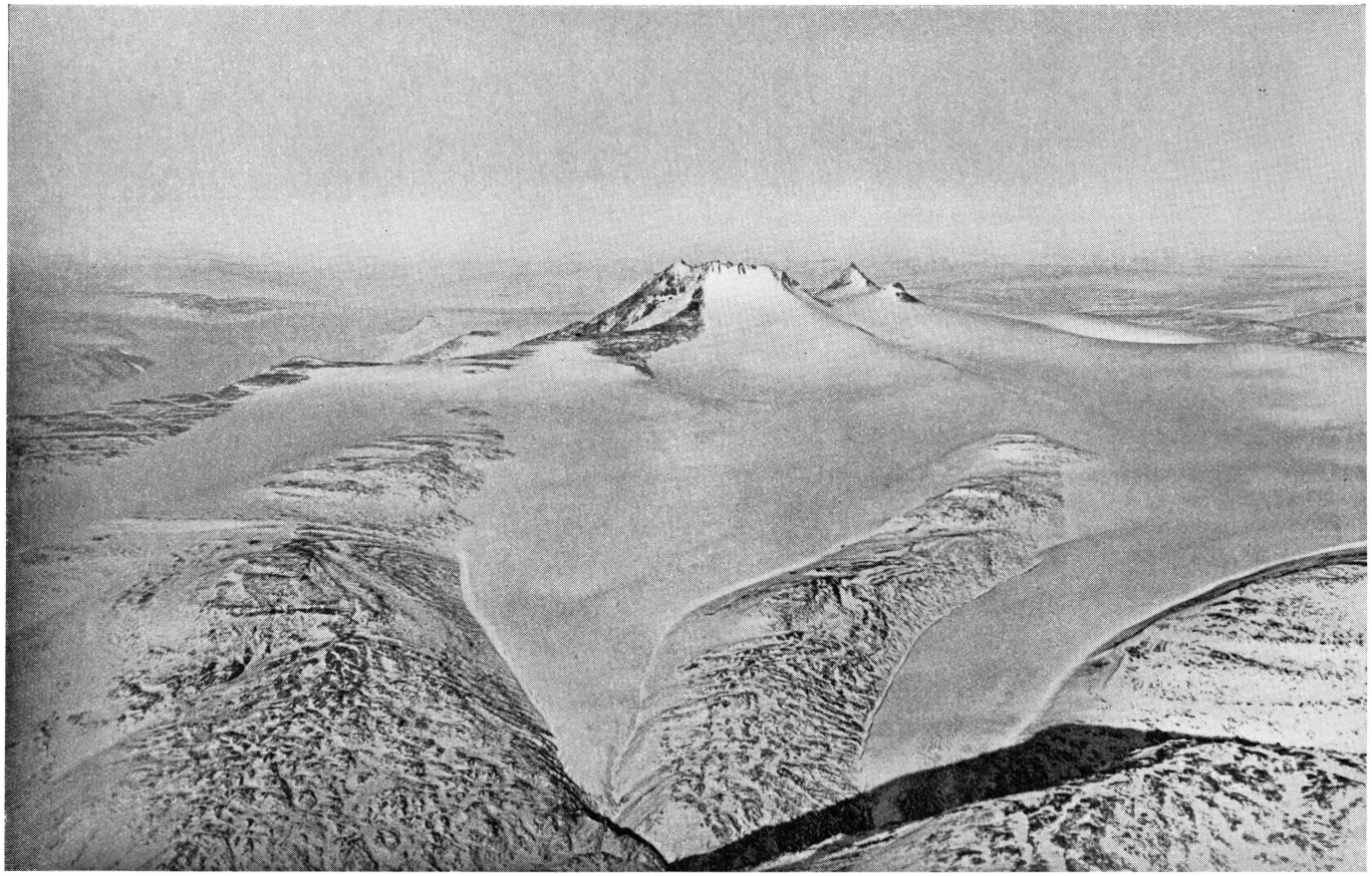

Fig. 48. Wistars Bjærg, about 1930 m, the highest mountain on Peary Land.

hand it issued a branch to the northeast whose existence was not known before.

During the ensuing hours I was busily engaged in measuring and sketching the landscapes over which we flew—large fjord systems, occasional lakes, mountain ranges, and glaciers.

Another large geographical riddle was approaching its solution: Fr. E. Hyde Fjord. Its mouth was discovered by PEARY in 1900, and in 1907 J. P. KOCH and his companions of the Danmark Expedition had tried to trace it farther inland, but had to give up the attempt owing to lack of provisions and food for the dogs.

Along the south side of the fjord the mountains rose steeply to great altitudes, so it was not till we were quite near the fjord that we gained a full view of it, and the immense fjord lay below us, extending more than 100 km farther inland than previously assumed.

In planning the route for our flight we had made a happy choice: we were now to fly towards the west-southwest, and it proved to be precisely the direction of the fjord, so that we might complete our great geographical discovery. We smiled at each other, conscious of this unexpected luck.

Some distance further on the fjord issued a branch towards the north. Two islands were situated in this fjord branch, which continued in a broad flat valley, at first in a northerly and subsequently in a westerly direction. The valley was bounded on the north by a mountain range, whose highest peaks were mapped by me in 1921 from the sea-ice north of Greenland. Four large glaciers descended the south slope of the range. The valley into which the glaciers descended was protected towards the east, north, and west by the mountains, which formed like a circular hot-house, and I therefore called it Drivhuset—the hot-house. Here, just south of the northernmost point of Greenland, it must be wonderful in the summer. This place must afford an excellent working field to zoologists and botanists. Perhaps they will one day arrive by airplane and remain during the summer to study the plant and animal life here at the end of the world.

I turned my eye towards the south. We had already passed a small fjord branch terminating in a glacier, and were approaching the highest point of Peary Land, Nordkronen, which I had sighted from a mountain peak in 1921.

The mountain Nordkronen itself resembles Vesuvius; it is penetrated by lava dykes, but it is probably merely by chance that it has a conical shape like a volcano. Many glaciers issue their tongues down the sides of the mountain, deep valleys occupied by glaciers and lakes lead to the centre of Peary Land.

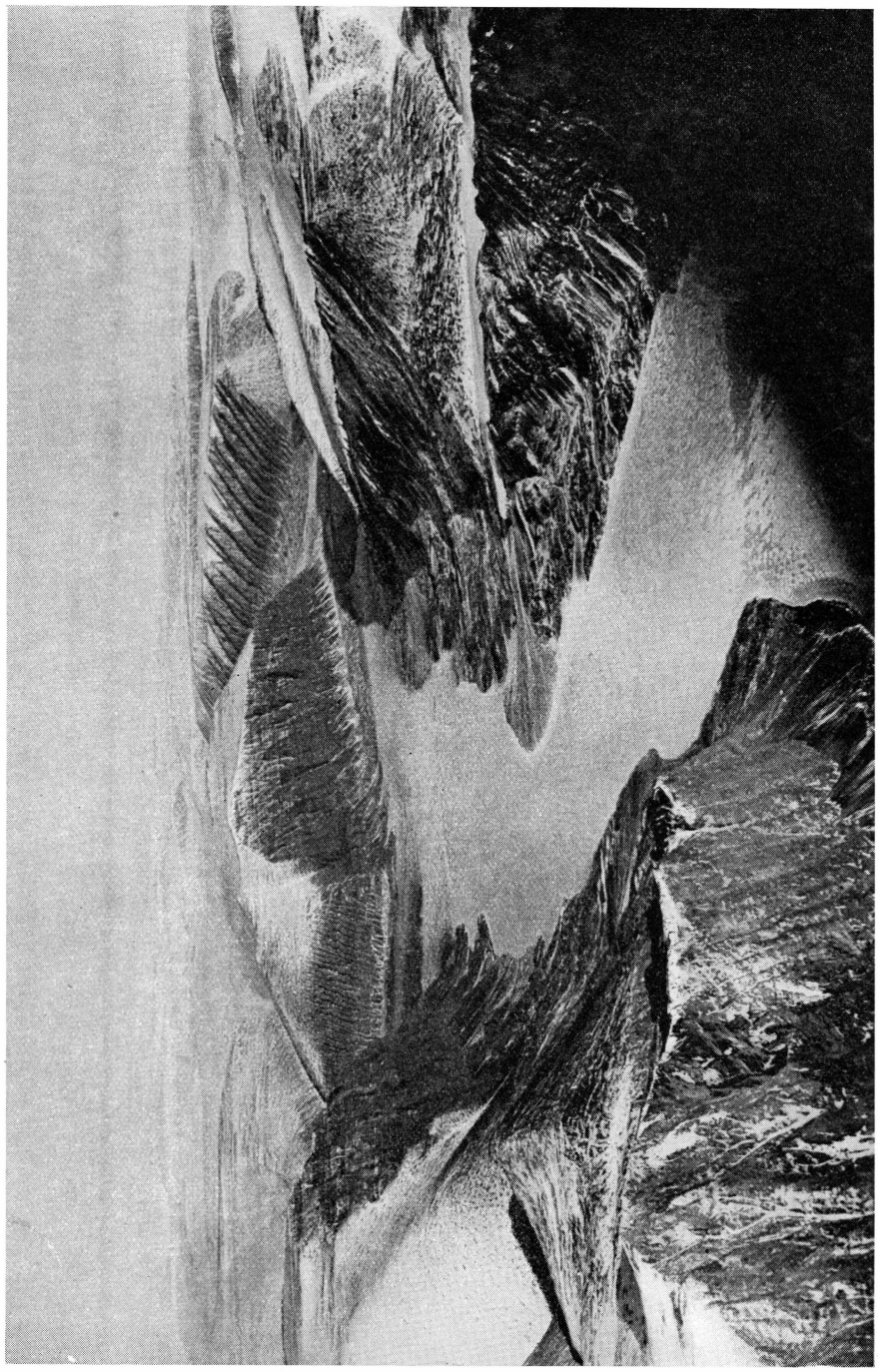

Fig. 49. Head of Thors Fjord.

Fr. E. Hyde Fjord continues far inland. On our north, wild alpine landscapes occurred, long and jagged mountain ranges with only few glaciers and small narrow valleys.

To the south the landscapes had quite a different character. We were looking down across a level plateau surface extending at an altitude of about 1200 m, with many glaciers and intersected by deep ravines with almost perpendicular sides.

We then reached a beautiful small fjord branch, which extended far southward, and shortly after we sighted another fjord. Glaciers descended into both of them, and many icebergs were ice-bound near the glacier fronts.

At last we reached the head of Fr. E. Hyde Fjord, whence a narrow and deep valley continued towards the northwest. We looked up through this valley. It was only about 20 km long and debouched into the head of one of the fjords cutting into the land from the north coast. In this way the whole northern portion of Peary Land becomes almost an island.

We were flying across a large glacier area. There it was, the glacier which I sighted in 1917 from a mountain top situated near the mouth of De Long Fjord; I then looked up the fjord and sighted the glacier which descended at the head of the fjord.

Suddenly and unexpectedly a large fjord came into view, the glacier at its head lay almost immediately below us. In 1917 I had mapped the entrance to this fjord on the north coast, and I then believed that I saw the head of the fjord. Now it proved that it was only a bend of the fjord I then sighted; for the fjord is connected by a sound with the preceding fjord.

On measuring and sketching all these new discoveries I glanced at the clock. It was nearly time for us to turn. Everything had been agreed upon beforehand, the pilot knew precisely which course to follow until a stipulated hour, when he was to change the course, likewise computed beforehand, and so on. The radio operator, too, knew this, and every fifth minute he sent a message to the ship in order that our comrades on the ship should be able to follow our flight on a map and at any moment be able to determine our position in case an accident should happen to us. The photographic work had likewise been planned beforehand, and OVERBYE noted down whenever he took a photograph.

A change of course was therefore a great and troublesome operation, which would cause considerable disturbance in the work of all of us. I again glanced at the clock. I was nervous lest the vast ice-covered plateau over which we were flying should not cease so that we might gain a view of J. P. Kochs Fjord. It was a matter of minutes now. If we had had some head-wind—and nobody knows the force of

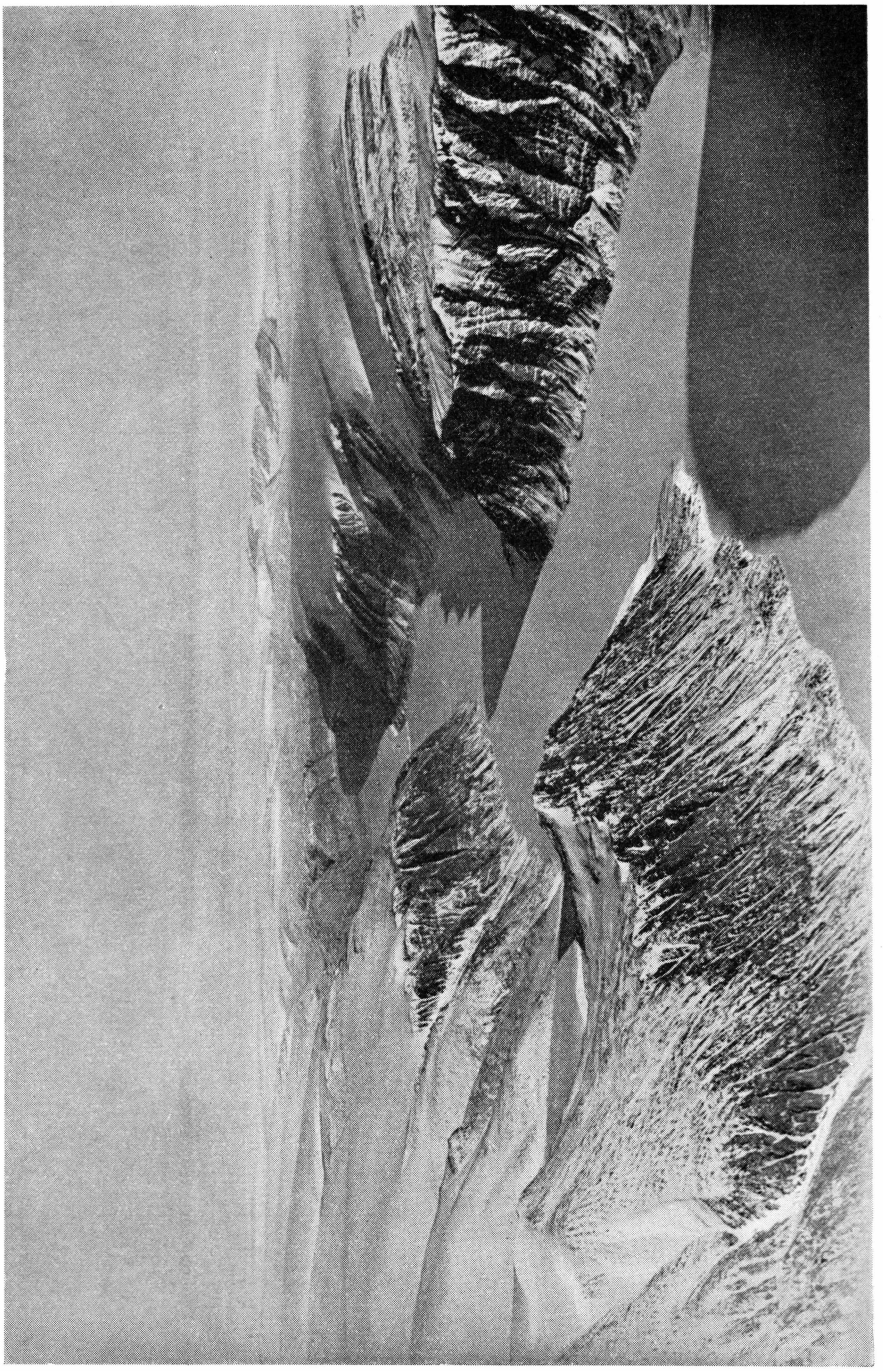

Fig. 50. Odins Fjord with Ymers Gl.

the wind up here at an altitude of 2400 m—there was a great risk that we should not reach it. However, luckily enough I had hardly come to the end of these reflections when J. P. Kochs Fjord emerged below.

There were not many seconds to spare for sentimental feelings. Yet to me this was perhaps the strongest impression during the flight. During the time since the hydroplane turned inland across Peary Land I had had the opportunity of recognising several of my camp sites from 1917 and 1921, even some on the north coast, where I had had glimpses of islands, fjords, and mountain peaks. Now suddenly this fjord lay extended below us, the fjord in which KNUD RASMUSSEN and I spent the bitter Constitution Day (5th June) of 1917; a violent blizzard had forced us to camp here, with hardly any provisions left and with dogs dying of hunger; it was on that day we realised that it would be impossible for us to reach the regions rich in game south of Peary Land, and that our return journey would be a struggle for life. I recognised the fjord, and I cast a glance at the place where our camp then stood.

I again looked ahead, and was astonished to see that J. P. Kochs Fjord continued towards the south to turn subsequently towards the east. In a moment I realised that this was the unknown part of the fjord which PEARY took to be a channel. The second large geographical riddle had been solved.

This surpassed our most sanguine expectations. In 1921, standing on the inland ice, I only faintly discerned a depression extending towards J. P. Kochs Fjord, but that the fjord itself extended so far southward, I never imagined.

Our new course took us away from the inner parts of the fjord, and I therefore decided to deviate somewhat from our planned route. I calculated that if we changed our course for only 5 minutes, the whole of the fjord could be sketched. In this we did succeed; but I regret that we did not follow the new course for 10 minutes instead of five. However, the decision had to be made instantly. OVERBYE had to stop taking photographs in order to calculate the new course, his calculation was then handed over to the pilot, who adjusted the plane in accordance with it. I was fully aware that the route planned beforehand represented the maximum distance which the hydroplane would be able to cover. And now I asked my companions, without consulting them beforehand, to add to the route. They did it without objections, though it meant a great risk; for we were to return across the Atlantic with no possibility of landing along the route, and nobody knew whether we would have to fight our way against a severe head wind.

Having flown along the fjord to its head, where a large glacier descended from the inland ice, we again turned to our old route. Next

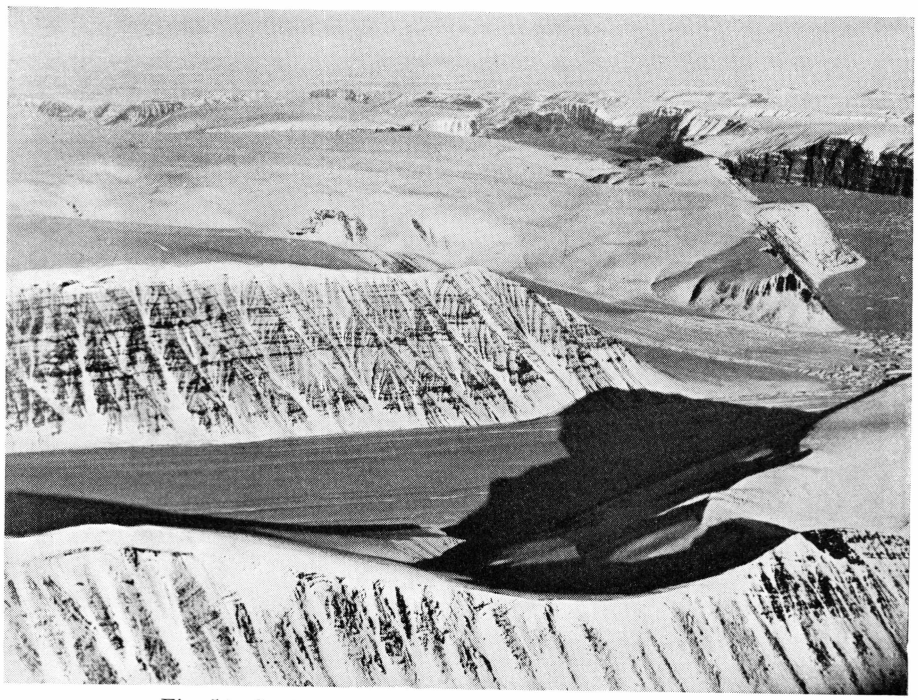

Fig. 51. Central and inner parts of J. P. Kochs Fjord.

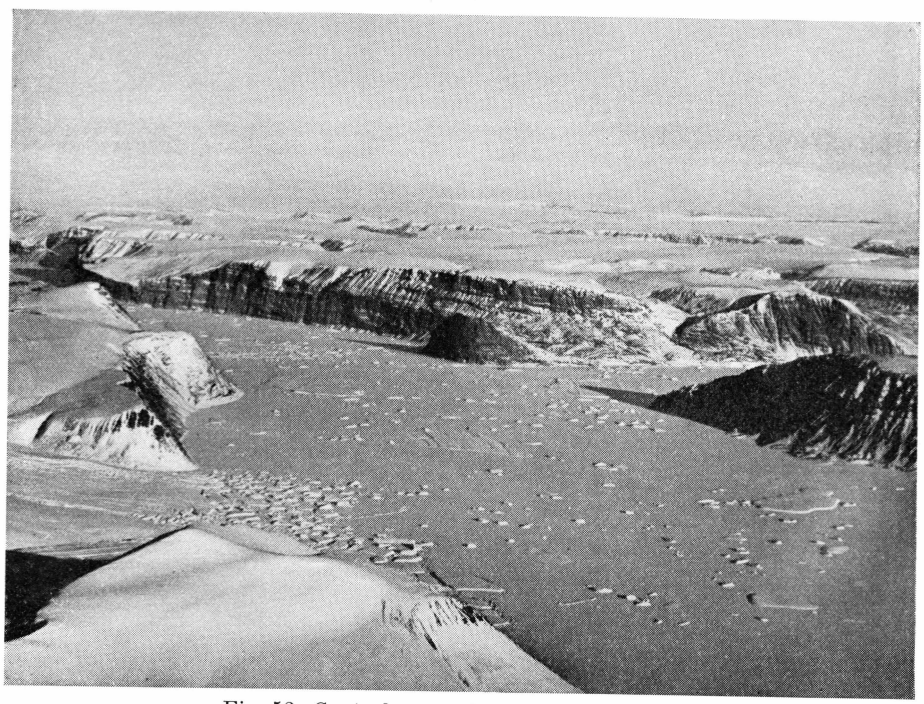

Fig. 52. Central part of J. P. Kochs Fjord.

moment we flew across the large lake which I discovered in 1921, and which forms, as it were, the eastern half of the Peary Channel.

I was now looking across the regions north of Vildt Land and recognised my camps and cartographic observation stations in 1921. To the north the Nordkronen, the highest point of Peary Land, was still visible, while below us the landscapes were made up of level plateaus now and then broken by glaciers. No more great geographical discoveries were in store for us.

On approaching the head of Independence Fjord photographs were taken in rapid succession. Then we sailed out over the ice of Independence Fjord with its many ice-bound bergs, and onwards across the land south of the fjord to Hagens Fjord, where a couple of new islands were discovered. Subsequently we were looking down upon the flat gravel plains where MYLIUS-ERICHSEN and his companions spent their last dreary summer, and had a view southward into Danmarks Fjord, before we again headed towards the icy dome of Nordostrundingen.

Suddenly the pilot pointed at some mountain peaks ahead. Again the mythical Fata Morgana Islands made their appearance. Where were these mountain tops to be located? We laid our course towards them, for now we made up our mind to see them immediately below us.

However, shortly after we again realised that it was Nordostrundingen which had played us a trick. Yet our observations did not agree entirely with the map; possibly the location of Nordostrundingen is not precisely where it is marked on the map.

Sailing across the narrow ice-free strip of land, Nakkehoved, we once again, at an altitude of 2000 m, turned our eyes towards the east and northeast: No land was to be seen in any direction off the coast of Greenland. Then we set out on our return flight across the pack-ice towards Spitsbergen.

The night had gone, and morning was approaching. We were dead-tired; so far we had been so deeply engrossed in our work that we had not noticed it. We packed up our instruments, OVERBYE took the wheel, while we had some coffee and hard-boiled eggs, the most suitable provisions on such long flights. Then we lit our cigars and cigarettes, a balm to our strained nerves, the homing device was started, and the pilots alternated at the wheel. The monotonous return flight across the Greenland Sea had begun.

As we reached the ice-edge and the highest mountain peaks of Spitsbergen appeared above the horizon, a thick bank of clouds spread towards us, so we had to fly right over the surface of the sea till we landed in Kings Bay near the ship.

The flight had lasted for 11 hours 30 minutes, and the distance covered was 2200 km. Fuel was left for another 300 km.

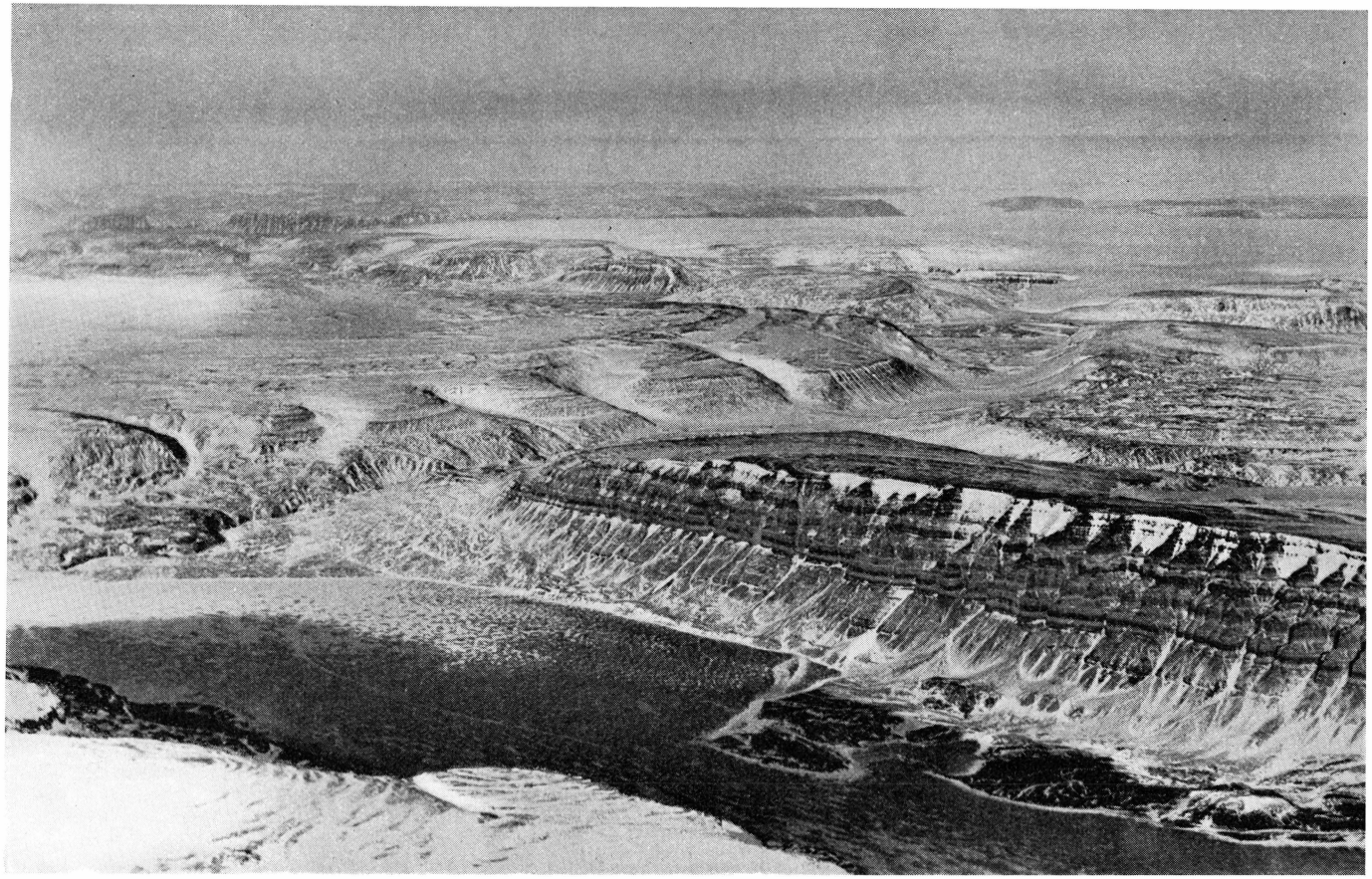

Fig. 53. Wandels Dal with Mifisommer Sø in the foreground. View of Wallcotts Land; in the background, right, Holger Kiærs Nunatakker, to the left Vildt Land.

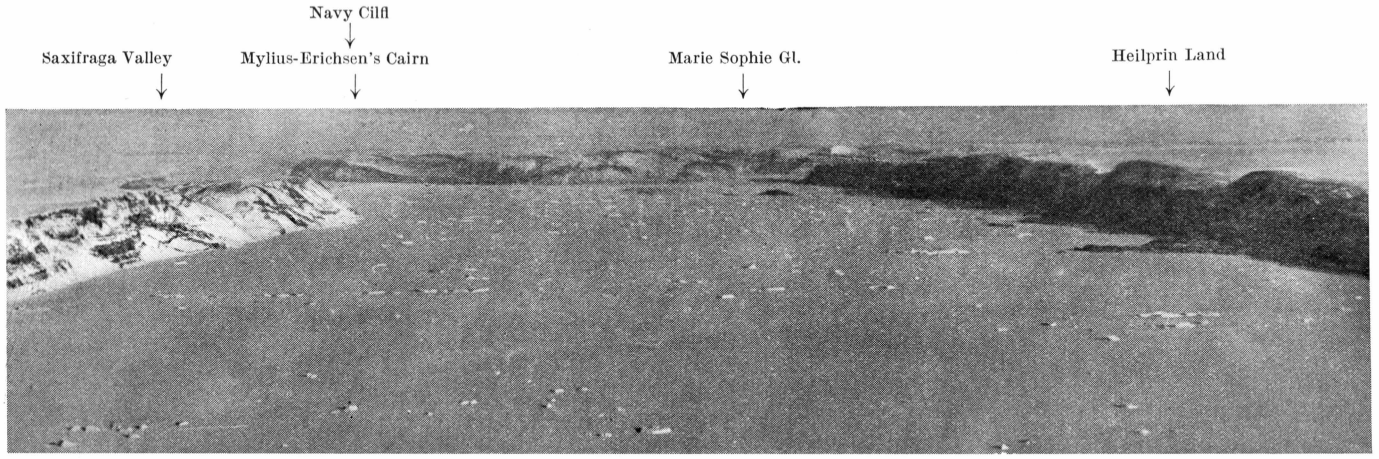

Fig. 54. Head of Independence Fjord.

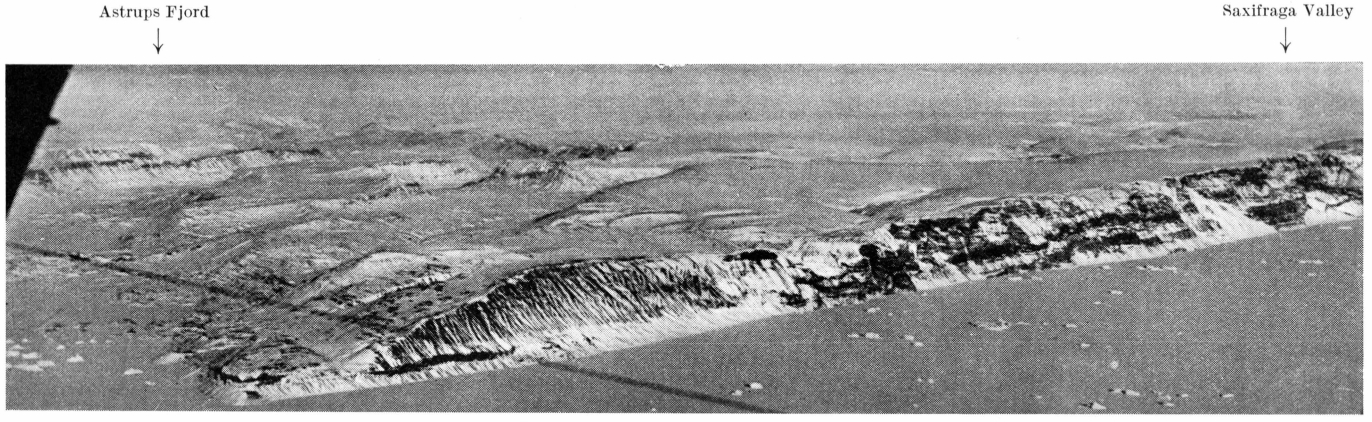

Fig. 55. View of Ubberup Land.

The Homeward Journey.

During the day, May 16th, we rested and slept. Meanwhile the mechanicians re-fitted the various things that had been removed from the hydroplane before the long flight in order to lighten it. At the same time the ship was made ready for the return journey to Denmark.

On May 17th the hydroplane was supplied with fuel, and the final preparations for the return flight to Copenhagen were made. The Meteorological Office of Tromsø reported fine weather over Norway.

In the morning of May 18th, at 9 a. m., we left Kings Bay, flying at a low altitude southward along the coast of Spitsbergen owing to clouds, which, however, lifted the farther south we came. Along the route we flew a couple of times round the Bjørneø, waving to the two Norwegian hunters that were stationed there. As we reached the coast of Norway the weather was practically clear, and we landed at Tromsø in the afternoon.

The weather forecasts from the Norwegian west coast were exceptionally favourable, and next day we therefore flew directly to Trondheim, which we left next morning, arriving at Copenhagen on May 20th, at 2 p. m.

The whole flight had lasted for 21 days. The total of flyings hours was 57 hours 50 min., during which a distance of 10,500 km had been covered.

THE SEA-PLANE EXPEDITION 1938 AND THE PEARY CHANNEL

Mapping from the Inland Ice.

Now that Peary Land and the regions through which PEARY drew his channel have been mapped, it will be natural once again to consider the circumstances under which the channel came into existence and what was actually observed by PEARY.

In forming a judgment of PEARY's map of the Peary Channel it should be borne in mind that his aim was to approach as near as possible to the North Pole, using the inland ice as a travelling route. The large depressions of the North Greenland fjords (cf. ADAMS, 1893, pp. 308—09) prevented him from mapping these fjords and the edge of the inland ice. When the inland ice ceased in about 82° N. lat., he first thought it was Victoria Fjord which barred his way, but gradually the depression proved to extend all the way to the east coast. Similarly as PEARY had made no attempt to map the depressions behind Petermanns Fjord and Sherard Osborn Fjord, he made no actual mapping of this depression either. Thus of this region merely a rough sketch, based mostly on free-hand drawing, is available from his hand; it was not till he reached Navy Cliff that an actual survey took place.

Actually it is a very difficult task to map the edge of the inland ice and the land in front of it from stations on the inland ice, it being very difficult to approach the ice-edge. In April-June heavy gales with driving snow are often experienced on the slopes of the inland ice towards the land below. This often renders it very difficult to make out one's position, for the driving snow conceals the large crevasse systems which are often found near the edge. In addition more or less hidden snow-bridges will often occur in the early summer. In July a broad belt of slushy snow is found in the marginal zone, and below it there is rough ice without snow; this month is therefore unsuitable for travelling along the marginal zone of the inland ice. In August and the beginning of September the snow-free belt of the inland ice is broadest; the

river-beds, often very large, will then contain little water. Following such a river-bed one will be sure not to meet crevasses, and if crevasse areas occur, the snow-bridges spanning them have in many cases burst, and will accordingly be visible in the late summer. Journeys in the marginal zone are therefore least dangerous at this season, but may be very inconvenient, because the snow-free surface of the ice is very rough, and will cut the dogs' paws and the footwear of the men.

Near the edge the level and apparently horizontal surface of the inland ice will prove to slope downwards at the same time as it grows irregularly undulated, and the highest mountain peaks of the land below come into sight in the distance. Owing to mirages it is impossible to make even a fairly accurate estimate of the distance; the correct position of the mountains will not be found out till after some days' travel and only if the observations for longitude and latitude are correct. The nearer one approaches the land, the more undulating grows the surface of the inland ice, and the land may disappear again for short periods, only the highest summits will be visible, and if the position of the ice edge is not known, a mapping will be almost impossible (cf. EJNAR MIKKELSEN's mapping of Kronprins Christians Land from the inland ice). Suddenly a depression may turn up, and one gains a view down a glacier; the front of the glacier, however, is rarely visible; if land is seen beyond it, the glacier must be supposed to descend to a land area.

The mapping of the ice edge made by me from the inland ice in 1921 soon taught me that in order to gain a view of the land and nunataks which extended into the inland ice on either side of the depressions I must descend into the depressions. My journey took me down into the depressions behind Victoria Fjord, Sherard Osborn Fjord, and Petermanns Fjord, whereas it was impossible for me to descend into the depression back of Nordenskiölds Fjord, and the map is therefore rather doubtful there. Nor did I succeed in determining the ice-edge south of Newman Bugt.

On approaching the ice edge and looking for a place of descent, one should be especially careful. In North Greenland, where the land is built up of level sediment plateaus almost everywhere, the inland ice in many places rises from the land with even slopes free from crevasses, or the marginal zone may be horizontal or may even slope gently upward towards the land. But quite unexpectedly it may form a steep ice wall of a considerable height; this for instance is the case over wide stretches of Inglefield Land (cf. also the place of descent of the 1st Thule Expedition on Mylius-Erichsens Land (M. o. G. Bd. 51, Fig. 12) and J. P. KOCH's photographs from the Danmark Expedition (M. o. G. Bd. 46, Fig. 39 and others). It is therefore much more difficult to descend the inland ice than to ascend it: during the ascent one sees the difficulties, but during

a descent one often has a feeling of travelling blindly, and even fairly near the edge a broad stretch of the land situated immediately below will often be concealed to the eye.

Errors in the mapping of the edge of the inland ice are often due to irregularities in the surface of the ice obstructing one's view.

Analysis of the Original Literature on the Peary Channel.

On considering the original literature about the Peary Channel (cf. pp. 114—124) we shall find that from 1892 three brief descriptions by PEARY are at hand and in addition a report (by KEELY) based on PEARY's verbal report immediately after his return. In these reports special emphasis is given to the opening among the mountains to the east, which showed an unbroken horizon, and which convinced PEARY that he had reached the east coast of Greenland. Further, mention is made of the fjord to the northwest which was traceable in a southeastward direction. ASTRUP (1893), too, describes the view towards the east coast and at the same time supplies the first description available of Peary Land, stating that to the north and east as far as the eye could reach they only saw high partially snow-covered mountains, but no inland ice. PEARY's description in "My Arctic Journal" is in fair agreement with his previous descriptions, and the same applies to his lecture to the Royal Geographical Society of London in 1898.

However, the three most important descriptions of the journey are: 1) ADAMS' description (1893), written after a perusal of all PEARY's notes and probably further based on conversations with PEARY; 2) ASTRUP's description of the journey (1895); and 3) PEARY's report on the expedition (1898).

It is noteworthy that as early as 1893 PEARY published a map ("My Arctic Journal", cf. Fig. 23) which he maintains almost unaltered up to 1903, when it was replaced by the Hydrographic Office map No. 2142. It is further noteworthy that PEARY did not directly mention any channel till 1898, when, on the other hand, he considered the existence of a channel a fact.

ADAMS in his article mentions eight points,

1) PEARY was able to make out both shores of Victoria Inlet (Nordenskiölds Fjord) in the neighbourhood of its entrance into Lincoln Sea. (This is quite correct since the mountains on either side of the mouth of Nordenskiölds Fjord are visible from that part of the depression where PEARY was standing.)
2) He traced the higher mountains that border the northern side of the channel all along from Lincoln Sea to Independence Bay. (This,

too, is quite right, for from the inland ice PEARY looked out across the lower Walcotts Land and Adam Bierings Land towards the high Peary Land north of J. P. Kochs Fjord and Wandels Dal.)

3) He was unable, at his distance from the western edge of the ice, to see the southern border of the channel between 45° and 40° W. long.

4) "In his march along the edge of the ice-cap to the south-east he was able now and then to see the channel through rifts in the mountains that border it" (see below).

5) From Navy Cliff "he saw the eastern opening of the inlet that he had followed across North Greenland" (i. e. the depression with Marie Sophie Gl. and Valmuedalen).

6) "Two broad fiord or channel entrances were made out".—(One of these was the head of Independence Fjord and the depression with Marie Sophie Gl., the other was Brønlunds Fjord).

7) Peary Land is described as follows: "It showed no ice-cap, and there were no signs of ice-cap on the lands west and north-west".—(Ice-cap must here be taken to mean inland ice).

8) "Mr. Peary has no doubt that these lands are parts of an archipelago of unknown extent."

The clearest description is that given by ASTRUP in 1895. He mentions the entrance of a large fjord to the north-northwest and its continuation which was observed in a northeasterly direction. Further he says that this fjord would apparently never come to an end, and that it possibly extended in the form of a channel between the west and the east coast. . . . "We now began to feel certain that we had before us a channel" . . . From Navy Cliff he says about the northern part of Independence Fjord (he was unable to see that it was occupied by Marie Sophie Gl.): "How far inland this bay or fjord cuts its way, we were unable to decide with certainty . . . but *the probability is*[1]) that it is directly connected with the large indentation on the west coast bearing the name of Victoria Inlet, and forming with this a channel . . . *At any rate it is a fact*[1] that between both these fjords there exists a continuous broad ravine bounded by mountain walls several thousand feet high, and the only question as to which there can be some uncertainty for the time being is whether the bottom of this depression along its middle portion is situated above or below the level of the sea." —This description of the supposed Peary Channel and the mention of the depression extending from west to east south of Peary Land as a

[1]) Italies by me.

fact is an entirely unobjectionable account of ASTRUP's observations during the journey.

In "Northward over the Great Ice" PEARY mentions the entrance to a fjord in the northwest and the depression of this fjord which continues eastward. He gives the following description of Peary Land: ". . . everywhere north-west, north, and east, black and dark-red precipices, deep valleys, mountains capped with cloud-shadowed domes of ice stretched away in a wild panorama . . ." After mentioning a wide opening in the mountains to the north-east he decides to descend on to the land "and discover if it (i. e. the opening) looked out into the East Greenland Arctic Ocean". PEARY here describes an experience made by all travellers on the inland ice, saying "The land, though yet some miles away, seemed as if at our very feet, and as if we might easily throw a stone upon it." From the inland ice an estimate of the distance is extremely difficult owing to the clear air and no doubt also because in calm weather the air is much heated over land in contrast to the cold air over the inland ice.

From Navy Cliff PEARY mentions the mountains forming the southern boundary of the channel and through which he had now and then caught glimpses of the depression and the frozen channel occupying it. He ends the description with the following remark: "It was evident that this channel marked the northern boundary of the mainland of Greenland".

Brønlunds Fjord is described as "a second fjord or *channel*[1] extending apparently to the north-westward". Finally he says: "There is every reason to believe that to the north-west, north, and north-east we were gazing upon an archipelago whose western limits Lockwood had discovered in 1882".

If several of the authors who have found themselves justified to express themselves as authorities concerning the Peary Channel, had given greater attention to the statements by ADAMS, PEARY, and ASTRUP quoted above, many misunderstandings might have been avoided.

PEARY's Map and the Most Recent Map.

Having travelled southward for a short distance owing to the depression of Nordenskiölds Fjord, of which he had a view, PEARY again followed a northeasterly course, approaching the summit of the inland ice between the depression of Nordenskiölds Fjord and the depression of J. P. Kochs Fjord. From this place he had a view of the top of the plateau of Freuchens Land and its characteristic southern boundary. On being stopped by the land masses to the north and northeast, he had already passed the highest point of the inland ice and had no longer

[1]) The italics are mine.

a good view of Freuchens Land. We know from ADAMS's report that PEARY did not see the channel between 40° and 45° W. long. On his map he therefore gives it the same direction as the inner part of J. P. Kochs Fjord, of which he then had a view south of Freuchens Land to the entrance of Nordenskiölds Fjord known from LOCKWOOD's journey. There is no doubt that the triangular land area shown between the two branches of PEARY's channel, towards the mouths of Nordenskiölds Fjord and De Long Fjord respectively, is Freuchens Land, and that the channel extending towards De Long Fjord is the central part of J. P. Kochs Fjord. Partly because of the difficult outlook across Freuchens Land, partly because according to LOCKWOOD's map only two fjords, viz. Nordenskiölds Fjord and De Long Fjord, cut far inland, the southern portion of Freuchens Land and the northern channel are placed too far to the northeast on PEARY's map.

From ASTRUP's astronomical determination we know that the northernmost point reached on the journey was situated in about 82° N. lat. 40° W. long. If we take it for granted that their northernmost camp was situated near this point, we shall find that when PEARY was travelling on the eastern slope of the inland ice, his view towards Freuchens Land was partially barred by the inland ice. It must be taken for granted that the fjord in the northwest mentioned by PEARY is Nordenskiölds Fjord. Further PEARY has observed that the inland ice slopes rapidly towards the southern part of Freuchens Land, and he has been looking down into the southern part of J. P. Kochs Fjord. He no doubt had a view of the ice in front of Adams Gl., the land west of this glacier being low, and it was natural for him to mark the depression as continuing from Adams Gl. in the same direction as the inner part of J. P. Kochs Fjord as far as the mouth of Nordenskiölds Fjord though he was unable to make an accurate estimate of the distance to the southern part of Freuchens Land.

Both PEARY and ASTRUP mention that the fjord (J. P. Kochs Fjord) continues in an easterly direction. This, too, is understandable. If we continue the angles from the camp, high land will be found to exist between Adams Gl. and Astrups Gl. (marked by PEARY as the northernmost of his three nunataks). Seen from the camp this land conceals the watershed between J. P. Kochs Fjord and Midsommer Sø (altitude about 200 m) in Wandels Dal. When therefore PEARY from the camp looked across the depression with Adams Gl. and the depression with Astrups Gl., it seemed to him that the low-lying Midsommer Sø was "the fjord", and it was therefore natural for him to continue J. P. Kochs Fjord to the southeast.

Even at this camp both PEARY and ASTRUP believed that their way was again barred by a large fjord from the north coast. But it was

not long before the idea of a channel occurred to them. Having passed Nunatak No. 2 (the land between Astrups and Hobbs Gls.), they were again looking across a depression (Hobbs Gl.), which likewise descended into the "channel", viz. the lake (230 m above the sea) in front of Hobbs Gl. PEARY'S travelling route lay at a height of about 12—1400 m and the whole of Wallcotts Land and Adam Bierings Land with the exception of the eastern part of Storm Ice-Cap were situated below PEARY'S travelling route. He could not avoid seeing that the glaciers now extended northeastward from the inland ice and that the whole drainage from the inland ice across the nearest land took place in the same direction; and to the north he had a constant view of the higher-lying almost snow-free land (the present Peary Land), which with the nearly 2000 m high Mt. Wistar in the background forms a huge drainage system from the north towards the "channel".

This confirmed PEARY and ASTRUP in their supposition that the land seen north of the inland ice was separated from Greenland by the "channel", of which they now and then (i. e. each time they were looking down a glacier) had glimpses, and which extended parallel with their route. Even before they passed the third nunatak indicated by PEARY (i. e. the land between Hobbs Gl. and Nyeboes Gl., placed by PEARY too far westward), their supposition as to the channel was again confirmed when through an opening in the mountains they had a wide view of sea ice and beyond it the horizon to the east ("the East Greenland Sea"); personally I have had the same view from this place of the inland ice; one is in no doubt that one is gazing upon the sea.

It is true that in front of the fourth glacier, Nyeboes Gl., between Nunatak 3 and the land with Nyeboes Gl., there is no lake, but the small branch glacier to the north-east (see M. o. G. Bd. 65, Nr. 15, Pl. V, Fig. 3) descends into a very deep ravine, which, like the next, very deep, ravine (Nugapinguak Kløft), extends in a northeasterly direction, thus belonging to the aforementioned drainage system.

The rather high-lying Holger Kiærs Nunatakker and Vildt Land were taken by PEARY to be one and the same land, as he was unable to see Marie Sophie Gl., which divides these two land areas; this results in the indentation in the land with Navy Cliff marked on PEARY'S map.

The land north of the channel (viz. Peary Land) seems to be largely based on free-hand drawing. PEARY and ASTRUP no doubt had a view of Ymers Gl., extending towards Fr. E. Hyde Fjord and of Wandels Dal opening into Brønlunds Fjord, but they did not sketch these depressions; for both of them took Peary Land to be an archipelago. No doubt Storm Ice-cap and Chr. Erichsens Ice-cap, both of which are very high,

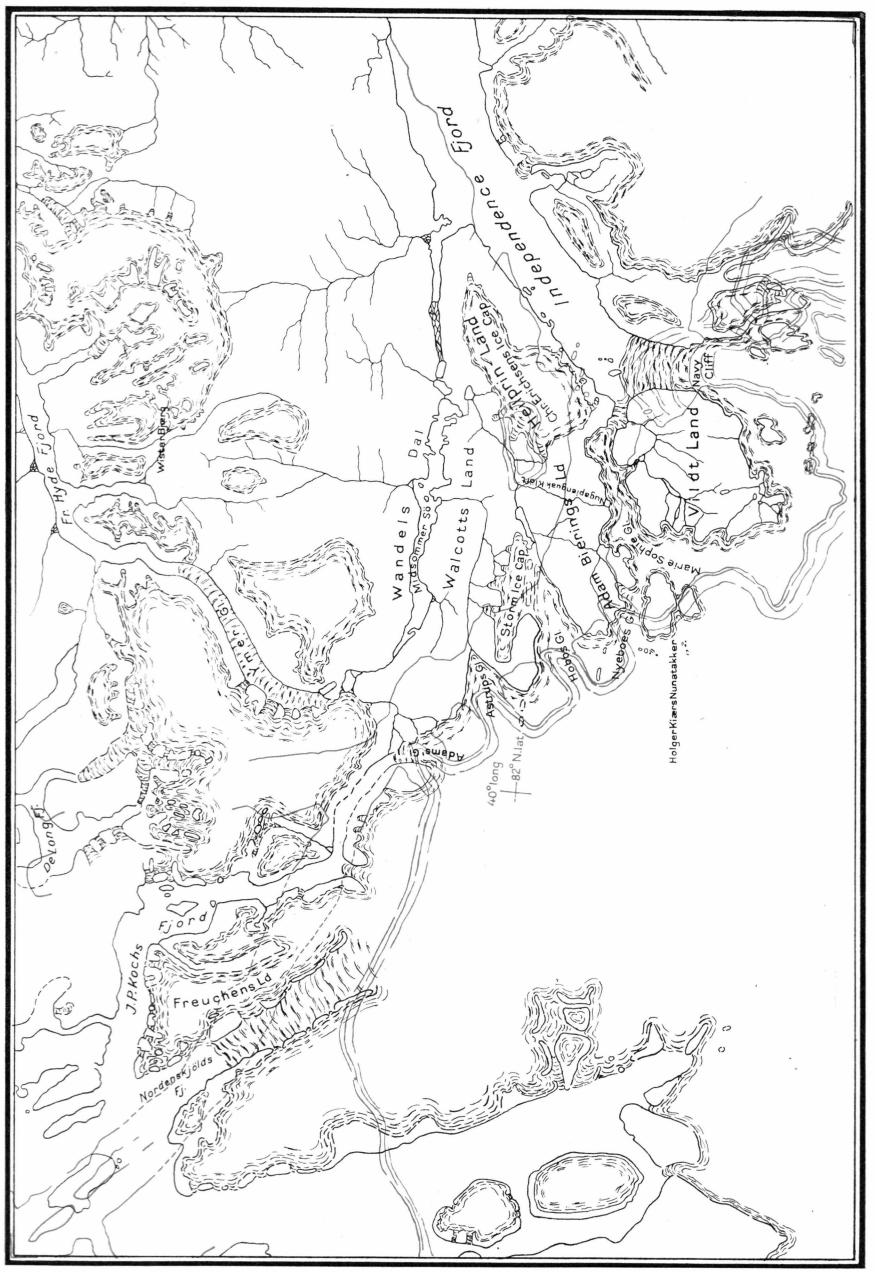

Fig. 56. Map showing Peary's map of the Peary Channel and surroundings (red) compared with the most recent map (black).

have acted as the fixed points during their stay on this part of the inland ice. For some reason or other PEARY indicated the channel west of the highest portion of Storm Ice-cap, which is not correct; it was more justifiable to mark the channel west of Heilprin Land with Chr. Erichsens Ice-cap. No doubt PEARY overestimated the width of the opening in the mountains through which he looked down across the "East Greenland Sea"; or the surface conditions of the inland ice may have given him a false impression of its width. This is perhaps the reason why the southern part of Heilprin Land has been cut off, so that here the "channel" is too broad and has a too northerly course.

It will be evident from the above that

1) the end of the inland ice and the absence of inland ice on the land to the north (Peary Land), and
2) the two large drainage systems descending from the southeast and north into the depression between the fjords of the west coast and the east coast and the glimpses of very low-lying ice
   a) at the head of J. P. Kochs Fjord in front of Henson Gl.,
   b) in front of Astrup Gl. (Midsommer Sø, c. 200 m),
   c) in front of Hobbs Gl. (lake at a height of 230 m),
   d) the sea ice of Independence Fjord, whose western boundary PEARY was unable to see,

gave rise to the supposition of the existence of the Peary Channel.

It will be seen from Fig. 56 that between the northern camp in 82° N. lat., 40° W. long. and Navy Cliff the glaciers and the land areas situated nearest to PEARY's route are in all essentials correctly indicated on PEARY's map.

NOTES ON THE MAPS

On Pls. 1—16 (except Pl. 13) the most important expedition maps of North Greenland have been copied on the same scale (1:1,000,000) and in the same projection (conical projection) in order to obtain a basis for comparison. The maps may be divided into four groups:

1) Inglefield Land, Humboldt Gl., and southern Washington Land (Pl. 1).
2) The stretch from southern Washington Land to Kap Britannia (Pls. 2—6).
3) The area from Beaumont Ø to Zig-Zag Dalen near Danmarks Fjord (Peary Land) (Pls. 7—12).
4) The area from MYLIUS-ERICHSEN's cairn near Kap Glacier to Brønlund's grave on Lamberts Land (Pls. 14—16).

The scale, 1:1,000,000, is nearly the scale of the maps copied in Pls. 2, 3, 4, 7, and 8 (lower part), and it is the same as that of Pls. 9 and 14. The copies on Pls. 5, 10 (upper part), and 15 have been reduced to half the size of the originals. The scale of the original maps copied on Pls. 1, 6, and 11 is 1:300,000, and of that copied on Pl. 12 1:750,000. Only as regards Pl. 8 a fairly considerable enlargement has been made.

On Pls. 2, 4, 7, and 10 (lower map) the terrain is represented in line-drawing without colour; these maps are only copies in a different projection from those of the original maps. On the originals of Pls. 3, 5, 8, 9, 10 (upper map), 14, and 15 the relief is represented by lines, but they are printed in colour indicating geographical features; this, of course, cannot be shown on a copy in black and white, and the reader is therefore referred to the original material. The preparation of Pls. 1, 6, and 11 was especially difficult (cf. below).

The original names are not copied on the plates, because they would have concealed the cartographic details, but the names and their present place are shown in red on transparent cover sheets. By comparison with the original maps it will not be difficult to find out where

the names mentioned in the text under each expedition have originally been placed. All altitudes, too, are inserted on these plates. On the early maps altitudes are only exceptionally indicated, and if so, they have been determined directly by barometer measurements on mountain peaks. Determination of altitudes by angle measurements was introduced by the Danmark Expedition, but it would seem that the method was but sparsely employed by the Alabama Expedition and the First Thule Expedition. Practically all the altitudes on Pls. 1 and 6 have therefore been determined by me. The altitudes shown on Pl. 11 are chiefly based on my observations, though a number of the altitudes determined by the Danmark Expedition are found in eastern Peary Land. Practically all the altitudes on Pl. 16 were determined by the Danmark Expedition. It is interesting to note that so far (up to 1940) no survey of North Greenland justifying the preparation of contour maps has been executed.

The preparation of Pls. 1, 6, and 11 has caused some difficulty, and the result is not as satisfactory as I might have desired. The three plates were prepared on the basis of a number of map sheets of my atlas (1932, see Pl. 1) on a scale of 1:300,000 printed in ten colours, the terrain being represented in crayon. Re-drawing the terrain in line-drawing on a scale of 1:1,000,000 would have taken very long time, it would have been extremely expensive and would hardly have given a satisfactory result. By the courtesy of the Geodetic Institute, Copenhagen, the coast contours were therefore printed on a scale of 1:300,000, the land in yellow, the terrain in two brown colours. The map-sheets were glued together, and glaciers, inland ice, and travelling routes were inserted. Subsequently the resulting map was photographed and reduced to a scale of 1:1,000,000. However, owing to the contraction of the paper this procedure was not always satisfactory.

Difficulties due to the contraction of the paper, which especially on account of the war is a factor beyond computation, but also the circumstance that the plates have been executed by several persons, and were re-drawn from one projection into another, has resulted in minor differences.

Pl. 1 represents the north coast of Greenland from Kap Alexander (the westernmost point of Greenland) to and including the southern part of Washington Land. It is a photographic reproduction of sheets 13—14 and in part 11—12 of my "Map of North Greenland" (published by the Geodetic Institute, Copenhagen 1932). As the earlier maps are drawn on such a small scale, and are so doubtful that it was impossible to copy them on a scale of 1:1,000,000, the reader is referred to text-figures 1, 2, 3, 4, 6, and 8.

Name Plate to Pl. 1.[1])

Errata.

C. Ingersol	read:	C. Ingersoll.
C. Russel	—	C. Russell.
Mc Garry Island	—	Mc Gary Island.
Henryk Arctowsky Ice Cap	—	Henryk Arctowski Ice Cap.

The area from Kap Alexander to and including Humboldt Gl. **(Inglefield Land).**

The following names were given by

BAFFIN:	ROSS:
Smith Sound.	C. Alexander.
INGLEFIELD:	
Crystal Palace Cliffs.	C. Hatherton.
Littleton Isl.	C. Frederik VII.

The Second Grinnell Expedition:

Kane Bassin.	C. Francis.
Peabody Bay.	Bancroft Bay.
Humboldt Gl.	C. Taney.
C. Kenrick.	Minturn River.
C. Ohlsen.	Marshall Bay.
Hartstene Bay.	C. Russell[2]).
Brother John's Gl.[2])	C. Wood.
Life Boat Cove.	C. Kent.
Refuge Hbr.	Dallas Bay.
C. Inglefield.	C. Scott.
Force Bay.	Brooks Isl.
C. Grinnell[2]).	Advance Bay.
C. Ingersoll.	McGary Isl[2]).
Rensselaer Bay.	C. Agassiz[2]).
C. Leiper.	Inglefield Land.

HAYES	
McCormick Bay.	Foulke Fj.
Heywood Hill.	Alida Lake.
Mt. Aubrey.	Dodge Mt.
Harris Hill.	Jensen Pt.
Port Foulke.	Sunrise Pt.
Knorr Isl.	Dodge Gl. = Crystal Palace Gl.

[1]) The names on the name-plates to Pls. 1, 6 and 11 have been copied from my atlas of 1932. For the names on Pl. 16, see below.

[2]) Wrongly spelt on "Map of North Greenland" (1932).

The British Arctic Expedition:

Pandora Hbr.

The Bicentenary Jubilee Expedition:

Wulff River
September Lakes.
Hiawatha Gl.
Bonsall Isl.

A number of Eskimo names are found on the earlier maps. The names found on the map of 1932 are those in use among the Eskimos about the year 1923. The spelling is according to Mr. H. Ostermann.

Uvdlerssuak.
Kordlortorssuak.
Kordlortorssuit.
Kilîvigssuit.
Taserartalik.
Nâlungiaivik.
Kátánguarssuak.
Kaersorssuak.
Kavdlunâlik.
Etah
Kekertârssuit.
Nauja.
Kingmissulik.
Anoritôk.
Aunartok.
Inuarfigssuak.
Nûgssuak.
Kâkaitsut.

The land north of Humboldt Gl. Part of **Washington Land.**

Names given by the Second Grinnell Expedition:

Washington Land.
Kennedy Channel.
C. Forbes.
Benton Bay.
C. Clay.
Cass Fjord.
C. Webster.
Wright Bay.
C. Jackson.
C. Calhoun.
Morris Bay.
C. Madison.

Names given by the Bicentenary Jubilee Expedition:

Daugaard-Jensen Land.
Romer Lakes.
C. Lyngbæk.
Bjørnehiet.
Jægerstien.
Ismaagereden.
Henryk Arctowski Ice Cap.
Mt. Nordlyset.
Putlersuak (name given by the Eskimos of the expedition).
Poulsen Cliffs.
Nygaard Bay.
Talilenguak Cliffs.
Nunatami (name given by the Eskimos of the expedition).
Troedsson Cliffs.
Nikolaj Nielsen Coast.

Pl. 2. A copy of Charles A. Schott's map of 1865 (cf. p. 35). It shows Morton's discoveries on the southern part of Washington Land.

Pl. 3. (cf. p. 54). A copy of the northern part of BESSELS's map of 1876.

Pl. 4. (cf. pp. 69 et seq.). A copy of map entitled "Smith Sound, Kennedy, & Robeson Channels—From discoveries made by the American expeditions under Drs. Kane & Hayes 1854—61; and in the U. S. S. "Polaris", under command of C. F. Hall, 1871—72, as derived from charts published by the U. S. Hydrographic Office, April 1874. The coasts of Grinnell Land and Greenland North of the 82nd parallel, with the western shores of Robeson Channel, Kennedy Channel and Smith Sound: are from the explorations of Captains G. S. Nares, F. R. S. and H. F. Stephenson, R. N. assisted by Commander A. H. Markham R. N. and the Officers of Her Majesty's Ships ALERT & DISCOVERY in the British Arctic Expedition of 1875—76.—The southern entrance to Smith Sound partly from the observations of Captain E. A. Inglefield, R. N. in 1852.—Figures on the land show the heights in feet above the sea." (In "Journals and Proceedings", etc., 1877, facing p. 38; and in NARES: "A Voyage to the Polar Sea", 1878, Vol. I, facing p. xl).

Pl. 5. A copy of the western half of the map of the Second Thule Expedition on a scale of 1:500,000 (cf. M. o. G. Bd. 64, No. 2).

Pl. 6. A photographic reproduction of my "Map of North Greenland" (1932) sheets 11, 12, 5, 6, 7, and 1. (see p. 339).

Name Plate to Pl. 6.

Errata.

C. Schuckert	read:	C. Schuchert.
C. Fuldford	—	C. Fulford.
Frankfield Bey	—	Frankfield Bay.

Names not found on Pl. 6:
Petermanns Fjord.
C. Webster (see Pl. 1).
Sommerdalen.

The area between Humboldt Gl. and Petermanns Gl. is bounded on the south by Kane Bassin and Peabody Bugt. It comprises **Washington Land** and **Daugaard-Jensens Land.**

Names given by the Second Grinnell Expedition:

Cass Fjord.
C. Webster.
Wright Bay.
C. Jackson.
C. Calhoun.
Morris Bay.
C. Madison.
Mt. Adams.

C. Hamilton.
C. Jefferson.
Lafayette Bay.
C. Independence.
C. Constitution.
Crozier Isl.
Franklin Island.

Names given by the U. S. "Polaris" Expedition:

John Brown (Coast) Ice Cap.
Hans Isl.
C. Bryan.
Bessels Fjord.
Hannah Isl.
Joe Island.
C. Maynard.
C. Morton.
Petermann Fjord[1])
Petermann Peninsula.
C. Lucie Marie.
C. Handy.
C. Pussy.
C. Schurz.
C. McRitchie.
C. Schufeldt[2]).

Names given by the British Arctic Expedition:

Constance Gl[1]).
Edith Gl[1]).
Faith Gl.
Cecil Gl.
Petermann Gl.
C. Bemerton.

Names given by the Bicentenary Jubilee Expedition:

Jægerstien.
Bjørnehiet.
Ismaagereden.
Poulsen Cliffs.
Nygaard Bay.
Talilenguak Cliffs.
Nunatami.
Troedsson Cliffs.
Nicolaj Nielsen Coast.
Atrypa R.
C. Resser.
Alakratiak Fjord.
Graptolit Næsset.
Pentamerus Mts.
Fossil Bay.
C. Schuchert[3]).
C. Godfred Hansen.
C. Ulrich.
C. Field.
C. Thorsen.
C. Coppinger.
C. Godthaab.
C. Schoubye.
Romer Lakes.
Henryk Arctowski Ice Cap.
Mt. Nordlyset.
Daugaard-Jensen Land.

Hall Land: the land between Petermanns Gl. and Newman Bugt.

Names given by the U. S. "Polaris" Expedition:

Hall Basin
Hubert Gl.
Belgrave Gl.
C. Eisendecher.

[1]) Not found on "Map of North Greenland" (1932).
[2]) On my map (1932) erroneously placed west of Petermann Gl.
[3]) Wrongly spelt on "Map of North Greenland" (1932).

C. Wymann.
C. Mary Cleland.
Offley Isl.
C. Tyson.
Hall Land.
Newman Bay.
C. Buddington.
Polaris Bay.
Halls Rest.
Thank God Hbr.
C. Lupton.
C. Porter.
C. Ammen.
Mt. Chester.
C. Sumner.
Polaris Promontory.

Names given by the Bicentenary Jubilee Expedition 1920—23:

C. Egedesminde.
C. Godhavn.
Porsild Gl.
Hellerup Ld.
C. Agnes.
Sigurd Berg Gl.
C. Fulford.
Hauge Mts.
Mt. Kayser.

Nyeboes Land (the land between Newman Bugt and St. George Fjord with Steensby Gl.).

Names given by the U. S. "Polaris" Expedition:

C. Brevoort.
Repulse Hbr.
Mt. Meyer (1700 feet).
Congress Highlands
C. Stanton.
Reynolds Isl.
Howgate Isl.

Names given by the British Arctic Expedition:

Gap Valley.
Mc Cormick Valley.
Black Horn Cliffs.
Drift Point
Rest Gorge.
Mt. Hall (3800 feet).
Rockhill.
Hand Bay.
Degree Hills.
Mt. Egerton.
Frankfield Bay.
Rest Pt.
C. Bryant.
C. Fulford.
Mt. Wyatt (2050 feet).
C. Archer.
Mt. Punch.
C. Dobing.
St. George Fjord.

Names given by the Second Thule Expedition:

Nyeboe Land.
Steensby Gl.
Skeldalen.
Koralhøjsletten.
I. P. Ravn Højslette.
Mt. Jul. Petersen.
Dreyer Firn.
Øksebladet.
Alma Glück Valley.
Store Canyon.
C. Holtedahl.

Names given by the Bicentenary Jubilee Expedition:

Mt. Nina Bang.
Mt. Korsgaard.
Svineryggen.
Mt. Home.
Mt. Storgaard.

The land between St. George Fjord with Steensby Gl. and Sherard Osborn Fjord with Ryder Gl. **(Warmings Land).**

Names given by the British Arctic Expedition:

Dragon Point.
Mt. Windham Hornby (3700 feet).
Craig Pt.
St. Andrew Bay.
Castle Isl.
C. Cleveland.
C. Gray.
Waggon Cliffs.
C. Buttress.
Sherard Osborn Fjord.

Names given by the Second Thule Expedition:

Mt. Dragefjæld.
Hendrik Isl.
Ulvesletten.
Tungerne.
Hartz Sound.
Permin Ld.
Ættestub
Cape V. Nordmann.
Skalhøjene.
Lerbugten.
Graptolitsletten.
Sultelejren.
Daniel Bruun Firn.
Djævlekløften.
C. Hunt.
Rink Firn.
Midgaardsormen.
C. Heiberg-Jürgensen.
Porsild Nunatak.
Warming Land.
Ryder Gl.

Name given by the Bicentenary Jubilee Expedition:

N. P. Johansen Land.

The land between Sherard Osborn Fjord with Ryder Gl. and Victoria Fjord with C. H. Ostenfeld Gl. **(Wulffs Land).**

Names given by the British Arctic Expedition:

Reef Isl.
Wedge Isl.
C. May.
Mt. Parr.
Mt. Hooker.
Mt. Coppinger.
Dome Cliffs.
Mt. Farragut.
Middle Point.
Horizontal Cliffs.
Solitary Cliffs.
Plain Cliffs.
Blue Cliffs.
Stephenson Isl.
Victoria Fjord.

Name given by the U. S. Lady Franklin Bay Expedition:

Nares Sound.

Name given by PEARY:

Keltie Gulf[1]).

Name given by the Second Thule Expedition:

Sommerdalen.
Sven Hedin Firn.
Storsletten.
Purpurfjældene.
De Geer Land.
C. Quensel.
C. Wallén.
Midfjæld Isl.
Borgen.
Læbugten.
Isvolden.
Stjernen.
C. Springforbi.
Gunnar Andersson Valley
C. Øret.
C. Næbet.
C. H. Ostenfeld Gl.
Wulff Land.

Names given by the Bicentenary Jubilee Expedition:

Aage Bistrup Land.
C. Troedsson.
Th. Pedersen Land.
Danbo Land.
Røhling Land.

The land between Victoria Fjord with C. H. Ostenfeld Gl. and Nordenskiölds Fjord with Jungersen Gl. **(Nares Land).**

Names given by the U. S. Lady Franklin Bay Expedition:

Nares Land.
Cape Wohlgemuth.
Nordenskiöld Fjord.

Names given by the Second Thule Expedition:

C. Vinterberg.
Blaafjæld.
Sletten.
C. Lembcke-Otto
Sixtus.
C. Middendorff.
Jungersen Gl.

Names given by the Bicentenary Jubilee Expedition:

C. Knudsen.

For the following names, see Pl. 11:

Mt. Albert.
Beaumont Isl.
John Murray Isl.
Centrum Isl.
C. Wegener.

[1]) The name not found on "Map of North Greenland" (1932).

Pl. 7. A copy of LOCKWOOD's map (cf. p. 78, 4).

For the sake of completeness the western part of LOCKWOOD's journey and his map in "Three Years of Arctic Service" (1886, facing p. 304) are copied in Fig. 11, p. 81.

Pl. 8. A copy of Hydrographic Office Chart No. 2142.

In contrast to the original maps of all the earlier expeditions, which are mostly on a scale of c. 1:1,000,000, the maps from PEARY's expeditions are on a comparatively small scale, and with the exception of the nearest surroundings of Navy Cliff, original material is lacking from PEARY's expeditions in 1892 and 1900. The map used by ADAMS (Georg. Journ. 1893) is stated to be reduced from Admiralty Chart No. 275, and is on a scale of 1:2,500,000. It differs somewhat from the Hydrographic Office Chart No. 2142, of which I have at my disposal a copy on a scale of c. 1:3,500,000, on the basis of which Pl. 8 was prepared. I first contemplated to prepare a copy (on a scale of 1:1,000,000) of ADAMS's map, but since the Hydrographic Office Chart No. 2142 was the official map, I preferred to make this map the basis of Pl. 8.

It should be emphasised that PEARY's mapping of Greenland was very sketchy, and as regards the Peary Channel and the north coast of Peary Land no original material is available from PEARY's hand except some maps on a very small scale. The available maps are Admiralty maps, and it does not appear from them on which material they are founded.

Pl. 9. A copy of the northernmost part of the northern leaf of the map of the Danmark Expedition (Pl. 5 in: Georg. Tidsskr. 21. Bd. Hæfte V, 1912).

Pl. 10. The map to the right, below, is a copy of FREUCHEN's map from the First Thule Expedition (M. o. G. Bd. 51, Pl. XI). The map to the left, above, is a copy of the eastern half of the map of the Second Thule Expedition (M. o. G. Bd. 64, No. 2, Pl. II).

Pl. 11 is a photographic copy (see p. 339) of "Map of North Greenland" (1932), sheets 1, 2, 3, 4, 7, 8, 9, and 10.

Name Plate to Pl. 11.

Errata.

Mt. Frysefjæjld	read:	Mt. Frysefjæld.
Nordenskjöld Fj.	—	Nordenskiöld Fj.
C. Kang	—	C. Kane.
Berthelsen Gl.	—	Bertelsen Gl.
Indepedence Fjord	—	Independence Fjord.

Wulffs Land, bounded by Sherard Osborn Fjord with Ryders Gl. and Victoria Fjord with C. H. Ostenfelds Gl.

The following names were given by the British Arctic Expedition:

Stephenson Isl.
Victoria Fjord.

Names given by the U. S. Lady Franklin Bay Expedition:

Nares Sound.

Names given by the Second Thule Expedition:

C. Næbet.
C. Øret.
Stjernen.
C. Springforbi.
Læbugten.
Isvolden.
Borgen.
C. Wallén.
C. Quensel.
De Geer Land.
Midfjæld Isl.
C. H. Ostenfeld Gl.

Names given by the Bicentenary Jubilee Expedition:

Røhling Land.
Danbo Land.
Th. Pedersen Land.
C. Troedsson.

Nares Land, the land between Victoria Fjord and Nordenskiölds Fjord with Jungersen Gl.

Names given by the U. S. Lady Franklin Bay Expedition:

Cape Wohlgemuth.
Nares Land.
Nordenskiöld Fjord.

Names given by the Second Thule Expedition:

Sixtus.
C. Lembcke-Otto.
Sletten.
C. Middendorff.
Blaafjæld.
Jungersen Gl.
C. Vinterberg.

Names given by the Bicentenary Jubilee Expedition:

Brikkerne.
Harder Gl.
C. Knudsen.

Peary Land (name given in 1906 by the "Commissionen for Ledelsen af de geologiske og geographiske Undersøgelser i Grønland") is separated from the remaining part of Greenland by J. P. Kochs Fjord, Wandels Dal, Jørgen Brønlunds Fjord, and Independence Fjord.

Names given by the British Arctic Expedition:

Beaumont Isl.
Mt. Albert.
C. Britannia.

Names given by the U. S. Lady Franklin Bay Expedition:

Nares Sound.
John Murray Isl.
C. Frederick.
Elison Isl.
C. Salor.
Chipp Sound.
C. Emery.
Markham Isl.
Blue Cape.
Black Cape.
Linn Bay[1])
C. Benét.
Mascart Inlet.
C. Payer.
Distant Cape.
Buys-Ballot Gl.[1]).
Low Point.
Jewell Fj.
C. Ramsay.
C. Ralston.
Gardiner Fjord.
C. Wijkander.
C. Mohn.
Mt. Gardiner.
Luigi Amadeo Isl.
C. Hoffmeyer.
C. Neumayer.
Mary Murray Isl.
De Long Fjord.
Wild Sound.
Hazen Land.
C. Hommock.
Weyprecht Fjord.
Braynard Isl.
Lockwood Isl.
C. Christiansen.
Mt. Schley.
Conger Sd.
C. Kane.
C. Washington.

Names given by PEARY:

Hunt Fjord.
Thomas Gl.
Benedict Fjord.
A. Harmsworth Gl.
C. Cannon.
Sands Fj.
C. Morris Jesup.
Mary Peary Peaks.
Constable Bay.
C. James Hill.
H. H. Benedict Mountains.
Bliss Bay.
Moore Gl.
Roosevelt Range.
Daly Mountains[2]).
C. Bridgman.
Fr. E. Hyde Fjord.
C. John Flagler.
G. B. Schley Fjord.
Wyckoff Land.
Mt. Clarence Wyckoff.
Mt. Henry Parish.
McKinley Sea.
Melville Land.

[1]) Name not found on "Map of North Greenland" (cf. M. o. Gr. Bd. 64, Pl. II).

[2]) On sheet 3, "Map of North Greenland" (1932), Daly Mts. is wrongly indicated south of Bertelsen Gl.

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Names given by the Danmark Expedition:

Marie Sophie Gl.
Brønlund Fjord[1]).
C. Knud Rasmussen.
C. Harald Moltke.
C. Caroline Marie.
C. Kjøbenhavn.
C. Eiler Rasmussen.
Herlufsholm Strand.
C. Isak Glückstadt.
Dannebrogstinde.
Hundeskrænten.
Mt. Stjernebannertinde.
(Peary's Cairn).

Names given by the Second Thule Expedition:

Fladø.
Centrum Isl.
C. Lars Larsen.
Mt. Vigfus
Strømstedet.
Lemming Fj.
Sverdrup Isl.
C. Holmsen.
Nansen Land.
C. Daugaard-Jensen.
Mt. Thulefjæld.
Hanne Isl.
Inge Isl.
Th. Thomsen Fjord.
Ad. Jensen Fjord.
O. B. Bøggild Fjord.

Names given by the Bicentenary Jubilee Expedition:

Erlandsen Land.
Trappetrinene.
Mt. Frysefjæld.
Mt. Buen
Gryden.
Hvalsletten.
Koralkysten.
Mt. Falkefjæld.
Koralkalk River.
Graptolit River.
Kjovesletten[1]).
C. Vaarbrud.
Mudderbay.
(J. P. Kochs Cairn).
Bertelsen Gl[1]).
Cape J. P. Koch.
Kaffeklubben Isl.
Borup Gl.
Mt. Rink.
Birgit Koch Peaks.
MacMillan Gl.
C. Hans Egede.
C. Christian IV.
Gertrud Rask Land.
Nordkronen.
Mt. Propfjæld.
Hans Egede Mountains (Land).

The **area** bounded by Nordenskiölds Fjord with Jungersen Gl., J. P. Kochs Fjord with Wandels Dal and Brønlunds Fjord, the interior of Independence Fjord, and Academy Gl.

Names given by PEARY:

Navy Cliff.
Heilprin Land.
Nansen Nunataks.
Academy Gl.

[1]) Name wrongly spelt on "Map of North Greenland" (1932).

Names given by the First Thule Expedition:

Diabasnæs.
Diabasholmene.
Lyngeholmene.
Chr. Erichsen Ice Cap.
C. Lundbohm.
C. Schmelck.
Skelelven.
Valmuedalen.
Vildtland.
Nyeboes Bræ.
Afskedsvarden.
Holger Kiær Nunataks.
Adam Biering Land.

Names given by the Second Thule Expedition:

C. Wegener.
Freuchen Land.
J. P. Koch Fjord.
Thulevarden.

Names given by the Bicentenary Jubilee Expedition:

Hjærtet.
Nyren.
C. Klampenborg.
Sadlen.
C. Rungsted.
Havlit Lakes.
Grenen.
Langesø Lake.
Støvlen.
C. Gleerup.
Astrup Gl.
Midsommer Lake.
Trianglen.
Storm Ice Cap.
Hobbs Gl.
Inuiterk Lake.
Nugapinguak Valley.
Etukussuk Valley.
Moræne Lake.
Refsnæs.
C. Ejnar Mikkelsen.
Blomsterstranden.

Mylius Erichsens Land, bounded by Academy Gl., Independence Fjord, and Danmarks Fjord.

Names given by PEARY:

Academy Land.
C. Glacier.
Independence Bay (Fjord).

Names given by the Danmark Expedition:

Hjærtefjældsdal.
Pinseskæret.
Sjællandssletten.
Ulvebakkerne.
Gundersteddal.
C. Kronborg.
Mylius Erichsen Land.
Valdemar Glückstadt Land.
Jyske Aas.
Himmelbjærget.
Slutstenen.
(Mylius-Erichsen's summer camp 1907.
C. Rigsdagen.
C. Ludovika.
Hagen Fjord.
C. Bernhard.
C. Peter Henrik.

C. Grundloven[1]). Astrup Fj.
J. C. Christensen Land. Hugh Lee Gl.

Names given by the First Thule Expedition:

Zig-Zag Dalen. Kap Renaisance.

Names given by the Bicentenary Jubilee Expedition:

Slebsager River. Saxifraga Valley.
Neergaard River. Kranievarden.
C. Stadil. Troldhat.
Josephine Gl. Terne Valley.
C. Bøgebjærg. C. Kærby.
Ubberup Ld. C. Kallundborg.
C. Værslev.

Kronprins Christians Land, the land between Danmarks Fjord and Nioghalvfjerdsfjorden with Nioghalvfjerds Gl.

Name given by the Danmark Expedition:

Kap Viborg.

Pl. 12 shows the coast-line on the basis of Pl. 11, with contours and more important recent discoveries and the flying route of 1938.

Pl. 13. The coast-lines are based on my "Map of North Greenland" (1932) and on observations and drawings made by me during the flight in the *Perssuak* on May 15th—16th, 1938. It goes without saying that it was possible to work far more effectively in a closed cabin than in the open planes in 1932 and 1933. The final preparation of the map was supported by about 70 photographs, the majority of which were taken by Captain OVERBYE, some few by MAYR and myself.

From the regions a little east of Friggs Fjord to Nordpasset no photographs are available. The map is here based on the map drawn by me from the plane. I had no good outlook, as we were looking against the sun.

The material brought home was worked up with painstaking care by Dr. WALTER BLUMER, Bern. In a couple of places (the central part of J. P. Kochs Fjord) the photographs could be utilised in the aerocartograph. Several pairs of photographs were useful stereoscopically, but portions of the map are, of course, drawn on the basis of rather primitive observations. I was present when Dr. BLUMER prepared the

[1]) Name not found on "Map of North Greenland" (1932), sheet 10.

topography on the basis of the available material, but owing to the war I was unable to correct the proofs of the map, which i.a. resulted in the following errors:

1) Some errors in the spelling of the names (e.g. Kap Riksdagen for Kap Rigsdagen, Kap Morris Jessup for Kap Morris Jesup, Vistars Bjærg for Wistars Bjærg. Ymer Gl. for Ymers Gl.) The two lines in the right upper corner have been inserted by a mistake.

2) The coast-line from Kap Morris Jesup to Kap Britannia is not correctly copied everywhere from my atlas (1932). Both coasts in the interior of J. P. Kochs Fjord are indicated with a full-drawn line, while a short stretch should have been shown in a broken line (cf. Pl. 12). The outer part of Hugh Lee Gl. near Astrups Fjord is marked with land colour. Brikkerne near Victoria Fjord have no ice cap on the top. The inner part of the ice cap east of Kap Washington is not quite in accordance with my map of 1932.

The following new names were given after the Seaplane Expedition to Peary Land 1938:

Ormen.
Friggs Fjord.
Frejas Fjord.
Thors Fjord.
Odins Fjord.
Harders Fjord.
Hensons Gl.
Lurgletscher.
Tjalfes Gl.
Ymers Gl.
Sifs Gl.
Balders Gl.
Yduns Gl.
Sydpasset.
Nordpasset.
Drivhuset.
Ladegaardsaaen.
Spøttrup Elv.
Esrum Elv.
Tyrs Elv.
Tvilum Elv.
Børglum Elv.
Asmild Elv.
Vitskøl Elv.
Deichmanns Øer.
Tordenskjolds Fjæld.
Wistars Bjærg[1]).
Nordkronen.
Hans Tavsens Iskappe.
Walcotts Land.
Herluf Trolles Land.
Amundsens Land.
Lokes Elv.

NB. The name Adams Gl., the name of the glacier descending to the head of J. P. Kochs Fjord, is not marked on the map.

Pl. 14 is a copy of the greater part of the northern leaf of the map of the Danmark Expedition (cf. Pl. 5, Geogr. Tidsskr. 1912).

[1]) Name given by PEARY, but not found on earlier maps.

Pl. 15 is a compilation of EJNAR MIKKELSEN's map (M. o. G. Bd. 52, Pls. III (scale c. 1:3,000,000) and I (scale c. 1:650,000) and the map of the Danmark Expedition (Geogr. Tidsskr. 1912, Bd. 21, Hæfte V, Pl. 5).

Pl. 16. The coast-lines are based on the maps of the Danmark Expedition, the Alabama Expedition, the First Thule Expedition, and the Bicentenary Jubilee Expedition, supplemented with observations made by me during the flight on August 16th, 1933. It has repeatedly been pointed out in the present paper that during that flight the weather was not so favourable as might have been desired, especially from the edge of the inland ice across Danmarks Fjord to Ingolfs Fjord it was very cloudy, which impeded the observations. On the whole it should be pointed out that the mapping of the regions west of Danmarks Fjord is rather sketchy, the terrain, in particular, being very rough. Zig-Zag Dalen has been copied from FREUCHEN's map, and the regions south of Hagens Fjord are very little known.

The southern part of the land east of Danmarks Fjord, chiefly the regions east of Fyens Sø, are fairly low and flat plateau land, whereas the regions betweenDanmarks Fjord and Romers Sø are much higher and traversed by large canyons. This is only suggested on the map, as the cartographic material is very sparse here.

The following new names are found on the map:

Kap Gustav Rasmussen.
Kap Georg Cohn.
Kap Steglich-Petersen.
Kap Bernhoft.
Blaasø.
Skallingen.
Romer-Sø.
Grenen.
Flade Isblink.
Prinsesse Margrethe Ø.

Prinsesse Dagmars Halvø has been corrected to Prinsesse Dagmars Ø, though with some doubt. Possibly the name should be maintained for the continental coast.

Kronprins Christians Land is placed so as to include the land area between Danmarks Fjord and the outer coast that is not covered by the inland ice.

Inland ice is specially marked. Open water and lakes marked in blue colour (all the lakes were entirely free from ice except Romers Sø, which still remained ice-covered). Pack-ice and summering winter-ice in the fjords shown in white.

Name Plate to Pl. 16.

Some heights measured by the Danmark Expedition could not be located on the new map and are therefore omitted. With the exception

of some heights north and south of Independence Fjord, all the heights are derived from the map of the Danmark Expedition.

The names on Pl. 16 have been copied from:

1) the maps of the Danmark Expedition (Errata: Valdemar Glückstadt Land for Valdemar Glückstadts Land, Brønlund Fjord for Jørgen Brønlunds Fjord). In accordance with the most recent spelling of placenames in Greenland the letter **e** in Bjærg, Fjæld, etc., has been replaced by **æ**, likewise the letter **j** has been omitted in Kap København (Kjøbenhavn) and Kap Ringkøbing (Ringkjøbing), and Nordost-Rundingen has been replaced by Nordostrundingen;

2) the map of the Alabama Expedition;

3) the map of the First Thule Expedition (Kap Renaisance corrected to Kap Renaissance); and

4) the map of the Bicentenary Jubilee Expedition, sheets 9 and 10 (Kjovesletter corrected to Kjovesletten).

Peary Land.

Names given by PEARY:

C. (Mt.) Clarence Wyckoff.
C. (Mt.) Henry Parish.
Melville Land.
Independence Bay (Fjord).

Names given by the Danmark Expedition:

Herlufsholms Strand.
Wandels Hav.
Kap Eiler Rasmussen.
Kap København.
Kap Caroline Marie.
Kap Harald Moltke.
Brønlunds Fjord.
Kap Knud Rasmussen.

Name given by the First Thule Expedition:

Diabasnæs.

Names given by the Bicentenary Jubilee Expedition:

Mudderbay.
Kap Vaarbrud.
Kjovesletten.
Graptolit River.
Koralkalk River.
Mt. Falkefjæld.
Koralkysten.
Gryden.
Hvalsletten.

Mylius-Erichsens Land.

Names given by the Danmark Expedition:

Astrups Bugt.
Hugh Lee Bræen.
Kap Grundloven.
Kap Peter Henrik.
Kap Bernhard.
J. C. Christensens Land.

Hagens Fjord.
Kap Ludovika.
Kap Rigsdagen.
Slutstenen.
Himmelbjærget.
Jydske Aas.
Kap Kronborg.
Gundersteddal.
Valdemar Glückstadts Land.
Pinseskæret.
(Ulvebakkerne).
Sjællands Sletten.
Hjertefjeldsdalen.
Kap Holbæk.
Fynske Alper.
Danmarks Fjord.

Names given by the Alabama Expedition:

Fyens Sø.
Amdrups Højland.
Leffingwell's Nunatak.

Names given by the First Thule Expedition:

Zig-Zag Dalen.
Kap Renaissance.

Names given by the Bicentenary Jubilee Expedition:

Kap Bøgebjærg.
Ubberup Land.
Josephine Gl.
Kap Stadil.
Neergaard River.
Slebsager River.

Kronprins Christians Land.

The following names were given by the Danmark Expedition:

Kong Frederik VIII's Land.
Zachariaes Isström.
Kap Drygalski.
Norske Øer.
Brönlunds Grav.
Lamberts Land (old whalers name).
Nioghalvfjerds-Fjorden.
Kap Adolf Jensen.
Bagatellerne.
Kap Anna Bistrup.
Hovgaards Ø.
Kap H. N. Andersen.
Kap Povl.
Dijmphna Sund.
Lynn Ø.
Hekla Sund.
Mallemukfjældet.
Holms Land.
Fældestrand.
Eskimonæsset.
Ingolfs Fjord.
Kap Jungersen.
Henrik Kröyers Holme.
Amdrups Land.
Sophus Müllers Næs.
Antarctic Bugt.
Nordostrundingen.
Erik S. Henius Land.
Nakkehoved.
Prinsesse Dagmars Halvø (Ø).
Prinsesse Thyras Ø.
Kap Ringkøbing.
Prins Frederiks Øer.
Alexandrine Bjærgene.
Sjællands Fjældene.

Pl. 17,A. A copy (natural scale) of PEARY's map published in the Geographical Journal 1903.

B. A copy of map (natural size) published in the Bulletin of the American Geographical Society, December 1903.

It is interesting to note that as late as November 1903, PEARY published in London a map which is practically unaltered from the small map published in 1893 in Mrs. PEARY "My Arctic Journal", while at the same time the Peary Arctic Club sent to the American Geographical Society a map which is identical with the Hydrographic Office chart No. 2142, but which differs in several respects from the view held by PEARY from 1892 to 1903, especially concerning the extension of the inland ice, (cf. pp. 140—141).

Pl. 18. Map showing MYLIUS-ERICHSEN's last journey in 1907, according to the most recent information. Owing to an error Fyens Sø and Sælsø have not been indicated as lakes (ruled).

Pls. 19 and **20.** The maps, which are based upon previous mapping and upon air surveys in 1932 and 1933, were drawn in 1933 to be published in colours (cf. p. 278). My flying routes in 1932 and 1933 are shown in red, numbered in accordance with the remarks pp. 280—288.

Pl. 21. Map showing ice conditions and flying routes between Spitsbergen and North Greenland, based upon observations made during the flights on May 10th and 15th—16th, 1938.

Clouds over the open water and haze over the pack-ice indicated. Pack-ice only indicated where large areas of the ice were visible. (During the flight it was almost always possible with short intervals to see small areas of the ice through openings in the haze).

SUMMARY

On looking back on the many expeditions to the North Greenland coasts from about the middle of the last century to the present day, it will be seen that they have been dominated by a very few great ideas, in fact only by two, viz. 1) the quest of the North Pole, and 2) of the Peary Channel. During the attempts to reach these goals North Greenland has gradually been mapped.

1) The North Pole.

In 1616 BAFFIN discovered the route through Smith Sund. For the next two hundred years no ship came to these waters, but in 1818 they were visited by Ross and PARRY; Ross closed Smith Sund to the north in spite of PARRY's protests.

The route was re-opened by INGLEFIELD in 1852, but he had no opportunity of extending his investigations northward.

Subsequently KANE and HAYES created the exciting and fantastic picture of the ice barrier in Kane Bassin and the open water in Kennedy Kanal, which was supposed to extend as far as the North Pole. HALL broke through this barrier and pushed northward by ship beyond 83° N. lat., but after his death the possibilities thus opened up were not utilised by the expedition. The question whether there was an open sea around the North Pole still remained unanswered.

NARES put an end to the theory of an "open polar sea" and all expectation of reaching the North Pole by ship. NARES's expedition, with sledge parties in the west (ALRIDGE), southwest (ARCHER), east (BEAUMONT), and southeast (FULFORD), gave us the picture of the narrow passage between Greenland on the one side and Ellesmere Land-Grant Land on the other side. Thus the Smith Sund route had been mapped, and on NARES's Expedition MARKHAM had set the new polar record (1877—83°20′ N. lat.).

Now followed a period in which it was considered sporting to beat the polar record. LOCKWOOD, travelling along the north coast of Greenland, beat MARKHAM's record by four miles (1882—83°24′ N. lat.). This

record was beaten by NANSEN (1895—86°14′ N. lat.), whose record was again beaten by CAGNI (1900—86°33′ N. lat.)—the last two expeditions in the waters north of Franz Joseph Land.

By making a reconnaissance on the inland ice in about 70° N. lat. in 1886, PEARY had prepared himself for solving the riddle of the inland ice, but he was outdistanced by NANSEN, who solved the problem in 1888.

In 1892 PEARY attempted to use the inland ice, which he believed extended northward to 85° N. lat., as a highway in order to beat LOCKWOOD's polar record. He did not succeed, for the inland ice ceased at 82° N. lat.

In 1894—95 PEARY planned to push towards the North Pole along the east coast of Greenland, using the newly discovered Independence Fjord as a base, but these plans came to nothing.

In 1900 PEARY repeated LOCKWOOD's attempt to beat the polar record by travelling along the north coast of Greenland. He succeeded in determining the northward extension of Greenland, but only pushed as far as 83°50′ N. lat.

In 1902 PEARY, following MARKHAM's route, beat his own record from 1900, reaching 84°17′ N. lat. Finally, in 1906, he succeeded in beating CAGNI's record, reaching 87°6′ N. lat., and in 1909, when ice conditions in the polar basin were exceptionally favourable for sledging, he reached the North Pole. The struggle to reach this goal, which had for centuries contributed so greatly to further the exploration of the polar countries, had thus come to an end. It will appear from Pl. 17 what was mapped on the North Pole expeditions.

2) The Peary Channel.

Turning now to the Peary Channel, the second problem which has caused so much energy to be displayed, we have to go far back in history. Legendary conceptions dating as far back as the 17th century, to the effect that Greenland extended across the North Pole to the New Siberian islands, were utilised, about 1865, by the famous geographer Dr. A. PETERMANN to form an astonishingly tenacious theory about a polar basin with a continent, Greenland, in the centre, extending to the New Siberian islands. Into the sea between this continent and Siberia the Siberian rivers carried the drift-wood present everywhere along the coasts of Spitsbergen, East Greenland, and Iceland. PETERMANN first regarded Smith Sund as a bay closed to the north. Later on, when drift-wood was found here, too, though in small quantities, he was of opinion that it had been carried up there from the Bering Sea.

However, very early PETERMANN's theory was disputed. During the preparations for NARES's Expedition notably Dr. BROWN had advanced the view that the continent of Greenland must be traversed

by channels, or ice-free areas might occur not too near the North Pole, by way of which the Eskimos of East Greenland and the American animals, the musk-ox and the lemming, might have migrated to the east coast of Greenland. It is interesting to note that BEAUMONT was not instructed to push as far northward as possible, but his object was precisely to explore and investigate a channel, leading to the east coast, should any such exist. LOCKWOOD, too, kept in mind the possibility that one or several of the many fjords discovered by him on the north coast of Greenland might be channels leading to the east coast.

The question was thus of immediate interest in 1892, when PEARY was stopped in 82° N. lat., because the inland ice came to an end here, and it did not, therefore, come as a surprise to him when he observed features suggesting the presence of a channel. PEARY sketched a channel, while ASTRUP established the depression between the north and east coasts as a fact, but he was not certain whether it was above sea-level along the whole stretch. However, the route of migration had been found.

PETERMANN's theory was not definitely abandoned till 1900, when PEARY determined the approximate boundaries of the land now bearing his name. As regards the Peary Channel, PEARY, when starting on his expedition in 1898, planned a journey through it, and in 1909 two members of his expedition, BORUP and MACMILLAN, planned an investigation of the channel. However, these plans were not carried out, and none of PEARY's expeditions after 1892 supplied further information about the channel.

In 1906 MYLIUS-ERICHSEN made the question of the Peary Channel one of the items of his expedition programme, and the history of the Peary Channel now passed into a dramatic stage. To MYLIUS-ERICHSEN the Peary Channel would seem to have represented the question whether or not there existed an archipelago northeast of Greenland. MYLIUS-ERICHSEN points out that the Peary Channel might have been a migration route for the musk-ox, the reindeer, and the wolf as also for the Eskimos from the north to the east coast of Greenland, and he considers the existence or non-existence of the Peary Channel as one of the main problems to be solved on the expedition.

J. P. KOCH was entrusted with the task of mapping the outer coast as far as Kap Clarence Wyckoff, while MYLIUS-ERICHSEN and his party undertook to investigate whether or not there existed an archipelago northeast of the mainland of Greenland.

Evidently MYLIUS-ERICHSEN was thinking of the archipelago when he was looking into Danmarks Fjord from Prins Frederiks Øer; Valdemar Glückstadts Land might be an island, and thus possibly form part of the archipelago. The best part of the spring was spent mapping Dan-

marks Fjord, and when MYLIUS-ERICHSEN quite by chance met J. P. KOCH and his party at Kap Rigsdagen on May 28th and learned that J. P. KOCH had reached PEARY's cairn on Kap Clarence Wyckoff, had pushed even as far as Kap Bridgman, and moreover had determined the main features of Independence Fjord, he made up his mind to return with J. P. KOCH to the ship. Next day, however, he decided to make a rapid journey to Kap Glacier in order, in the least, as originally planned, to link up with PEARY's station on Navy Cliff, after which the party was immediately to start on their return journey. By that time the exploration of the Peary Channel had been abandoned.

Instead of ending the journey in a few days, MYLIUS-ERICHSEN could not resist the temptation to explore both Brønlunds Fjord and Hagens Fjord; if immediately after obtaining connection with PEARY's Navy Cliff, he had concentrated all his energy on reaching the outer coast (as was his plan on parting from J. P. KOCH at Kap Rigsdagen), he would probably have saved his life. But in spite of all it was MYLIUS-ERICHSEN who proved that the supposition of an archipelago north and northeast of Greenland proper, set forth by PEARY and before him by BROWN, LOCKWOOD, and GREELY, was untenable; for he closed the heads of Danmarks Fjord, Independence Fjord, Brønlunds Fjord, and Hagens Fjord.

MYLIUS-ERICHSEN and his two travelling companions died during the return journey. In consequence J. P. KOCH's journey through the Peary Channel planned for the spring of 1908 was given up in order to search for the three men. On Lamberts Land he found the body of BRØNLUND and two sketch-maps and some landscape sketches made by HØEG-HAGEN; however, this material was too vague to allow the Danmark Expedition to come to any decision concerning the existence or non-existence of the Peary Channel. Apparently, therefore, the Danmark Expedition returned home without having solved one of the main items in its programme.

In 1910 EJNAR MIKKELSEN found a brief cairn report by MYLIUS-ERICHSEN containing the sentence "the Peary Channel does not exist" without any explanatory remarks, but not till 1912 did he return to Denmark with this news.

In 1912, without knowing anything about MYLIUS-ERICHSEN's discoveries at the head of Independence Fjord, and without knowing that two years before EJNAR MIKKELSEN had found the report in Danmarks Fjord with the sentence about the non-existence of the Peary Channel, KNUD RASMUSSEN and PETER FREUCHEN passed this place on their way into Independence Fjord, whose head they found to be barred by a glacier. As they travelled across the land north of the glacier they came upon the depression Valmuedalen; however, owing to bad weather

they could only trace its extension over a short distance northeastward. Thus it was proved that the Navy Cliff-land and Heilprin Land were connected by land, and that no channel debouched at the head of Independence Fjord. The expedition returned to Denmark in 1913, and immediately afterwards published a sketch-map drawn by FREUCHEN. This sketch-map, which was not in accordance with PEARY's observations, was published unaltered as a final map in 1915.

In 1913 severe criticism of PEARY in connection with the Peary Channel was advanced in the American Congress on the basis of the reported results of the latest Danish expeditions. Without examining whether PEARY's observations agreed with the observations of the Danish expeditions, it was established that the channel did not exist, and the official American map showing the channel was cancelled and withdrawn. That the Hydrographic Office submitted to this demand without examining the material secured by the Danish expeditions, relying merely on some newspaper notices, must be ascribed to the general excitement due to the North Pole controversy.

In 1916 KNUD RASMUSSEN and the present author started on a journey across the inland ice in order to explore the regions seen by PEARY from the inland ice in 1892, that is to say, the central and northern parts of the Peary Channel. As it proved impossible to make the journey that year, the plans were changed, so that the journey was to be made along the north coast next spring. On this expedition Nordenskiölds Fjord, the northern outlet of the Peary Channel, as well as De Long Fjord, the northern outlet of its branch, were closed. A new fjord, J. P. Kochs Fjord, was discovered, but at the same time we received the impression that the inland ice extended northward nearly to the head of De Long Fjord. In accordance with KNUD RASMUSSEN's wish this was shown on the provisional map of the expedition 1919; and the ice-cap on Adam Bierings Land was connected with the ice observed by us south of De Long Fjord. In 1919, after his two expeditions, KNUD RASMUSSEN wrote about the channel that it "had been reduced to a myth".

MYLIUS-ERICHSEN's categorical expression in the report deposited in Danmarks Fjord, that "the Peary Channel does not exist", seemed to be confirmed by the observations of both the First and the Second Thule Expeditions, and when PEARY died in 1920, inland ice was shown on the map where he had drawn his channel.

However, during the final working up of my cartographical material from 1917 I became aware of the great agreement existing between PEARY's and ASTRUP's observations, so they could hardly be a swindle; I was therefore very careful only to mark what had been observed. This map was printed in 1920 and published in 1922, and I carried it with me on my journey around the north of Greenland in 1921.

In considering the problem of the Peary Channel my attention had especially been attracted by two points: 1) PEARY's observation of the higher-lying northern slope of the channel traceable throughout its length (pointed out by ADAMS), and 2) ASTRUP's definition of the depression as a fact even though its bottom was unknown. In June 1921, travelling along the south coast of Peary Land, far out in Independence Fjord I had a wide outlook inland through Brønlunds Fjord, which continued, apparently as a channel to the horizon in the west, and some days later, standing at the top of a mountain situated northwest of the head of Brønlunds Fjord, I had a view of about 100 km of the large depression extending inland from the mouth of Brønlunds Fjord. A large low-lying lake was found at its bottom. The depression was bounded by low land towards the inland ice and on the opposite side by a much higher and precipitous mountain wall, as described by ADAMS. Owing to lack of provisions I did not get as far northward on the inland ice as to the northernmost point reached by PEARY, but I looked down into the lake and traced the depression towards J. P. Kochs Fjord. Thus the depression between the fjords of the north coast and the east coast was re-discovered, not in the form of a channel, but as a depression whose eastern portion was occupied by a lake. My planned inland ice journey next year to the northern part of the Peary Channel had to be given up owing to disease among the Eskimos and bad weather.

Finally, in 1938, the veil was to be withdrawn from the riddle of the Peary Channel. From the air I observed that J. P. Kochs Fjord extended southward and then, forming a right angle, southeastward to very near the aforementioned low-lying lake, the distance from the head of J. P. Kochs Fjord to the lake being merely about 25 km, while the pass was relatively low.

The dramatic exploration history of the Peary Channel had thus come to an end. Fourteen years after PEARY first set forth his supposition of a channel, Danish expeditions made the exploration of the Peary Channel one of their objects, and one expedition after the other returned home with the message, "The Peary Channel does not exist". I am not saying this to find fault, for I, too, was one of the cartographers who came to that result (1917). However, when the Peary Channel seemed to have entirely disappeared, the problem was again taken up by Danish expeditions, and PEARY was given the rehabilitation he deserved, though after his death, and the land lying north of the Peary Channel thus bears his name with honour.

Now that the problem of the Peary Channel has been solved, we may ask whether its magic influence on expedition programmes is at last played out. I do not believe so. It has been mapped from the air,

but no white man has ever travelled through it. What was planned by PEARY, MYLIUS-ERICHSEN, J. P. KOCH, EJNAR MIKKELSEN, BORUP and MACMILLAN, KNUD RASMUSSEN and PETER FREUCHEN will very likely be carried out one day, whether by men walking laboriously along with dog-sledges according to the old methods, or by men who will utilise the excellent landing places for seaplanes afforded by the lakes in Wandels Dal.

More than a quarter of a century has elapsed since MYLIUS-ERICHSEN planned his expedition. We know now that the supposed archipelago in North Greenland does not exist, but the question as to the route of migration from the north to the east coast is now just as burning as when MYLIUS-ERICHSEN put it in his programme. Except in the very short melting period one may travel on ice throughout the whole length of the "channel" save over the aforementioned 25 km.

Whether the Eskimos and the animals (musk-oxen, lemmings, reindeer, wolves) have also wandered around the north of Peary Land, is so far unknown, but it seems beyond doubt that the chief migration of Eskimos has taken place by way of the Peary Channel. The distance through the depression between the northernmost locality on the north coast in which Eskimo remains have been found (a meat-grave near Frankfield Bugt discovered by my Eskimo companions in 1921) and the northernmost locality on the east coast (remains of a bow found by myself at the head of Brønlunds Fjord in 1921) is only about 350 km. At either end of the Channel we find places with good possibilities for seal-hunting, viz. to the northwest a current-hole near the mouth of J. P. Kochs Fjord and to the east the crack across the mouth of Brønlunds Fjord; Wandels Dal has a large hinterland for musk-oxen, and probably, in earlier times, for reindeer, too; and around the many lakes, which are no doubt rich in salmon, the Eskimos may possibly have sustained life during long periods.

The Peary Channel, the large depression cutting across northernmost Greenland from west to east, seen in 1892 by PEARY and ASTRUP, lost and rediscovered, does not extend from Nordenskiölds Fjord to Independence Fjord, but between J. P. Kochs Fjord and Brønlunds Fjord. Its bottom is not below sea-level throughout its whole length, but only along a stretch of about 25 km does it rise notably above the level of the sea.

Færdig fra Trykkeriet den 31. December 1940.